Exploring wage returns to Korean language proficiency using semi-parametric analysis

Junghyun Baik
University of Auckland
jbaik0627@naver.com

Abstract. *This study investigates the wage returns to Korean as the official language in South Korea's labor market, focusing on its influence on earnings and the potential nonlinearity in this relationship. Using nationally representative survey data from the Korean Education and Employment Panel Survey 1 (KEEP1), Korean proficiency is measured through reverse-coded levels of the College Scholastic Ability Test (CSAT) Korean Subject.*

Ordinary Least Squares (OLS) regression, spline functions, and semi-parametric kernel regression are applied to capture both linear and nonlinear wage effects. A differencing method is employed to control for confounding variables such as education and work experience, isolating the independent impact of Korean proficiency.

The findings reveal that higher Korean proficiency levels are linked to accelerated wage premiums, possibly reflecting the broader importance of advanced linguistic skills in the Korean labor market. In contrast, lower proficiency levels could be associated with wage penalties, possibly due to linguistic difficulties that limit job opportunities and productivity. Notably, the sample comprises young adults aged 25 to 30 (with an average age of 27.56), which suggests that the observed effects may reflect early career dynamics where linguistic skills play a particularly pronounced role. These results underscore the dual role of Korean proficiency as both a component of human capital and a signaling mechanism, influencing hiring decisions and wage determination in the labor market.

This study contributes to the literature by providing empirical evidence on the wage effects of official language proficiency, highlighting its nonlinear influence on earnings. The findings suggest that higher Korean proficiency yields increasing wage premiums, emphasizing the role of advanced language skills in professional success. Additionally, the study underscores the importance of aligning language education policies with labor market demands. Expanding beyond basic literacy, targeted educational and training programs should incorporate advanced linguistic competencies to enhance both academic and workplace language proficiencies, ultimately reducing linguistic disparities in economic opportunities.

Keywords: *Korean proficiency; wage determination; nonlinear analysis; human capital; language economics.*

Análisis de la rentabilidad salarial del dominio del idioma coreano mediante análisis semiparamétrico

Resumen. *Este estudio analiza los beneficios salariales asociados al dominio del coreano como lengua oficial en el mercado laboral de Corea del Sur, centrándose en su influencia sobre los ingresos y en la posible no linealidad de esta relación. Utilizando datos de una encuesta nacional representativa —la Encuesta Panel de Educación y Empleo de Corea 1 (KEEP1)— el nivel de competencia en coreano se mide a través de los resultados invertidos del examen de aptitud académica para la universidad (CSAT), específicamente en la materia de lengua coreana.*

Se emplean modelos de regresión por mínimos cuadrados ordinarios (OLS), funciones spline y regresión semiparamétrica con núcleo para captar tanto efectos salariales lineales como no lineales. Asimismo, se utiliza un método de diferenciación para controlar variables de confusión como la educación y la experiencia laboral, con el fin de aislar el impacto independiente del dominio del coreano.

Los resultados revelan que niveles más altos de competencia en coreano están asociados a un aumento acelerado en las primas salariales, lo cual posiblemente refleje la relevancia general de las habilidades lingüísticas avanzadas en el mercado laboral coreano. En cambio, los niveles bajos de competencia podrían relacionarse con penalizaciones salariales, posiblemente debido a dificultades lingüísticas que limitan las oportunidades de empleo y la productividad. Cabe destacar que la muestra está compuesta por jóvenes adultos de entre 25 y 30 años (con una edad promedio de 27,56), lo que sugiere que los efectos observados podrían reflejar dinámicas propias de las etapas iniciales de la carrera profesional, donde las habilidades lingüísticas tienen un peso especialmente

destacado. Estos hallazgos subrayan el doble papel del dominio del coreano como componente del capital humano y como mecanismo de señalización que influye tanto en la contratación como en la determinación salarial en el mercado laboral.

Este estudio aporta evidencia empírica sobre los efectos salariales del dominio de la lengua oficial, destacando su influencia no lineal sobre los ingresos. Los resultados sugieren que una mayor competencia en coreano genera primas salariales crecientes, lo que enfatiza el papel de las habilidades lingüísticas avanzadas en el éxito profesional. Además, el estudio subraya la importancia de alinear las políticas educativas lingüísticas con las demandas del mercado laboral. Más allá de la alfabetización básica, los programas educativos y de formación deberían incorporar competencias lingüísticas avanzadas para mejorar tanto el desempeño académico como el profesional, reduciendo así las desigualdades lingüísticas en el acceso a oportunidades económicas.

Palabras clave: *Dominio del coreano; determinación salarial; análisis no lineal; capital humano; economía del lenguaje.*

1. Introduction

1.1 Research background and problem statement

In Korea, public discourse on the value and role of the Korean language and Korean language education has predominantly focused on the symbolic significance of national identity and cultural importance (e.g., Ko and Jeong, 2013; Lee, 2006). This tendency can also be understood in connection with the historical context of the Japanese colonial period, during which the Korean language was systematically suppressed (see Min, 2020).[1] Furthermore, a similar trend is observed in recent debates on the potential adoption of English as an official language, where discussions have predominantly focused on reaffirming and emphasizing the symbolic and cultural value of Korean as a national language, rather than addressing its functional and practical utility (e.g., Choi, 1998; Jeong, 2000).

However, beyond its symbolic significance as a national and ethnic language, Korean is an official and working language that functions as an essential tool for individuals' livelihoods and economic activities in Korea. Functionally, an "official language" is a critical asset directly tied to economic opportunities and social integration, not only in Korea but also in most other countries. In particular, it plays a significant role in access to public administration (Armstrong, 2017), employment opportunities (Chiswick and Miller, 2014; Dustmann and Fabbri, 2003), and the formation of economic and social relationships (Esser, 2006; Wei, 2016). Therefore, individuals commonly perceived as having lower official language proficiency—such as those from low-income or low-education backgrounds, immigrants, or multicultural families—are more likely to face structural disadvantages, including exclusion from public services, loss of job opportunities, and social isolation. To address these issues, governments worldwide, including Korea, have institutionalized language education and support policies, establishing relevant agencies and allocating resources to enhance literacy and official language proficiency (e.g., Cray and Currie, 2004; Ok et al., 2016; Vanek et al., 2020).[2]

1 Min (2020) analyzes the development of linguistic nationalism in Korea from the Enlightenment period through Japanese colonial rule to the present, examining how Korea's unique historical experiences have shaped the perception of Korean identity and language policy.

2 Although the cited studies primarily focus on immigrant groups, their insights into the impact of official language proficiency on economic and social outcomes can also apply to native populations. Even in studies on native speakers, while some variations may arise due to differences in context and target groups, the fundamental structure of economic advantages and disadvantages driven by language proficiency remains broadly consistent.

In order to establish the legitimacy of such language and language education policies, numerous studies have already been conducted in various countries to empirically examine the relationship between official language proficiency and labor market outcomes (Christl et al., 2020; Earle, 2009). One possible explanation is that the empirical investigation of the relationship between language proficiency and labor market outcomes—particularly wage levels and employment performance—not only serves as a process of providing quantitative evidence to justify government investment, but also functions as a foundational resource for assessing the potential socio-economic spillover effects of language proficiency improvement, including expanded labor market participation and increased income (Grin et al., 2010).

Despite the implementation of various language policies to improve literacy and multiple revisions to the public education curriculum, a lack of objective indicators and empirical research remains to assess how these policies have influenced individuals' economic outcomes in Korea and how they may shape future labor market performance. This gap likely stems from a lack of prior research and foundational data needed to analyze the economic value of Korean language proficiency in terms of individual wage levels and employment performance. Consequently, this gap represents a notable research limitation that warrants further investigation in both academic and policy discussions.

Against this backdrop, this study investigates the economic value of Korean proficiency as the official language in Korea's labor market, with a particular focus on its wage effects. Specifically, the study examines whether the relationship follows a nonlinear pattern. To empirically test this, the analysis draws on data from the Korean Education and Employment Panel 1 (KEEP1), a nationally representative dataset capturing educational and labor market trajectories of Korean youth. Korean proficiency is proxied using standardized proficiency levels, which are derived from scaled scores in the Korean section of the College Scholastic Ability Test (CSAT), a standardized exam widely used for university admissions in Korea.

To isolate the independent effects of Korean proficiency, a differencing method is employed, controlling for confounding variables such as education and work experience. The robustness of the semi-parametric approach is validated through goodness-of-fit tests. Findings are contextualized within human capital theory (Becker, 1962; Schultz, 1961) and signaling theory (Spence, 1973), providing insights into the role of official language skills in shaping labor market outcomes and guiding language and education policy.

1.2 Definition of key terms: literacy, official language proficiency, and natives

In this study, 'official language proficiency' is defined as a concept encompassing the overall language abilities required to effectively use and communicate in the official language at the national level, including reading, writing, speaking, and listening. In contrast, literacy refers to a narrower concept that primarily involves the ability to read and write, as well as the comprehension and utilization of texts. Existing studies analyzing the wage effects of literacy (e.g., Christl et al., 2020; Earle, 2009; Garrouste, 2008) explain literacy as a subset of official language proficiency when interpreting results. This study follows the same perspective and interprets previous studies analyzing the wage effects of literacy as part of studies on the wage effects of official language proficiency in a broader sense.

In addition, the CSAT Korean subject level used in this study is a standardized, large-scale national exam that serves as a representative assessment tool for measuring a wide range of proficiency levels, from basic literacy to advanced text comprehension. The CSAT Korean section applies a standardized, score-based relative grading system, which allows it to function as a proxy for official language proficiency with a certain degree of objectivity. However, since the CSAT does not directly assess production-based language skills such as speaking and writing, it is important to clarify that the concept of official language proficiency used in this study primarily focuses on comprehension-based proficiency. Further details on the CSAT can be found in Section 4.2.2.

Another key consideration is that the term 'natives' (native speakers) used in this study refers to the majority linguistic group in the target country (in this case, Korea) who use the official language as their mother tongue and were born and raised in that country. This distinction is important, as in multilingualism research, the terms "native speakers" or "native language" are often used to refer to minority or indigenous language speakers (e.g., Māori in New Zealand, Indigenous languages in Canada), which differs in context from the definition applied in this study.

2. The context of official language curriculum and language policy

In Korea, representative policies aimed at enhancing official language proficiency (Korean proficiency) among natives include the public education curriculum and literacy support programs. An overview of these two institutional frameworks is necessary to provide the contextual background for this study.

2.1 The revision history of the Korean language curriculum (the development of official language education)

Korea's national language education policy has evolved to establish Korean as the official language, while also expanding literacy and language utilization skills to meet changing societal demands. The early Korean language curriculum (the 1946 syllabus and the first to third curricula) focused on basic literacy and the establishment of the standard language. Since the 1980s, curriculum reforms have shifted toward academically oriented education (the fourth curriculum), function-oriented education (the fifth to seventh curricula), and an emphasis on media and job-related literacy (since the 2000s)[3].

The 2007 revised curriculum introduced the subject "Media Language," reflecting changes in the digital environment. The 2009 revision reorganized the Korean language curriculum into five areas—listening and speaking, reading, writing, grammar, and literature—while adopting grade-band achievement standards. The 2015 curriculum revision defined Korean language proficiency as a tool for thinking, communication, and learning, emphasizing core competencies such as critical and creative thinking, communication, and information literacy.

The most recent 2022 revision of the Korean language curriculum was restructured to strengthen "media literacy" and "job-related Korean proficiency" in response to the evolving digital environment. Digital and media literacy were incorporated into the core competencies of the Korean language curriculum, and new high school elective courses such as *Literature and Visual Media* and *Media Communication* were introduced. Additionally, to address the declining literacy skills of lower-grade elementary students, the curriculum expanded Korean language instruction time and subdivided reading and writing education into categories such as *Foundations of Reading*, *Foundations of Writing*, and *Fundamentals of Hangul and Korean Language Norms* (Noh, 2023). This shift indicates a transition beyond basic literacy education toward the development of Korean language proficiency for broader social participation, including engagement in the labor market, aligning to some extent with the objectives of adult literacy support policies.

3 The detailed discussion on the revisions of the Korean language curriculum refers to Choi et al. (2023) and Min (2016).

2.2 Lifelong Education Act-based adult literacy support policies

Support for adult literacy education in South Korea is based on the Lifelong Education Act, which provides the legal and policy framework for its implementation. Article 2 of the Lifelong Education Act defines "literacy education" as an organized educational program designed to equip individuals with the basic life skills necessary for daily living, including literacy skills.[4] However, this legal definition contrasts with the broader concept of literacy promoted by UNESCO, which includes not only fundamental literacy but also critical thinking, digital competency, and lifelong learning skills. In South Korea, policies supporting individuals with low levels of official language proficiency primarily focus on ensuring minimum essential literacy for social adaptation, rather than embracing the expanded international perspective that incorporates literacy as a means of critical engagement and digital fluency (see Ok et al., 2016).[5]

Within this framework, the National Institute for Lifelong Education (NILE) oversees adult literacy support programs in South Korea under the Ministry of Education. The major initiatives include:

(1) conducting national literacy surveys to collect baseline data for policy development;
(2) implementing primary- and secondary-level literacy education programs for adults who missed formal schooling opportunities; and
(3) operating literacy education centers at the provincial and municipal levels.

However, the effectiveness of these policies is difficult to assess due to a lack of publicly available data. The most recent official document providing insight into these initiatives is the 2023 Adult Literacy Education Support Project Performance Report, which primarily presents descriptive statistics on the number of local governments receiving funding, the number of participating learners, and the operation of accredited literacy programs. These statistics alone do not allow for a comprehensive evaluation of the efficiency of resource allocation. Furthermore, the 2024 Fourth Adult Literacy Survey reported that the estimated population with literacy levels below the middle school level declined significantly

4 UNESCO defines literacy as more than just reading and writing skills; it encompasses the ability to understand, interpret, create, and communicate information in digital environments as a lifelong learning competency. For the full text, see: https://www.unesco.org/en/literacy/need-know.
5 Ok et al. (2016) assessed that adult literacy education in Korea is largely perceived as an issue of basic literacy or letter recognition.

between 2014 and 2023. However, this decline may not necessarily indicate the success of literacy education policies; instead, it could be attributed to the natural decline of older, lower-educated cohorts over time and the general improvement in educational attainment across generations.[6]

Meanwhile, existing research on lifelong education and literacy has focused less on evaluating the effectiveness of current policies and more on expanding the conceptual framework of adult literacy and exploring more practical educational directions. Ok et al. (2016) analyzed adult literacy education policies in several countries, including the United Kingdom, Canada (Ontario), Japan, Norway, Germany, and Finland, and argued that literacy policies should be aligned with school-based literacy education while also recognizing the distinct learning needs of adult learners. Similarly, Park et al. (2017) conducted interviews with 15 Korean-language education experts to collect opinions on the future direction of adult literacy education, emphasizing the need to expand literacy education to include workplace and media literacy. Additionally, Lee (2020) highlighted the necessity of integrating digital and occupational literacy into literacy education, arguing that in a lifelong learning society, literacy education should not be limited to basic literacy but should also consider its application in professional and cultural contexts. These studies share a common perspective, advocating for a shift away from narrowly defined literacy policies focused solely on eradicating illiteracy toward a more comprehensive lifelong education approach—one that encompasses adult literacy as a broad and evolving concept.

2.3 Common trends and limitations of recent policy changes

The revisions in the Korean language curriculum and adult literacy support policies emphasize the need to move beyond a narrow approach centered on basic literacy and the eradication of illiteracy. Instead, they advocate for an expanded concept of literacy within the framework of lifelong education. The Korean language curriculum has been restructured to strengthen media literacy and occupational literacy, while adult literacy support policies have also been recommended to shift away from focusing solely on basic literacy toward a broader lifelong learning approach.

---

6 According to the results of the 4th Adult Literacy Survey published in 2023, the proportion of the population with literacy levels equivalent to middle school education or lower has generally decreased from 2014 to 2023. This survey categorizes adult literacy into four levels:

- Level 1: Inability to perform basic reading, writing, and arithmetic.
- Level 2: Basic reading, writing, and arithmetic skills are present but insufficient for practical use.
- Level 3: Sufficient for simple daily activities but inadequate for public and economic participation.
- Level 4 and above: Equivalent to middle school-level literacy or higher.

However, a critical limitation of these policies is the lack of foundational data or empirical evidence to assess their effectiveness, with research analyzing their connection to labor market outcomes remaining scarce.

3. Related literature

This literature review section aligns with the study's objectives and scope by first reviewing international research on the wage effects of official language proficiency (Section 3.1), and then examining language economics studies conducted in Korea, particularly those estimating the relationship between language proficiency and wages (Section 3.2). Notably, most studies in Korea have focused on the economic returns to English as a foreign language, while empirical research on the wage effects of Korean proficiency as the official language remains scarce.

3.1 The wage effects of official language proficiency

Language economics has extensively examined the wage premium linked to host language proficiency among immigrants; however, research on the wage returns to official language skills among native speakers remains underexplored outside the literacy framework. Business studies emphasize that communication skills—facilitated by official languages—enhance worker performance (e.g., Biryanto et al., 2018; Supriyati et al., 2023), enterprise outcomes (e.g., Yu and Yang, 2023), and organizational commitment (e.g., Mikkelson et al., 2015). These findings underscore the need to investigate the economic relationship between wages and official language proficiency, as native speakers exhibit varying degrees of proficiency which, in turn, might influence their labor market outcomes (Vigouroux and Mufwene, 2020).[7]

Due to data availability and historical precedent, most empirical studies have relied on literacy as a proxy for official language proficiency. Literacy has increasingly been viewed as a robust indicator of human capital, complementing or substituting traditional metrics like years of schooling. Since literacy assessments in large-scale surveys such as the International Adult Literacy Survey

7 Vigouroux and Mufwene (2020) highlight the limitations of economic analyses that assume full language proficiency based solely on native status, noting that proficiency varies among native speakers and can significantly impact labor market outcomes. This study applies their insights to Korea, a monolingual and monoethnic society, empirically examining how variations in official language proficiency affect wage outcomes. To avoid confusion with the commonly used "native language" concept in migration studies, this study adopts the term "official language proficiency," clarifying that Korean is both the native and official language for the majority of Koreans.

(IALS) and the Program for the International Assessment of Adult Competencies (PIAAC) are conducted in the official language of each country[8], they provide valuable insights into the wage returns of official language proficiency (e.g., Christl et al., 2020; Earle, 2009).[9] Numerous studies extend the Mincer wage equation (Mincer, 1974) by incorporating literacy alongside education and experience.[10]

Empirical findings from IALS data consistently highlight the wage premium of literacy and its interaction with national contexts. For example, McIntosh and Vignoles (2001) estimated an 11.4–12.6% wage effect in the UK, while Green and Riddell (2003) found that a 20-point literacy increase in Canada corresponds to a wage premium equal to one additional year of schooling. Cross-country analyses by Leuven et al. (2004) and Blau and Kahn (2005) further emphasized literacy's role in explaining wage differentials shaped by institutional and market mechanisms.[11]

Building on earlier findings, PIAAC-based studies further reinforce the significance of literacy in wage determination. Hanushek et al. (2015) identified a 17% wage premium for a one-standard-deviation increase in literacy across 23 countries, while Hampf et al. (2017) reported a 22% premium using a two-stage least squares approach to address skill measurement endogeneity. Christl et al. (2020) demonstrated that literacy accounts for 25–34% of the wage gap between immigrants and natives in Austria—collectively underscoring literacy as a key determinant of wages. The shift from IALS to PIAAC has enabled researchers to refine literacy measures and employ more rigorous econometric techniques, further solidifying the link between literacy and labor market outcomes.

Moving beyond large-scale literacy surveys, recent studies have expanded their scope by incorporating alternative indicators of language proficiency, such

8 The IALS and PIAAC samples predominantly consist of native speakers, with immigrants making up a smaller proportion, thereby enabling studies to use those surveys to capture the wage effects of natives' official language proficiency.

9 The Adult Literacy and Lifeskills (ALL, 2003–2008) survey, also led by OECD, has been less utilized in skill-related economic studies, likely due to its limited scope and fewer participating countries compared t IALS and PIAAC (Martin, 2018)

10 Various studies have combined scores from different literacy test domains - document literacy, prose literacy, and numeracy in IALS; literacy, numeracy, and problem-solving in PIAAC - to estimate the wage effects of skills such as literacy. High correlations between these domains, ranging from 0.7 to 0.96 (Blau and Kahn, 2005; Earle, 2009; Green and Riddell, 2003; Hampf et al., 2017; Hanushek et al., 2015), suggest that these composite measures can serve as proxies for broader literacy skills and, by extension, official language proficiency. For detailed information on the test domains and their content, refer to OECD Skills Outlook 2023.

11 Additionally, studies utilizing IALS data have consistently demonstrated the robust explanatory power of literacy as a determinant of wages, despite variations in educational and human capital variables included in wage equation models and the application of diverse statistical techniques (e.g., Barone and Van de Werfhorst, 2011; Hanushek and Zhang, 2009; Sakellariou, 2013).

as standardized test scores, job-specific requirements, and communication skills. Ubalde and Alarcón (2020) linked linguistic reasoning to wage premiums using O*NET and Census Population Survey data. Salahodjaev and Malikova (2021) found that reading comprehension in Tajikistan yields higher returns than other cognitive skills, using the World Bank and GIZ's Jobs, Skills, and Migration Survey. Glewwe et al. (2022) highlighted the wage impact of literacy and Mandarin test scores using Gansu Survey data from China. These studies reflect the expanding scope of language economics, driven by increasingly sophisticated datasets and refined measures of official language proficiency.

3.2 The labour market outcomes of language proficiency in Korea

Studies on the economic returns to language proficiency in Korea have primarily focused on English, given its widespread use in education and its role as a key hiring criterion in the labor market (see Park, 2011). Many of these studies use the Test of English for International Communication (TOEIC, developed by Educational Testing Service [ETS]) scores as a measurement indicator, producing mixed results depending on sample characteristics. For instance, Choi and Kim (2009), analyzing KLIPS[12] data, found no significant wage premium for TOEIC scores. In contrast, Kim and Choi (2010) reported a 3.8% wage premium for a 100-point TOEIC increase among college graduates. Similarly, Lee and Yang (2011), using GOMS[13] data, identified a 3% wage premium for higher TOEIC scores, which rose to 5% after addressing endogeneity. These findings suggest that English proficiency offers wage advantages for the highly educated, though TOEIC's relevance to workplace skills remains debated.

Beyond wage premiums, research has also explored the broader macroeconomic implications of English proficiency. For example, research on overseas English training (Ahn, 2009; Choi, 2015; Park, 2009) and analyses linking TOEFL scores with macroeconomic indicators such as Gross National Income across Asian countries (Li et al., 2022) underscore its economic significance, though such studies remain limited in scope.

In contrast, research on the wage effects of official language proficiency in Korea has primarily relied on literacy as a proxy, largely drawing on PIAAC data. Lee and Wie (2017) found a 7.2% wage premium for a one-standard-deviation

12 Korean Labor and Income Panel Study, established by the Korea Labor Institute (KLI).
13 Graduates Occupational Mobility Survey, conducted by the Korea Employment Information Service (KEIS).

increase in literacy scores, while Lee et al. (2019) reported a 7.5% premium in the context of vocational training. These studies underscore the significance of literacy but primarily examine it as a proxy, providing limited insights into the direct effects of official language proficiency on labor market outcomes.

Cross-national PIAAC analyses by Hanushek et al. (2015) and Hampf et al. (2017) further revealed wage premiums of 21% and 24%, respectively, for a one-standard-deviation literacy increase among Korean samples. However, as cross-national studies, they primarily focus on identifying overarching trends across countries, offering limited insights into country-specific language demands, wage progression, and employment stability. As a result, the direct relationship between official language proficiency and labor market outcomes within Korea remains an underexplored area of research.

3.3 Gaps and limitations

Existing research on language skills and wages faces several limitations. First, many studies rely heavily on literacy as a singular metric, overlooking the multidimensional nature of language proficiency. While literacy assessments primarily capture reading and writing skills, they do not adequately account for other types of language abilities that are essential in professional settings, such as workplace communication and contextual language use. Notably, Deming and Kahn (2018) found strong correlations between wages and sociolinguistic skills—including communication, negotiation, and collaboration—while Green (2012) highlighted that teaching, persuading, and active listening positively affect wages. Such findings suggest that language skills beyond literacy also play a crucial role in economic outcomes, underscoring the need to explore various aspects of language proficiency in labor market research.

Second, measurement and conceptual issues in literacy surveys raise concerns. High correlations between literacy, numeracy, and problem-solving skills reported in IALS and PIAAC (over 0.8; Blau and Kahn, 2005; Green and Riddell, 2003; Hampf et al., 2017) suggest that these surveys primarily capture fundamental cognitive skills, including basic language proficiency, rather than the full spectrum of official language skills. Consequently, when literacy is used as a proxy for official language proficiency, existing wage effect estimates may systematically underestimate the actual returns to language skills, as they fail to account for advanced linguistic competencies essential in professional and academic contexts. This limitation highlights the need for more comprehensive measurement frameworks that capture a broader range of language proficiency, extending beyond basic literacy to higher-order language abilities. Such refinements are

crucial to ensuring that assessments of official language proficiency more accurately reflect its role in labor market outcomes.

Third, regional bias is evident in existing studies. Most research relies on OECD-led literacy surveys, focusing on OECD member states and Western countries capable of large-scale survey implementation. This geographic limitation has restricted understanding of the wage premium of language skills in regions such as Asia, low- and middle-income countries (LMICs), and non-OECD states. Expanding research to diverse datasets and regional surveys is essential for capturing broader economic contexts.

Finally, methodological constraints persist in studying the relationship between language proficiency and wages. Traditional OLS-based Mincer wage equations assume linearity in skill accumulation, potentially oversimplifying the complexity of language skills' wage returns. While quantile regressions and categorized skill-level analyses address some of these issues (e.g., Churkina et al., 2023; Di Paolo and Tansel, 2019), they still impose linear structures within segments. Nonparametric and semi-parametric approaches offer more flexibility, allowing for nonlinearities and heterogeneous effects across different population subgroups. Pagan and Ullah (1999) proposed nonparametric methods to relax restrictive assumptions in econometric modeling, and subsequent studies (e.g., Denny and Doyle, 2010; Yatchew, 1997) have demonstrated their effectiveness in capturing nonlinear wage dynamics. Future research should further explore these advanced techniques to better model the intricate relationship between language proficiency and labor market outcomes.

3.4 Theoretical framework

3.4.1 Human Capital Theory

This study adopts Human Capital Theory (Becker, 1962; Schultz, 1961) to interpret the findings. Human Capital Theory posits that knowledge and skills acquired through education, training, and experience enhance productivity, thereby increasing economic opportunities and income. Building on this framework, Mincer (1974) introduced the wage equation, which incorporates education and work experience to estimate the effect of human capital on wages. This model has been widely applied in language economics research.

The study of language proficiency as a form of human capital began in the 1980s in the United States, where host-language proficiency—such as English—was identified as a key determinant of wage gaps between immigrants and natives, facilitating economic integration (e.g., McManus et al., 1983; Reimers, 1983).

Concurrently, research on the wage premium of literacy demonstrated its utility as a substitute for traditional educational attainment in measuring human capital (e.g., Hanushek and Zhang, 2009; Taştan and Erdoğan, 2018).

Language proficiency is thus recognized as a critical component of human capital, enhancing productivity and labor market competitiveness. Building on this foundation, the present study examines Korean proficiency as a form of human capital and its impact on wages.

3.4.2 Signaling and Screening Theory

This study also applies Signaling Theory (Spence, 1973) and Screening Theory (Riley, 1979) as interpretive frameworks. Signaling Theory explains how job seekers convey productivity through indicators such as education, certifications, or work experience in the presence of information asymmetry, while Screening Theory focuses on how employers evaluate candidates' capabilities through testing, interviews, and reference checks. Language proficiency is posited to function both as a signal of productivity for job seekers and as a screening criterion for employers.

Given the sample's focus on young, early-career employees in regular positions (see Section 4.1), it is plausible that language proficiency serves as a signal to compensate for limited work experience during the hiring process. In Korea, hiring practices often include document screening, aptitude tests assessing cognitive skills, and interviews evaluating teamwork and communication abilities (Kwon, 2021). Language proficiency likely plays a key role in these processes, enabling candidates with higher proficiency to secure better-paying positions.

The integration of Signaling Theory and Screening Theory provides a robust analytical framework for examining the role of language proficiency as an indicator of technical competencies and potential organizational value. This theoretical foundation supports the analysis of the wage effects of Korean language proficiency in this study.

3.5 Research questions

Building on the identified gaps and limitations in the reviewed literature and theoretical frameworks, this study addresses the following research questions:

RQ1. Does proficiency in Korean as an official language significantly affect wages in the labor market?

This study evaluates whether Korean proficiency, measured via College Scholastic Ability Test (CSAT) scores, functions as a key human capital factor in

wage determination, addressing gaps in prior studies that focused primarily on literacy metrics.

RQ2. Is the relationship between Korean proficiency and wages nonlinear?

This study examines potential nonlinearities in the Korean proficiency–wage relationship using a semi-parametric approach, challenging the linear assumptions of previous research and offering new insights.

4. Methodology

4.1 Data - Korean Education and Employment Panel 1 (KEEP1)

This study uses data from the Korean Education and Employment Panel 1 (KEEP1), developed by the Korea Research Institute for Vocational Education and Training (KRIVET), to analyze the impact of Korean proficiency, proxied by CSAT Korean subject levels, on wages.

Between 2004 and 2015, KEEP1 tracked students from secondary education into their early careers, offering valuable insights into education and labor market policies. This study focuses on the final wave (2015, 12th wave), comprising individuals aged 26–39, ensuring sufficient labor market exposure to reduce lifecycle bias (Hanushek et al., 2015).[14]

KEEP1 provides detailed data on educational background, work experience, and wages, alongside self-reported CSAT Korean levels (graded on a 1–9 scale, from highest to lowest proficiency), enabling a nuanced analysis of the wage effects of Korean proficiency. The final sample includes 1,314 respondents with complete data on key variables.

By leveraging KEEP1's nationally representative design and rich longitudinal data, this study offers a robust foundation for assessing the wage premium of Korean language skills in the labor market.

4.2 Measures

4.2.1 Dependent variable - log hourly net earnings

This study uses respondents' actual hourly earnings as the dependent variable, a standard metric in wage analyses to account for variations in working hours and

14 Hanushek et al. (2015) cautioned against potential biases when estimating skill returns among early-career individuals, highlighting steep income growth over the life cycle (Haider and Solon, 2006) and the gradual revelation of skills over time (Altonji and Pierret, 2001).

reduce potential biases (e.g., Hanushek et al., 2015; Leuven et al., 2004; Patrinos and Sakellariou, 2011).

Hourly earnings were calculated using post-tax average monthly earnings (in KRW) reported in KEEP1, which include fixed wages, overtime pay, and special bonuses, reflecting actual income. Average monthly earnings were divided by 4.3 (52 weeks ÷ 12 months) to derive weekly earnings, then divided by weekly working hours to obtain hourly earnings.

Nominal hourly earnings were adjusted to actual earnings using the annual Consumer Price Index (CPI) from Statistics Korea (base year: 2020). The natural logarithm of the actual hourly earnings was then taken, and extreme values in the top and bottom 1% were excluded to construct the final dependent variable.

4.2.2 Independent variable - CSAT Korean levels as a measure of official language proficiency

This study adopts levels from the Korean subject of the CSAT as the primary independent variable to represent respondents' language proficiency. The CSAT, administered annually in South Korea, is a high-stakes exam taken by approximately 500,000 participants (e.g., 522,670 in the 2025 CSAT; Kim, 2024), including high school graduates and holders of Korea's high school equivalency exam (often referred to as GED holders in a global context), representing individuals with nontraditional educational qualifications seeking university admission. It evaluates multiple subjects, including Korean, mathematics, English, and foreign languages, based on the national high school curriculum.

The Korean section of the CSAT primarily assesses reading comprehension through advanced passages from social sciences, natural sciences, and literary texts, evaluating factual, inferential, and critical understanding. The 2005–2007 CSAT Korean section[15] used in this study comprised 60 questions (90 minutes), including six listening comprehension questions and 15 questions on "speaking, writing, and grammar." These questions measure language usage skills, such as interpreting conversational contexts and revising or expanding written content.

While the test's multiple-choice format has limitations, its structured design and extensive coverage of linguistic competencies—ranging from foundational literacy to advanced reasoning and critical analysis—ensure a comprehensive

15 The exams used in this study consisted of 60 questions (90 minutes) from 2005 to 2007, reduced to 50 questions (80 minutes) from 2008 to 2009, and currently comprise 45 questions (80 minutes) as of 2024. Since 2005, scores have been consistently graded on a 100-point scale. Listening comprehension was discontinued after 2013 due to concerns about its suitability for assessing language proficiency. From the 2022 CSAT, "Speaking and Writing" and "Language and Media" were introduced as two separate elective subjects.

assessment of Korean proficiency. Unlike conventional international literacy surveys, the CSAT does not merely measure basic reading skills but systematically evaluates a broad spectrum of language abilities, from everyday comprehension to complex textual interpretation required in academic and professional settings.[16]

4.3 Model specification and estimation

This study employs Yatchew's semi-parametric differencing method (Yatchew, 1997, 1998, 2003) to analyze the nonlinear relationship between Korean proficiency and wages. Building on Tobias (2003)'s findings on the nonlinear relationship between cognitive skills and income, Denny and Doyle (2010) used Yatchew's approach to demonstrate a sharp increase in wage premiums at advanced literacy levels in Hungary. Similarly, this study investigates potential nonlinear trends in the wage premium associated with Korean proficiency, capturing patterns that linear regression may overlook.

The analysis is based on the Mincer wage equation (Mincer, 1974), specified in two forms: the baseline model (Equation 1) treats Korean proficiency as an ordinal variable, controlling for experience, experience squared, years of education, and gender. The supplementary model (Equation 1-1) introduces categorical dummy variables for proficiency levels, using level 9 as the reference category. This dual approach examines differential wage effects across proficiency levels and captures potential tipping points where wage effects change, providing insights into nonlinear dynamics that linear models might overlook.

$$w_i = \delta_0 + \delta_1 \text{Kproficiency}_i + \mathbf{X}_i \beta + \in_i \; i = 1, \ldots, n \tag{1}$$

$$w_i = \delta_0 + \sum_{k=1}^{8} \delta_k \mathbf{D}_{k,i} + \mathbf{X}_i \beta + \in_i \tag{1-1}$$

In Equation (1), w_i represents the log hourly wages of the i-th individual, and Kproficiency_i denotes Korean proficiency proxied by CSAT Korean scores. $\mathbf{X}_i$ includes control variables such as work experience, the square of work experience, years of education, and gender, while $\in_i$ represents the error term. In Equation (1-1), $\mathbf{D}_{k,i}$ indicates a dummy variable corresponding to the k-th category (levels 8 to 1, with level 9 as the reference category).

To explore potential nonlinearities, this study applies Yatchew's (1997, 1998) two-step semi-parametric differencing method. This approach is well-suited for

16 The CSAT does not explicitly test all dimensions of language proficiency, such as interpersonal communication or dialectal variation. However, it remains the most standardized and widely recognized measure of official language proficiency in South Korea, covering reading comprehension, grammar, and language use at an advanced level.

identifying complex functional relationships between Korean proficiency and wages, as it avoids imposing a specific functional form while maintaining linearity for control variables. The differencing process accounts for and removes linear relationships between control variables and log wages, isolating nonlinear dynamics between the primary variables.

The foundational model incorporates a nonparametric function, f(Kproficiency) to capture the relationship between Korean proficiency and wages, as specified in Equation (2):

$$w_i = \mathbf{X}_i\beta + f(\text{Kproficiency}_i) + \epsilon_i \tag{2}$$

Where f(Kproficiency) is assumed to have compact support, meaning it takes nonzero values only within a specific interval and is zero elsewhere. This assumption restricts the function's influence to a defined range. Additionally, the first derivative of the function is constrained in magnitude, ensuring that the function does not change abruptly and remains stable within a certain range.

The subsequent steps follow the approach outlined by Tobias (2003) and proceed as follows: First, the unspecified function f(Kproficiency) is eliminated to estimate the parameters of the controls, β. Next, the estimated parameters are used to isolate the nonlinear functional relationship from the model, ultimately enabling the estimation of f(Kproficiency), the target function.

To achieve such steps, the model firstly assumes f(Kproficiency) is continuous and smooth, ensuring that individuals with similar proficiency levels i and j have comparable function values.[17] By differencing these values, $\Delta f(Kproficiency) \approx 0$, the model in Equation (2) transforms into Equation (3), isolating the parameter estimates for the control variables:

$$w_i - w_j = (\mathbf{X}_i - \mathbf{X}_j)\beta + f(\text{Kproficiency}_i) - f(\text{Kproficiency}_j) + \epsilon_i - \epsilon_j \tag{3}$$

$$\approx w_i - w_j = (\mathbf{X}_i - \mathbf{X}_j)\beta + \epsilon_i - \epsilon_j \tag{3-1}$$

Due to the similarity between f(Kproficiency$_i$) and f(Kproficiency$_j$), differencing cancels out the nonlinear function, simplifying the equation to a linear form, as shown in Equation (3-1). This transformation allows for estimating the linear

17 Yatchew's (1997) differencing method aims to eliminate nonlinearity by utilizing the similarity between observations and can be applied to both panel and cross-sectional analyses. In panel analyses, nonlinearity is removed by differencing variable values at two closely related time points T and T-1, based on the assumption that these values are similar. In cross-sectional analyses, the same effect is achieved by ordering individuals by language proficiency and differencing between adjacent individuals i, and j with similar proficiency (e.g., Denny and Doyle, 2010; Tobias, 2003).

parameter, using Ordinary Least Squares (OLS), which satisfies the root-n consistency requirement (Robinson, 1988).[18]

Differencing models may introduce inefficiencies due to data loss and increased variability in the differenced error term, potentially inflating the variance of estimates (Robinson, 1988). These limitations can undermine the model's accuracy, necessitating more efficient estimation techniques than simple OLS; therefore, the analysis employs 10th-order differencing (Denny and Doyle, 2010; Tobias, 2003; Yatchew, 1997). Weights for the differenced control variables are assigned following Yatchew's guidelines (Yatchew, 2003, p. 61), enhancing estimation efficiency. The process is represented in Equation (4).

$$\begin{aligned}\Delta_{10}\mathbf{X} = {} & 0.9494\mathbf{X}_{k} - 0.1437\mathbf{X}_{k-1} - 0.1314\mathbf{X}_{k-2} - 0.1197\mathbf{X}_{k-3} \\ & - 0.1085\mathbf{X}_{k-4} - 0.0978\mathbf{X}_{k-5} - 0.0877\mathbf{X}_{k-6} - 0.0782\mathbf{X}_{k-7} \\ & - 0.0691\mathbf{X}_{k-8} - 0.0606\mathbf{X}_{k-9} - 0.0527\mathbf{X}_{k-10}\end{aligned} \tag{4}$$

Next, the linear effects of the control variables, estimated through their coefficients $\hat{\beta}$ are subtracted from the dependent variable w_i), producing the transformed dependent variable $\widetilde{w_i}$ as shown in Equation (5). The nonlinear relationship between Korean proficiency and the adjusted wage return is then examined using kernel regression. To ensure the robustness of the estimates, bootstrapping with 400 replications is applied to calculate standard errors and confidence intervals at each data point.

$$\widetilde{w_i} = w_i - \mathbf{X}_i\hat{\beta} \tag{5}$$

Lastly, the effectiveness of the semi-parametric approach is validated by comparing the residual variance of the restricted model (e.g., OLS), which assumes a linear relationship between Korean proficiency and wages, with that of the differencing model in Equation (3-1), which evaluates the linear effects of control variables while removing nonlinearity. The parametric relationship between Korean proficiency and wages is represented by the function *h(Kproficiency)*, and the test statistic *V* is derived following the procedures outlined in Equations (6) to (8) (Yatchew, 1997).

$$s^2_{\text{res}} = \frac{1}{n}\sum_{i=1}^{n}\left(w_i - \mathbf{X}_i\hat{\beta} - h(\text{Kproficiency}_i, \hat{\delta})\right)^2 \tag{6}$$

$$s^2_{\text{diff}} = \frac{1}{n}\sum\left(\Delta w_i - \Delta X_i\hat{\beta}\,\text{diff}\right)^2 \tag{7}$$

18 As the sample size *n* increases, the estimates converge to the true value, and simultaneously, the standard error of the estimates decreases in inverse proportion to the square root of *n*.

Subsequently, using the values derived from Equations (6) and (7), the null hypothesis

H_0: f(Kproficiency) = h(Kproficiency, $\hat{\delta}$) is tested, assuming the parametric model holds true. The comparison is conducted using the test statistic derived in Equation (8).

$$V = \sqrt{d \cdot n} \frac{s_{\text{res}}^2 - s_{\text{diff}}^2}{s_{\text{diff}}^2} \tag{8}$$

Where n denotes the sample size, and d represents the differencing order. Under the null hypothesis, the test statistic V converges to a standard normal distribution $N(0, 1)$. A large value of V indicates rejection of the null hypothesis, suggesting that the restricted model does not adequately fit the data and supporting the validity of the semi-parametric approach.

5. Results

5.1 Descriptive statistics and variable relationships

As shown in Table 1, the mean log hourly wage is 9.349, with a standard deviation of 0.312. The minimum and maximum values (8.209 and 10.131) indicate that the wage data lacks extreme outliers with controlled variance. Using log wages also mitigates distribution skewness.

The sample's average age is 27.556 years (SD = 1.526), reflecting a population primarily consisting of young workers and labor market entrants aged 25–30. The average work experience is 6.407 years (SD = 2.097), suggesting many respondents likely entered the workforce immediately after middle or high school, possibly indicating lower educational attainment among some participants.

Educationally, approximately 60% of the sample hold a bachelor's degree, capturing the wages of entry-level college graduates. The gender distribution is balanced (49.7% male, 50.3% female), enabling unbiased analysis across genders.

Korean CSAT scores are reverse-coded, with 0 representing the lowest proficiency (Level 9) and 8 the highest (Level 1). The mean score is 3.692 (SD = 2.041), indicating most respondents fall within mid-range proficiency. Figure 1 illustrates the distribution of Korean proficiency scores.

As shown in Figure 1, respondents are concentrated in the 5–7 level range, accounting for approximately 50.5% of the total distribution. The highest levels, 1 and 2, represent relatively low proportions at 3.8% and 6.2%, respectively. The level distribution resembles a bell-shaped pattern, indicative of a normal distribution.

Table 1. Summary statistics

Variables	Mean	Standard Deviation	Min	Max
Wages (KRW/USD)	12,060 / 10.66	3,856 / 3.41	3,673	25,109
Log hourly wage	9.349	0.312	8.209	10.131
Korean language levels (CSAT, reverse-coded)	3.692	2.041	0	8
Gender (ref. Female)	0.497	0.500	0	1
Age	27.556	1.526	25	30
Work period (years)	6.407	2.097	1	12
Years of schooling	15.149	1.572	12	19
High school diploma	0.117	0.322	0	1
Associate degree	0.244	0.429	0	1
Bachelor's degree	0.601	0.489	0	1
Master's degree or higher	0.036	0.187	0	1
n				1,314

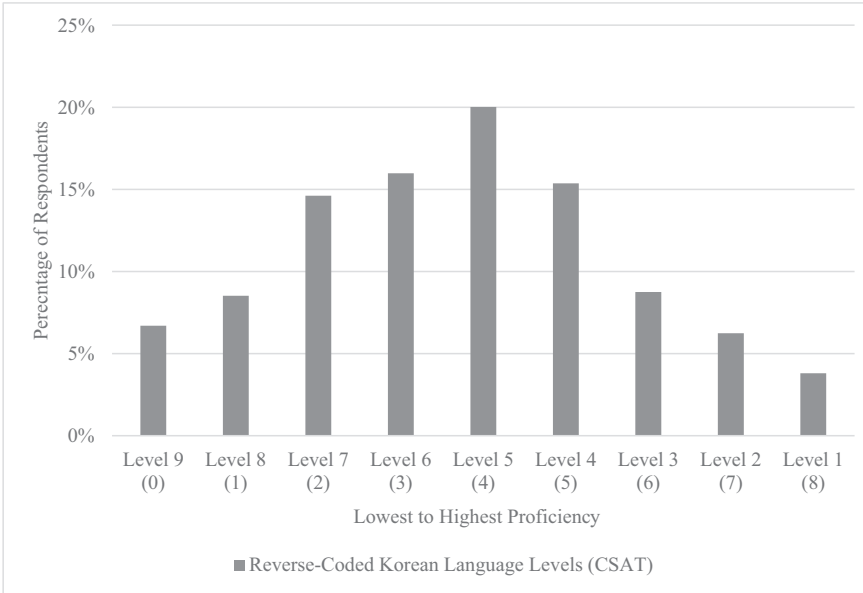
Note. Data source: KEEP1, 12th wave (2015). Wages are in Korean Won (KRW), converted to USD for reference (1,132.49 KRW/USD, 2015; avg. 10.66 USD, SD 3.41 USD; source: Bank of Korea, ECOS). Korean language levels (CSAT) are reverse-coded, with level 1 (8) representing the highest proficiency and level 9 (0) the lowest. Years of schooling were assigned according to the Korean education system: 12 for high school, 14 for associate degrees, 16 for bachelor's, and 19 for master's or higher.

Subsequently, Table 2 presents the results of a correlation analysis, conducted to better understand the relationships among variables and to refine the analytical approach.

There is a significant positive correlation between log hourly wages and gender ($r = 0.094$, $p < .01$), indicating that males tend to earn higher wages. Conversely, a significant negative correlation exists between years of service and log hourly wages ($r = -0.104$, $p < .01$), suggesting that wages decrease as years of service increase. Contrary to the general assumption that wages rise with experience, this result likely reflects the sample's characteristics. Specifically, with an average age of 27.5 years and a majority holding a bachelor's degree or higher, the effect of years of service may not be adequately captured. Workers with longer tenure are likely less educated, and their lower starting wages may contribute to the observed negative correlation.

A positive correlation exists between log hourly wages and years of education ($r = 0.231$, $p < .01$). In contrast, years of service and years of education are

Figure 1. Distribution of Korean language levels (CSAT)



Note. n = 1,314. Data source: KEEP1, 12th wave (2015). Reverse-coded Korean language levels (CSAT) range from Level 9 (0) as the lowest proficiency to Level 1 (8) as the highest proficiency.

Table 2. Correlation matrix of key variables related to wage and Korean language levels (CSAT)

Variables	Log hourly wage	Gender (ref. Female)	Work period (years)	Years of schooling	Korean CSAT level
Log hourly wage	1				
Gender (ref. Female)	0.0944***	1			
Work period (years)	-0.104***	0.185***	1		
Years of schooling	0.231***	-0.088***	-0.688***	1	
Korean language levels (CSAT, reverse-coded)	0.227***	-0.161***	-0.350***	0.414***	1
n					1,314

Note. Data source: KEEP1, 12th wave (2015). Korean language levels (CSAT) are reverse-coded, with Level 1 being the highest and Level 9 the lowest. Correlation coefficients represent linear associations between variables and do not imply causation. Significance levels: ***$p < .01$, **$p < .05$, *$p < .10$.

strongly negatively correlated ($r = -0.688$, $p < .01$). These findings suggest that years of education, rather than years of experience, play a more relevant role in understanding the wage effects of the main variables in this study.

Korean proficiency, the primary variable of interest, shows a significant positive correlation with log hourly wages ($r = 0.227$, $p < .01$), indicating that higher Korean proficiency is associated with higher wages. Additionally, Korean proficiency is negatively correlated with years of service ($r = -0.350$, $p < .01$) and positively correlated with years of education ($r = 0.414$, $p < .01$), suggesting that educational attainment may mediate the relationship between Korean proficiency and wages.

The following section further investigates the effects of Korean proficiency on wages through regression analysis.

5.2 The impact of Korean proficiency on wages: OLS analysis

Table 3 presents the OLS regression results analyzing the impact of CSAT Korean proficiency levels on wages, controlling for individual characteristics such as work period and years of education.

In Model (1), Korean proficiency is treated as a continuous variable, and the results indicate that a one-level increase in proficiency corresponds to approximately a 2.5%[19] increase in wages. This finding suggests a positive relationship between Korean proficiency and wages.

In Model (2), Korean proficiency levels are transformed into categorical dummy variables to analyze the wage effects of each level relative to the reference group (Level 9). Statistically significant wage premiums start from Level 4, with 9.8% for Level 4, 12.0% for Level 3, 22.0% for Level 2, and 16.6% for Level 1. These results suggest the potential presence of a nonlinear relationship between Korean proficiency and wages.

Model (3) replaces years of education with educational attainment dummies. The coefficients for Korean proficiency levels remain broadly consistent with those in Model (2). Additionally, the results indicate that associate degree holders earn 16.5% higher wages, bachelor's degree holders 27.2% higher, and those with master's degrees or higher 51.7% higher than high school graduates. These findings highlight the significant role of educational attainment in wage determination.

19 The percentage change in wages was derived using the exponentiation-based transformation for log-linear models: $(e^{\beta} - 1) \times 100$.

Table 3. Wage returns to Korean proficiency

Variables	(1)	(2)	(3)	(4)
Korean language levels (CSAT, reverse-coded, ordinal)	0.025*** (4.59)			-0.001 (-0.10)
Korean language levels (CSAT, ref: Level 9 (0), the lowest)				
Level 8 (1)		0.010 (0.20)	0.009 (0.17)	
Level 7 (2)		0.037 (0.70)	0.038 (0.73)	
Level 6 (3)		0.006 (0.12)	0.007 (0.15)	
Level 5 (4)		0.031 (0.63)	0.033 (0.68)	
Level 4 (5)		0.094* (1.86)	0.099 (1.67)	
Level 3 (6)		0.114** (2.07)	0.120 (2.18)	
Level 2 (7)		0.201*** (3.40)	0.208 (3.51)	
Level 1 (8)		0.154** (2.13)	0.162 (2.25)	
Gender (ref. Female)	0.080*** (4.02)	0.76 *** (3.83)	0.080*** (3.96)	0.081*** (4.00)
Work period (years)	0.019 (0.85)	0.24 (1.06)	0.017 (0.65)	0.007 (0.29)
Work period^2	-0.004 (-0.02)	-0.23 (-0.13)	0.031 (0.15)	0.104 (0.50)
Years of schooling	0.053*** (5.67)	0.056*** (5.95)		
Education (ref. high school diploma)				
Associate degree			0.153*** (3.51)	0.144** (2.09)
Bachelor's degree			0.241*** (4.83)	0.111* (1.71)
Master's degree or higher			0.417*** (6.37)	0.382*** (3.09)
Education × Reverse-coded Korean language levels (ordinal)				

Table 3. Wage returns to Korean proficiency (*Continued*)

Variables	(1)	(2)	(3)	(4)
Associate degree				0.005 (0.24)
Bachelor's degree				0.041** (2.23)
Master's degree or higher				0.019 (0.66)
n	1,314	1,314	1,314	1,314
R^2 (Adj. R^2)	0.105 (0.101)	0.113 (0.105)	0.115 (0.105)	0.115 (0.108)

Note. Data source: KEEP1, 12th wave (2015). Dependent variable: Log hourly wage. Coefficients are presented with t-values in parentheses. Gender is coded as a binary variable, with 1 indicating male and 0 (reference) indicating female. Work period² is the squared term to capture non-linear effects. Interaction terms (Education × Reverse-coded Korean Language Levels) examine how education levels interact with Korean proficiency in determining wage returns. Significance levels: ***$p < .01$, **$p < .05$, *$p < .10$.

Model (4) introduces interaction terms between Korean proficiency and educational attainment. The findings reveal that the wage effects of Korean proficiency are significant only for bachelor's degree holders, with a one-level increase in proficiency associated with a 4.1% wage premium, which suggests that Korean proficiency is particularly valuable during job entry and early career stages, where academic language skills play a crucial role in screening processes such as interviews, presentations, and aptitude tests. However, for individuals with master's degrees or higher, advanced literacy and comprehension are already expected as a baseline competency, limiting the wage impact of additional language proficiency due to its lower scarcity value. Likewise, for individuals with lower educational attainment, job-specific skills may outweigh the importance of high-level language proficiency in their labor market outcomes.[20]

Consistently across all models, males earn approximately 8% higher wages than females. Years of service does not exhibit a statistically significant effect on wages in any model, likely reflecting the younger age distribution of the sample, as noted in the correlation analysis.

20 Additional interaction terms, such as Korean proficiency × work experience, were tested but did not yield significant results. The primary reason for excluding these variables is the limited sample size, necessitating a parsimonious model specification. Moreover, the sample is restricted to individuals aged 25–30, a cohort with relatively short work experience. Given this narrow age range, strong interaction effects between Korean proficiency and experience were not anticipated, and empirical tests confirmed the absence of notable patterns. Thus, the model prioritizes education level as the most relevant interaction variable to capture meaningful economic differences.

In summary, the OLS results suggest (1) a potential nonlinear relationship between Korean proficiency and wages and (2) meaningful interactions between Korean proficiency and educational attainment. Based on these findings, the subsequent analysis adopts a semi-parametric approach to account for the influence of educational factors and control variables, offering a more flexible examination of the nonlinear relationship between Korean proficiency and wages.

5.3 Semi-parametric approach: Kernel regression results

Kernel regression analysis examined the nonlinear relationship between Korean proficiency levels and wages. Korean proficiency was treated as a continuous variable, and the dependent variable was the adjusted wage, derived by accounting for control variables through weighted differencing. This method minimized data distortion and ensured robust estimation. The results of the kernel regression are presented in Table 4.

Table 4. Estimated conditional mean and marginal effects from semi-parametric Kernel regression (post-differencing)

Metrics	Estimate	Std. Error	95% CI lower	95% CI upper
Estimated conditional mean of adjusted log wages	8.450*** (1037.7)	0.008	8.430	8.462
Marginal effect of Korean language levels (CSAT, reverse-coded)	0.028*** (6.18)	0.004	0.019	0.037
n				1,304
R^2	0.0447			

Note. Data source: KEEP1, 12th wave (2015). The results are derived from a local-linear regression analysis using an Epanechnikov kernel. Bandwidth was selected through cross-validation, resulting in a bandwidth of 1.9287 for effect estimation and 1.1637 for mean estimation. The *bwreplace* option in Stata 17 was employed, recalculating the bandwidth in each of the 400 bootstrap replications. To ensure smooth kernel estimates and mitigate issues arising from tied values in ordinal variables, minor random noise was added to the primary variables: Korean language levels (CSAT, reverse-coded), years of schooling, and work period were adjusted using uniformly distributed noise (e.g., *runiform* × 0.0001 in Stata 17). This adjustment ensures computational stability during kernel regression. The 10^{th}-order differencing process reduced the sample size from 1,314 to 1,304 observations. Bootstrap standard errors and *z*-values (in parentheses) were calculated using 400 replications. Effect estimates represent the average of derivatives, indicating the marginal impact of Korean language levels on wages. All reported coefficients are presented with their corresponding *z*-values.

The marginal effect of Korean language proficiency on adjusted log wages is estimated at approximately 0.028, indicating that a one-level increase in proficiency corresponds to an average increase of 0.028 in adjusted log wages. This effect is statistically significant at the 1% level, with a 95% confidence interval of [0.019, 0.037], reflecting the estimate's high reliability. Although the nonparametric kernel regression model does not assume a direct linear relationship, the positive impact of Korean proficiency on wages is evident.

The predicted mean of adjusted log wages from the kernel regression model is 8.450, representing the wage level after accounting for control variables. This value is statistically significant at the 1% level, with a 95% confidence interval of [8.430, 8.462], confirming its robustness. Adjusted values differ from observed values due to the removal of control variable effects during the differencing process.

The low R^2 value of approximately 0.044 reflects the reduced variance in the dependent variable after accounting for control variables. This limitation is inherent to the differencing process, which minimizes variation for the model to explain. Despite this, the analysis focuses on estimating the direct relationship between Korean proficiency and wages.

5.4 Visualization

To enhance the interpretability of the findings, this section presents visualizations examining the relationship between Korean language levels and wages. These include pre- and post-differencing distribution comparisons, predicted trends from kernel regression, and estimated wage effects derived from kernel-smoothed and OLS models.

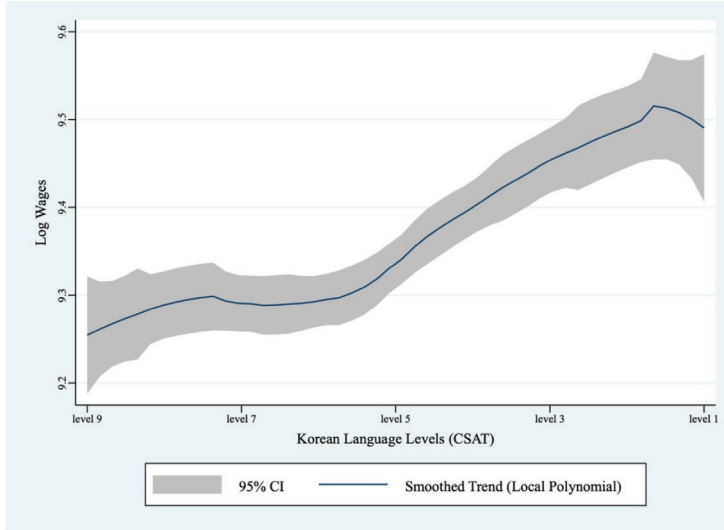
Figure 2 compares the relationship between Korean proficiency levels and wages before and after the differencing process. The graphs highlight how the differencing process adjusts the data, isolating the effects of Korean proficiency on wages while accounting for control variables.

Subfigure (a) reflects the influence of these control variables on wages, while Subfigure (b) isolates the adjusted relationship between log wages and Korean levels by removing these effects, offering a clearer view of their independent association. Both graphs allow for an intuitive comparison of the relationship before and after the differencing process.

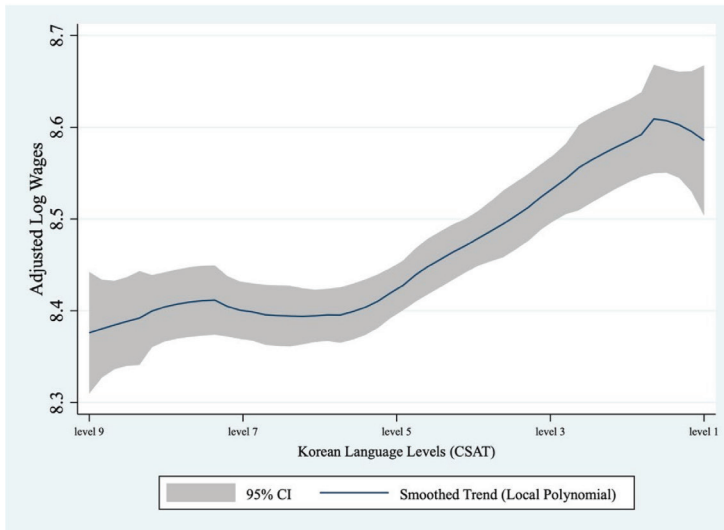
Differencing reduced adjusted log wages by approximately 10%, likely due to the removal of control variables' contributions (as seen in the y-axis range, where the starting point of the nonlinear graph decreased from approximately 9.25 before differencing to 8.38 after differencing). However, the overall trends

Figure 2. Log wages and Korean language levels (CSAT): unadjusted and adjusted trends

(a) Unadjusted Log Wages



(b) Adjusted Log Wages (After Differencing)



Note. n = 1,304. Subfigure (a) shows the relationship between Korean language levels and unadjusted log wages (w), while Subfigure (b) presents adjusted log wages ($\tilde{w}$)[21] obtained through a differencing process. Smoothed trends were estimated using a second-degree local polynomial regression with an Epanechnikov kernel, with bandwidth selected via cross-validation. Shaded areas represent 95 percent confidence intervals.

21 See Equation (5) for the explanation of w and $\tilde{w}$.

in both graphs remain similar, suggesting that control variables have relatively minor confounding effects on the relationship between Korean levels and wages. Given the limitations of the control variables used, caution is needed when interpreting these results as solely reflecting the independent effect of Korean proficiency.

Both graphs show a nonlinear relationship where wage growth accelerates as Korean levels improve. In higher proficiency levels (Levels 1–3), wage increases are more pronounced, while in lower proficiency levels (Levels 7–9), wages tend to plateau or remain low. These patterns suggest that individuals with high Korean proficiency may benefit from a wage premium, while those with lower proficiency face relative disadvantages.[22]

The following Figure 3 compares the trends predicted by the kernel regression model with those derived from OLS regression, highlighting both nonlinear and linear associations between Korean levels and wages. This comparison provides further insights into the strengths of kernel regression in capturing nonlinear relationships.

Figure 3 visually illustrates the nonlinear pattern between Korean CSAT levels and wages. The nonparametric kernel regression results (solid line) show an accelerating increase in log wages as Korean levels improve, particularly highlighting pronounced wage premiums among individuals with higher language proficiency (Levels 1–3).

In contrast, the linear OLS regression results (dashed line) simplify the relationship, assuming linearity between Korean levels and wages. This leads to slight overestimation of wages in mid-range levels (approximately Levels 6 to 4) and underestimation in both lower (Levels 9 to 7) and higher levels (Levels 4 to 1). These results suggest that linear OLS regression may not adequately capture the complex nonlinear dynamics between Korean proficiency and wages.[23]

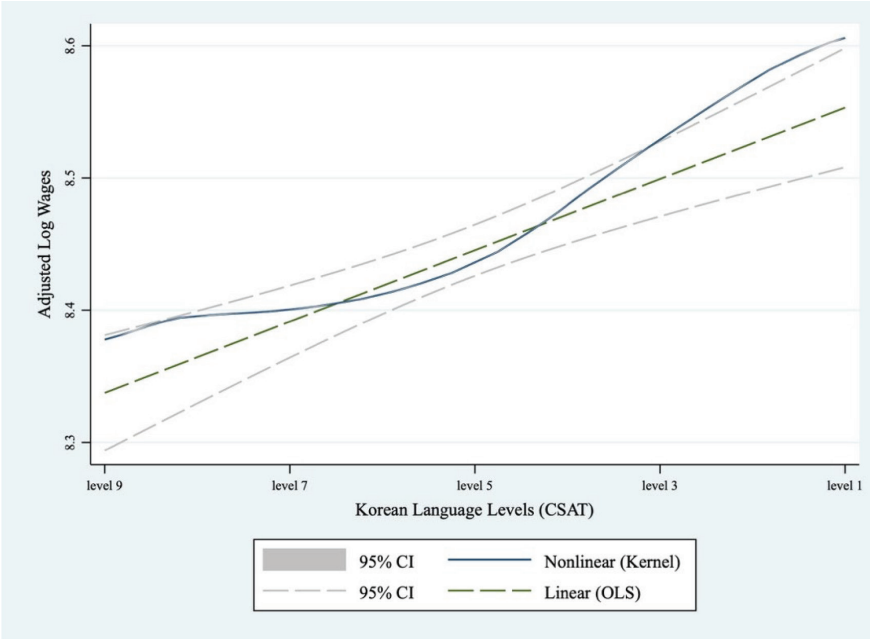
Figure 4 further compares the nonlinear and linear marginal effects of Korean levels on log wages, offering detailed insights into how wage effects evolve across specific proficiency levels. This allows for a clearer understanding of the incremental wage impacts and nuanced trends in wage changes by level.

---

22 The shaded areas representing 95% confidence intervals demonstrate the reliability of the estimates, with narrow intervals across most levels. However, the confidence intervals widen at the extreme ends (Levels 1 and 9) due to fewer observations, reflecting the limitations of smaller sample sizes in these ranges.

23 The confidence intervals (CIs) for the kernel regression (shaded area) are relatively narrow, indicating high predictive reliability. This reflects the kernel regression's ability to minimize local variance by optimizing bandwidth and focusing on localized data. In mid-range levels (e.g., Levels 5–6), where observations are more concentrated, the CIs are particularly narrow. On the other hand, the CIs for the OLS regression (dashed lines) are wider across all levels, with significant differences in mid-range and lower-level segments. This may result from OLS regression treating all observations equally, failing to account for local density variations.

Figure 3. Predicted nonlinear and linear trends of CSAT (Korean) levels on wages

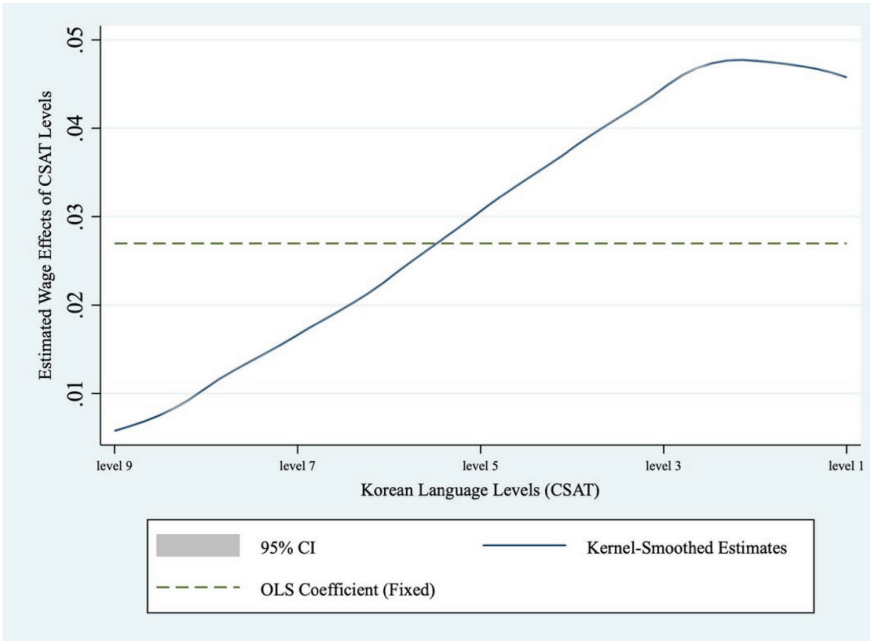


Note. n = 1,304. The y-axis represents adjusted log wages after partially removing the effects of control variables through a differencing process. The solid line illustrates the nonlinear trend, estimated using a second-degree local polynomial regression with an Epanechnikov kernel, with bandwidth selected via cross-validation. The dashed line represents the linear trend estimated through OLS regression. The comparison highlights the nonlinear flexibility of the semi-parametric approach, showing lower returns at lower Korean CSAT levels and sharp premiums at higher levels.

Figure 4 illustrates the marginal effects of CSAT Korean levels on log wages, highlighting a nonlinear relationship estimated by kernel regression (solid blue line). The marginal effects fluctuate with increasing Korean proficiency, with kernel regression and OLS estimates (dashed green line) converging at Level 5, indicating minimal differences between the two methods at this level.

However, significant discrepancies are observed at both higher (Levels 1–3) and lower (Levels 7–9) Korean proficiency levels. At higher levels, kernel regression estimates exceed OLSs, suggesting that advanced Korean proficiency may lead to substantial wage premiums in the labor market. Conversely, lower-level kernel regression estimates fall below OLS, indicating that the wage increases associated with limited Korean proficiency are smaller than OLS predicts.

Figure 4. Estimated wage effects of CSAT (Korean) levels: Kernel-smoothed and OLS estimates



Note. n = 1,304. The *y*-axis represents the estimated marginal wage effects of Korean language levels (CSAT), defined as the change in log hourly wages for a one-level increase in proficiency. The solid line illustrates kernel-smoothed estimates, capturing nonlinear trends, while the dashed line represents fixed OLS estimates assuming a constant relationship.[24]

These findings align with wage distributions observed in Figures 1 through 3. The lower-than-average wage effects at lower Korean levels and higher-than-average effects at higher levels underscore the consistency between observed wage patterns and marginal effect variations, which may suggest that limited Korean proficiency may impose a wage penalty; higher proficiency is associated with relatively significant wage premiums. Caution is needed in interpreting these figures, as this analysis minimizes the inclusion of control variables to focus on identifying overall trends.

The following section evaluates the validity of the semi-parametric approach relative to the restricted parametric model using Equations (6) - (8).

24 Shaded areas show 95 percent confidence intervals for kernel-smoothed estimates only, reflecting their variability and precision. The absence of CI for OLS estimates ensures visual clarity, as the fixed linear assumption does not account for localized variability. The narrow CI of the kernel-smoothed estimates, derived from a robust bootstrapping process (400 repetitions), highlights the high confidence in the predicted values.

5.5 Validation through diagnostic statistics

Spline regression was applied as the linear model for calculating the test statistics in Equations (6) to (8) (Denny and Doyle, 2010). Table 5 presents the results of the restricted cubic spline regression, examining the nonlinear relationship between Korean proficiency and log wages.

Spline 2 and Spline 3 have significant positive coefficients of 0.034 and 0.044, respectively ($p < .05$), suggesting that mid-to-high levels of Korean proficiency positively contribute to wage increases. In contrast, Spline 1 is not statistically significant, indicating that the wage effects of Korean proficiency are negligible at lower proficiency levels.[25] These findings highlight the nonlinear pattern in the relationship between Korean proficiency and wages, which cannot be adequately captured by simple OLS models.

This nonlinear relationship is further supported by the test statistic V (Equation 8), which compares the goodness-of-fit between the spline regression the differencing model (Equation, 3-1) following (Yatchew, 1997). The unusually large value of 19,884.853 suggests that the semi-parametric approach captures

Table 5. Estimated wage returns to Korean language levels using spline functions

Variables	Estimate	Std. Error	95% CI lower	95% CI upper
Korean level: spline 1	-0.007	0.018	-0.043	0.027
Korean level: spline 2	0.034**	0.013	0.007	0.061
Korean level: spline 3	0.044**	0.019	0.006	0.082
Gender (ref. Female)	0.075***	0.020	0.035	0.115
Years of schooling	0.056***	0.009	0.037	0.074
Work period (years)	0.021	0.023	-0.024	0.066
Work period^2	-0.000	0.001	-0.003	0.003
n				1,304
R^2 (Adj. R^2)	0.107(0.102)			

Note. Data source: KEEP1, 12th wave (2015). Dependent variable: Log hourly wage. The regression model was estimated with sampling weights and robust standard errors to ensure consistency. Significance levels: ***$p < .01$, **$p < .05$, *$p < .10$.

25 Gender and years of schooling consistently exhibit significant positive effects, with education, in particular, acting as a major determinant of wage increases. On the other hand, years of service and its squared term are not statistically significant, indicating that work experience has a limited impact on wages within this sample.

the nonlinear characteristics of the data more effectively than the linear model; however, this exceptionally large value may also reflect issues in the computational process or model specification, necessitating cautious interpretation. The inflated V may result from the large sample size (n=1,304), which amplifies the term $\sqrt{d \cdot n}$.

Additionally, significant disparities between the residual variance s^2_{res} and the differenced variance s^2_{diff}, or the introduction of noise during the transformation of ordinal variables into continuous ones - a key limitation of this study - may have contributed to this result.

Comparing the goodness-of-fit based on the Sum of Squared Residuals (SSR) reveals that the semi-parametric kernel regression achieves an SSR approximately 3.83% smaller than the linear OLS model, indicating a slightly better explanatory power. Although the improvement is modest, both the spline function and kernel regression consistently confirm nonlinear wage effects. Despite being based on OLS, the spline function highlights patterns such as an accelerated increase in wages at higher proficiency levels, reinforcing the kernel regression results.

Both methods validate the nonlinear relationship between Korean proficiency and wages, supporting the relevance of the semi-parametric approach. However, the exceptionally large test statistic and potential effects of added noise warrant a cautious interpretation of the results. Future research should aim to refine variable transformation methods to minimize noise and explore alternative statistical techniques to ensure the robustness of the findings.

5.6 Summary of findings

This study empirically analyzed the impact of Korean proficiency, as an official language, on wages in the South Korean labor market and identified the nonlinear characteristics of this relationship to address the following two research questions.

RQ1. *Does Korean proficiency, as an official language, significantly affect wages in the labor market?*

The OLS results confirm that Korean proficiency has a significant effect on wages. When treated as a continuous variable, a one-level increase in proficiency corresponds to a 2.5% wage premium. However, when categorized, statistically significant wage premiums emerge from Level 4 onward, ranging from 9.8% to 22.0% relative to the lowest proficiency group.

When accounting for educational attainment, the wage effect of Korean proficiency remains significant only for bachelor's degree holders, with a 4.1% premium per level increase in proficiency, indicating that the wage returns to language proficiency vary by education level, which suggests that Korean proficiency is particularly relevant for bachelor's degree holders during job entry and early career stages, where academic language skills are essential in recruitment processes such as interviews, presentations, and written assessment.

These findings indicate that Korean proficiency is an important determinant of wages, with increasing returns at higher proficiency levels, but its wage value may vary by educational background.

RQ2. *Is the relationship between Korean proficiency and wages nonlinear?*

The semi-parametric kernel regression results confirm a nonlinear relationship between Korean proficiency and wages. The estimated marginal effect of Korean proficiency on adjusted log wages is 0.028, meaning that a one-level increase in proficiency corresponds to an average 2.8% wage premium. However, this effect varies across proficiency levels.

OLS regression assumes a linear relationship between Korean proficiency and wages, which leads to overestimation of wage premiums for mid-range proficiency levels (Levels 6–4) and underestimation at both lower (Levels 9–7) and higher levels (Levels 4–1). In contrast, nonparametric kernel regression more accurately captures sharp wage increases at higher proficiency levels, reinforcing the presence of nonlinearity.

Visualization results further support this pattern. Wage premiums remain negligible at lower proficiency levels (Levels 9–7). Mid-range levels (Levels 6–5) show modest increases, while higher proficiency levels (Levels 3–1) exhibit accelerated wage growth, which suggests that high Korean proficiency leads to substantial wage premiums. In contrast, limited proficiency may impose a relative wage penalty.

Spline regression analysis provides additional confirmation. The positive and significant coefficients for mid-to-high proficiency levels indicate that wage gains become more pronounced as proficiency increases, while lower proficiency levels show no significant effects, which might reinforce the existence of a threshold effect, where language proficiency must reach a certain level before yielding noticeable wage benefits.

Overall, these results indicate that the wage effects of Korean proficiency are not uniform but follow a nonlinear pattern, with higher proficiency levels yielding disproportionate wage benefits.

6. Discussion and conclusion

6.1 Theoretical implications

The findings indicate that Korean proficiency serves as a crucial human capital factor in wage determination. The observed wage premiums at higher proficiency levels (Levels 1–3) suggest that advanced language skills - such as logical reasoning and complex reading comprehension - hold significant value in the labor market. Given that the CSAT Korean section primarily assesses these competencies, the results reinforce the broader role of language proficiency as human capital, aligning with global studies on wage returns to literacy skills.

Additionally, the study suggests that Korean language proficiency may function as a signaling mechanism in early-career labor market entry. The sample primarily consists of individuals aged 25–30, a cohort with limited work experience, where language proficiency could act as an alternative indicator of productivity. The emphasis on linguistic and cognitive assessments - such as interviews, aptitude tests, and job competency evaluations - in the Korean hiring process (Kwon, 2021) further supports this interpretation.

However, due to sample size constraints, this study could not examine occupation-specific screening processes or the differential role of language proficiency across job sectors. Future research should explore these mechanisms in greater detail through qualitative studies involving employer interviews and case analyses.

6.2 Policy implications

The results of this study provide key insights for refining literacy support programs in Korea. Current policies primarily focus on basic and functional literacy, aiming to enhance fundamental reading and writing skills; however, this narrow approach may overlook labor market demands, particularly the need for academic literacy - critical thinking, analytical reasoning, and advanced written communication, essential for high-skilled and professional roles.

Existing literacy programs predominantly target older, low-education populations, prioritizing essential literacy acquisition over broader language competencies. As Korea transitions into an aging society (Lee, 2024), expanding these initiatives to support all age groups and diverse literacy levels is crucial, which includes workforce reintegration programs for retirees and structured training for young professionals and mid-career workers, ensuring they develop advanced language skills relevant to the labor market; thus, literacy policies should move

beyond a one-size-fits-all approach, integrating higher-order language skills into lifelong learning programs.

The findings of this study also inform improvements in Korean language curriculum reforms. The 2022 revisions introduced media and workplace literacy to reflect evolving educational and labor market needs; however, it remains unclear whether these changes effectively enhance wage-relevant language skills. Media literacy may improve digital communication, yet its direct impact on labor market success is uncertain. Likewise, workplace communication courses in secondary education aim to develop job-related linguistic competencies, but whether these skills translate into actual labor market advantages requires further evaluation.

Given this study's findings that higher Korean proficiency levels yield more substantial wage premiums, educational policies should go beyond basic workplace communication and reinforce advanced linguistic competencies relevant to professional and managerial roles. Academic writing, structured argumentation, and critical text analysis should be more explicitly incorporated into curricula to align with labor market expectations.

Literacy and language education policies should bridge the gap between educational frameworks and labor market demands. Ensuring that formal education equip individuals with high-level language competencies might be critical to maximizing the economic value of official language proficiency in Korea.

Moreover, this study offers supplementary insights for enhancing Korean language education policies for immigrants and their children. While the KSL (Korean as a Second Language) curriculum, introduced in 2012, focuses on intercultural understanding and basic communication (Baek, 2014), it may fall short of equipping immigrant children with the advanced Korean proficiency needed for higher education and professional settings. Compared to the critical and creative Korean language education provided to native speakers, this gap could be a structural barrier to economic and social integration (Yu, 2024). Expanding language policies to include academic Korean and advanced linguistic, cognitive skills alongside basic communication would better support immigrant children's academic success and labor market competitiveness, contributing to broader social and economic inclusion as Korea transitions into a multicultural society.

6.3 Limitations

This study has several limitations that should be considered when interpreting its findings.

First, the sample, derived from the KEEP1 dataset, focuses on individuals aged 25–30 with relatively low work experience, potentially limiting the

generalizability of the results to older, more experienced populations. Although this study initially aimed to minimize life-cycle bias by focusing on this age group, the sample may not fully address this issue, as wage dynamics could differ significantly across broader age ranges.

Second, this study focuses on identifying overall trends, and due to data limitations and the need to secure an adequate sample size, only a minimal set of control variables - such as education, work experience, and gender - was included. However, residual endogeneity cannot be entirely ruled out, and the analysis does not account for institutional or regional labor market variations or intersectional factors such as socioeconomic background or immigrant status, which may interact with language proficiency. Future research should incorporate a broader set of controls to derive more precise relationships between language proficiency and wage outcomes.

Third, the semi-parametric kernel regression and spline methods used to detect nonlinear relationships, though robust, rely on bandwidth selection and transformation processes that may introduce bias or noise, potentially affecting precision.

Lastly, the lack of longitudinal data limits the ability to analyze causal relationships between Korean proficiency and labor market outcomes.

Future research should address these limitations by expanding the sample, incorporating longitudinal designs, and exploring additional statistical techniques and contextual factors to validate and refine the findings.

References

Ahn, J. (2009). The impact of the language study training abroad on labor market entrance. *The Journal of Educational Administration, 27*(2), 203-231.

Altonji, J. G., & Pierret, C. R. (2001). Employer learning and statistical discrimination. *The Quarterly journal of economics, 116*(1), 313-350.

Armstrong, A. (2017). The Provision of Language-Specific Public Services. *Journal of public economic theory, 19*(1), 142-157. https://doi.org/10.1111/jpet.12175

Baek, M. W. 백. (2014). A Case Study on the Improvement of the Korean Language Curriculum and Standard Textbooks [한국어 교육과정 및 표준 교과서 개선을 위한 사례 연구] [The Case Study on The Improvement of KSL Curriculum and Standard Textbook]. *Korean Language Education Research [국어교육연구], 56*(-), 39-76. https://www.riss.kr/link?id=A100163486

Barone, C., & van de Werfhorst, H. G. (2011). Education, cognitive skills and earnings in comparative perspective. *International sociology, 26*(4), 483-502. https://doi.org/10.1177/0268580910393045

Becker, G. S. (1962). Investment in Human Capital: A Theoretical Analysis. *The Journal of political economy, 70*(5), 9-49. https://doi.org/10.1086/258724

Biryanto, B., Hubeis, A. V., Matindas, K., & Sarma, M. M. (2018). The Influence of Communication Skills towards Job Performance of The State Civil Apparatus. *Jurnal studi pemerintahan (Journal of government and politics), 9*(3), 393-419. https://doi.org/10.18196/jgp.9386

Blau, F. D., & Kahn, L. M. (2005). Do Cognitive Test Scores Explain Higher U.S Wage Inequality? *The review of economics and statistics, 87*(1), 184-193. https://doi.org/10.1162/0034653053327649

Chiswick, B. R., & Miller, P. W. (2014). International Migration and the Economics of Language (7880). IZA Discussion Paper Series, n 7880. https://www.iza.org/en/publications/dp/7880

Choi, H. J. 최., & Kim, J. Y. 김. (2009). The Wage Premium of English Proficiency in the South Korean Labor Market [우리나라 노동시장에서 영어 실력의 프리미엄]. *Journal of Labor Economics [노동경제논집], 32*(2), 61-92.

Choi, M. S. 최., Won, J. S. 원., Jeong, H. S. 정., Kim, B. S. 김., Lee, K. H. 이., Jeon, E. J. 전., Jeong, H. S. 정., & Joo, S. H. 주. (2023). *Understanding Korean Language Education: Sixteen Perspectives on the Future of Korean Language Education* [국어 교육의 이해: 국어 교육의 미래를 모색하는 열여섯 가지 이야기]. Sahoe Pyeongron Academy [사회평론아카데미].

Choi, W. S. 최. (1998, 1998-07-20). *The Argument for English as an Official Language: An Extension of Western Hegemony* [영어공용화론 서구패권주의 연장]. Chosun Ilbo [조선일보]. https://www.chosun.com/site/data/html_dir/1998/07/20/1998072070390.html

Choi, Y. (2015). The effects of English training abroad on labor market outcomes in Korea. *Research in Social Stratification and Mobility, 41*, 11-24.

Christl, M., Köppl-Turyna, M., & Gnan, P. (2020). Wage differences between immigrants and natives: the role of literacy skills. *Journal of Ethnic and Migration Studies, 46*(19), 4010-4042. https://doi.org/10.1080/1369183X.2018.1526062

Churkina, O., Nazareno, L., & Zullo, M. (2023). The labor market outcomes of bilinguals in the United States: Accumulation and returns effects. *PLoS One, 18*(6), e0287711-e0287711. https://doi.org/10.1371/journal.pone.0287711

Cray, E., & Currie, P. (2004). Conceptions of Literacy in Canadian Immigrant Language Training. *Current issues in language planning, 5*, 51-63. https://doi.org/10.1080/14664200408669079

Deming, D., & Kahn, L. B. (2018). Skill requirements across firms and labor markets: Evidence from job postings for professionals. *Journal of labor economics, 36*(S1), S337-S369.

Denny, K., & Doyle, O. (2010). Returns to basic skills in central and eastern Europe. *The economics of transition, 18*(1), 183-208. https://doi.org/10.1111/j.1468-0351.2009.00368.x

Di Paolo, A., & Tansel, A. (2019). English skills, labour market status and earnings of Turkish women. *Empirica, 46*(4), 669-690.

Dustmann, C., & Fabbri, F. (2003). Language proficiency and labour market performance of immigrants in the UK. *The Economic journal (London), 113*(489), 695-717. https://doi.org/10.1111/1468-0297.t01-1-00151

Earle, D. (2009). The Effect of First Language and Education on Literacy, Employment and Income: An Analysis from the Adult Literacy and Life Skills Survey. Ministry of Education. https://www.educationcounts.govt.nz/publications/tertiary_education/education-literacy/The-effect-of-first-language-and-education-on-literacy,-employment-and-income

Esser, H. (2006). Ethnische Ressourcen: Das Beispiel der Bilingualität. *Berliner journal für Soziologie, 16*(4), 525-555. https://doi.org/10.1007/s11609-006-0220-0

Garrouste, C. (2008). Language Skills and Economic Returns. *Policy Futures in Education, 6*(2), 187-202. https://doi.org/10.2304/pfie.2008.6.2.187

Glewwe, P., Song, Y., & Zou, X. (2022). Labor market outcomes, cognitive skills, and noncognitive skills in rural China. *Journal of Economic Behavior & Organization, 193*, 294-311. https://doi.org/10.1016/j.jebo.2021.11.021

Green, D. A., & Riddell, W. C. (2003). Literacy and earnings: An investigation of the interaction of cognitive and unobserved skills in earnings generation. *Labour Economics, 10*(2), 165-184. https://doi.org/10.1016/S0927-5371(03)00008-3

Green, F. (2012). Employee involvement, technology and evolution in job skills: A task-based analysis. *ILR Review, 65*(1), 36-67.

Grin, F. O., Sfreddo, C., Vaillancourt, F. O., & Ebrary, I. (2010). *The economics of the multilingual workplace*. Routledge.

Haider, S., & Solon, G. (2006). Life-cycle variation in the association between current and lifetime earnings. *American economic review, 96*(4), 1308-1320.

Hampf, F., Wiederhold, S., & Woessmann, L. (2017). Skills, earnings, and employment: exploring causality in the estimation of returns to skills. *Large-scale Assessments in Education, 5*(1), 1-30. https://doi.org/10.1186/s40536-017-0045-7

Hanushek, E. A., Schwerdt, G., Wiederhold, S., & Woessmann, L. (2015). Returns to skills around the world: Evidence from PIAAC. *European Economic Review, 73*(73), 103-130. https://doi.org/10.1016/j.euroecorev.2014.10.006

Hanushek, E. A., & Zhang, L. (2009). Quality-consistent estimates of international schooling and skill gradients. *Journal of Human capital, 3*(2), 107-143. https://doi.org/10.1086/644780

Jeong, S. H. 정. (2000, 2000-03). *A Stern Warning to the Advocates of English* [영어 찬미자들에게 엄중경고함!]. Shindonga [신동아]. https://shindonga.donga.com/home/article/01/13/4626892/1

Kim, J. Y. 김., & Choi, H. J. 최. (2010). Role of English in School-to-Work Transition [학교에서 직장으로의 이전과정에서 영어의 역할]. *Labor Policy Studies [노동정책연구], 10*(3), 1-33.

Kim, W. J. 김. (2024, September 11). *Record number of repeat test-takers for CSAT in 21 years, influenced by medical school expansion*. ["n수생" 수능 응시자 21년만에 최대, 의대 증원 등 여파]. Kyunghyang Shinmun (경향신문). https://www.khan.co.kr/article/202409111200031

Ko, J. H. 고., & Jeong, B. M. 정. (2013). The Present Value of Korean Language Education Goals in the Modern Enlightenment Period: Based on the Results of Basic Research on Modern and Contemporary National Language and Literature Education [근대계몽기 국어교육 목표의 현재적 가치 - 근현대 민족어문교육 기초연구 결과물을 바탕으로 -]. *Proceedings of the Korean Language Education Research Association Conference [한국어교육학회 학술발표논문집], 2013*(1), 221-242.

Kwon, S. W. 권. (2021). Is Blind Recruitment Fair? [블라인드 채용은 공정한가]. *Journal of Business Studies [경영연구], 36*(1), 87-98.

Lee, J.-W., Han, J.-S., & Song, E. (2019). The effects and challenges of vocational training in Korea. *International Journal of Training Research, 17*(sup1), 96-111.

Lee, J. W., & Wie, D. (2017). Returns to education and skills in the labor market: Evidence from Japan and Korea. *Asian Economic Policy Review, 12*(1), 139-160.

Lee, J. Y. 이. (2020). Lifelong Learning Society and Directions for Literacy Education [평생학습사회와 문식성 교육의 방향] [Lifelong Learning Society and Direction of Literacy Education]. *Korean Language Education [국어교육], 171*(0), 1-29. https://kiss.kstudy.com/Detail/Ar?key=3840466

Lee, K. K. 이. (2006). Directions for Korean Language Policy in the Era of the Framework Act on the Korean Language [국어 기본법 시대의 국어 정책 방향] [Directions of Korean Policy in Korean Basic Law Periods]. *Hangeul [한글], -*(272), 221-247. https://www.riss.kr/link?id=A104071680

Lee, S. H. 이., & Yang, J. S. 양. (2011). Screening, Signaling, and Wage Effects of English Scores in the Labor Market: Focus on College Graduates [노동시장에서 영어점수의 선별, 신호 및 임금효과: 대졸자를 중심으로]. *Labor Economics Review [노동경제논집], 34*(2), 79-107.

Lee, Y. (2024). *Analysis of trends in successful aging research based on lifelong education: Focusing on papers from domestic academic journals*. Korean Society of Educational Gerontology. https://doi.org/10.31748/kseg.2024.10.1.122

Leuven, E., Oosterbeek, H., & Ophem, H. v. (2004). Explaining international differences in male skill wage differentials by differences in demand and supply of skill. *The Economic journal (London), 114*(495), 466-486. https://doi.org/10.1111/j.1468-0297.2004.00217.x

Li, Y., Teng, W., Tsai, L., & Lin, T. M. Y. (2022). Does English proficiency support the economic development of non-English-speaking countries? The case of Asia. *International journal of educational development, 92*, 102623. https://doi.org/10.1016/j.ijedudev.2022.102623

Martin, J. P. (2018). Skills for the 21st Century: Findings and Policy Lessons from the OECD Survey of Adult Skills. In. *St. Louis: Federal Reserve Bank of St. Louis*.

McIntosh, S., & Vignoles, A. (2001). Measuring and assessing the impact of basic skills on labour market outcomes. *Oxford Economic Papers, 53*(3), 453-481. https://doi.org/10.1093/oep/53.3.453

McManus, W., Gould, W., & Welch, F. (1983). Earnings of Hispanic Men: The Role of English Language Proficiency. *Journal of labor economics, 1*(2), 101-130. https://doi.org/10.1086/298006

Mikkelson, A. C., York, J. A., & Arritola, J. (2015). Communication Competence, Leadership Behaviors, and Employee Outcomes in Supervisor-Employee Relationships. *Business and professional communication quarterly, 78*(3), 336-354. https://doi.org/10.1177/2329490615588542

Min, H. S. 민. (2016). The Philosophy and Policy of Korean Education [국어교육의 철학과 정책] [On the Philosophy and Policy of Korean Language Education]. *Korean Language Education Research [국어교육학연구], 51*(2), 5-52. https://kiss.kstudy.com/Detail/Ar?key=3443108

Min, H. S. 민. (2020). Linguistic Nationalism and the Identity of the Korean Language in the Future [어문 민족주의와 미래 한국어의 정체성]. *Woorimal Geul [우리말 글], 87*(-), 197-246. https://www.riss.kr/link?id=A107211309

Mincer, J. (1974). *Schooling, experience, and earnings*. National Bureau of Economic Research; distributed by Columbia University Press.

Ministry of Education (교육부), N. I. f. L. E. 국. (2023). *2023 Adult Literacy Education Support Project Achievement Sharing* [2023년 성인 문해교육 지원사업 성과공유회].

Ministry of Education (교육부), (2025). 2025 Basic Plan for Adult Literacy Education Support Project [2025년 성인 문해교육 지원사업 기본계획 발표]. Ministry of Education, Republic of Korea.

Noh, E. H. 노. (2023). *Characteristics and Changes in the Revised Korean Language Curriculum* [2022 개정 국어과 교육과정의 특징적 변화].

Ok, H. J. 옥., Kim, J. Y. 김., & Park, J. H. 박. (2016). Analysis of Educational Policies on Adult Literacy Education [성인 문식성 교육 활성화를 위한 주요 국가의 정책 분석]. *Journal of Korean Literary Studies [작문연구], 31*, 1-27.

Pagan, A., & Ullah, A. (1999). *Nonparametric econometrics / Adrian Pagan, Aman Ullah*. Cambridge University Press.

Park, C. (2009). A study on the effect of overseas language training programs upon the transition from college to labor market. *J. Employ. Skills Dev, 12*(1), 117-139.

Park, J. H. 박., Ok, H. J. 옥., & Kim, J. Y. 김. (2017). A Survey of Experts' Opinions on the Development of Adult Literacy Education Curriculum [성인 문식성 교육과정 개발에 관한 전문가 의견 조사] [A Survey of Expert Opinion on Adult Literacy Curriculum Development]. *Journal of Writing Research [작문연구], 0*(35), 7-38. https://www.riss.kr/link?id=A104983594

Park, J. S.-Y. (2011). The promise of English: Linguistic capital and the neoliberal worker in the South Korean job market. *International journal of bilingual education and bilingualism, 14*(4), 443-455.

Patrinos, H. A., & Sakellariou, C. (2011). Quality of schooling, returns to schooling and the 1981 vouchers reform in Chile. *World development, 39*(12), 2245-2256.

Reimers, C. W. (1983). Labor Market Discrimination Against Hispanic and Black Men. *The Review of Economics and Statistics, 65*(4), 570-579. https://doi.org/10.2307/1935925

Riley, J. G. (1979). Testing the educational screening hypothesis. *Journal of political economy, 87*(5, Part 2), S227-S252.

Robinson, P. M. (1988). Root-N-Consistent Semiparametric Regression. *Econometrica, 56*(4), 931-954. https://doi.org/10.2307/1912705

Sakellariou, C. (2013). Are Cognitive Skills Relevant in Gender Earnings Decompositions? *Bulletin of economic research, 65*(2), 134-153. https://doi.org/10.1111/j.1467-8586.2011.00430.x

Salahodjaev, R., & Malikova, Z. (2021). Cognitive abilities and income: preliminary evidence from a developing country. *International Journal of Development Issues, 20*(1), 62-73. https://doi.org/10.1108/IJDI-06-2020-0123

Schultz, T. W. (1961). Investment in Human Capital. The American Economic Review, 51(1), 1-17.

Spence, M. (1973). Job Market Signaling. *The Quarterly journal of economics, 87*(3), 355-374. https://doi.org/10.2307/1882010

Supriyati, Misra, Y., Ira, Y., & Darham. (2023). Persuasive Communication and Work Effectiveness Enhancing Performance of Employees in DPRD Merangin Regency. *Journal of Economics, Business, and Government Challenges, 3*(02), 81-86. https://doi.org/10.33005/ebgc.v3i2.121

Taştan, H., & Erdoğan, S. (2018). Cognitive skills and economic performance: evidence from the recent international student assessment tests. *Eurasian Economic Review, 8*(3), 417-449. https://doi.org/10.1007/s40822-018-0099-z

Tobias, J. L. (2003). Are Returns to Schooling Concentrated Among the Most Able? A Semiparametric Analysis of the Ability–earnings Relationships. *Oxford Bulletin of Economics and statistics, 65*(1), 1-29. https://doi.org/10.1111/1468-0084.00038

Ubalde, J., & Alarcón, A. (2020). Are all automation-resistant skills rewarded? Linguistic skills in the US labour market. *The economic and labour relations review:ELRR,31*(3),403-424.https://doi.org/10.1177/1035304620903152

Vanek, J., Wrigley, H., Jacobson, E., & Isserlis, J. (2020). All Together Now: Supporting Immigrants and Refugees Through Collaboration. *Adult Literacy Education: The International Journal of Literacy, Language, And Numeracy*. https://doi.org/10.35847/jvaneck.hwrigley.ejacobson.jisserlis.2.1.41

Vigouroux, C. B., & Mufwene, S. S. (2020). *Do Linguists Need Economics and Economists Linguistics?* In (pp. 1-55). Cambridge University Press. https://doi.org/10.1017/9781108783101.002

Wei, L. (2016). *Multilingualism in the Chinese diaspora worldwide: transnational connections and local social realities*. Routledge, Taylor & Francis Group.

Yatchew, A. (1997). An elementary estimator of the partial linear model. *Economics Letters, 57*(2), 135-143. https://doi.org/10.1016/S0165-1765(97)00218-8

Yatchew, A. (1998). Nonparametric Regression Techniques in Economics. *Journal of Economic Literature, 36*(2), 669-721.

Yatchew, A. (2003). *Semiparametric regression for the applied econometrician*. Cambridge University Press.

Yu, M., & Yang, H. (2023). The impact of effective communication on corporate performance. *Journal of Computing and Electronic Information Management*, *11*(1), 105-107.

Yu, S. M. 유. (2024). A Comparative Study of the Korean as a Second Language (KSL) Curriculum and the Korean Language Curriculum: Focusing on Content Structure and Achievement Standards [한국어(KSL) 교육과정과 국어과 교육과정의 비교 연구 : 내용 체계 및 성취 기준을 중심으로] [A Comparative Study of the KSL Curriculum and the Korean Language Curriculum: Focusing on Content Organization and Achievement Standards]. *Multiculture and Education [다문화와 교육]*, *9*(3), 1-27. https://www.earticle.net/Article/A454997