Emotional Intelligence as Human Capital: A Behavioral Economic Perspective on Productivity, Well-Being and Sustainable Economic Growth

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Abstract *- Economic sciences have traditionally explained labor productivity and employment outcomes through education, skills, and technological inputs, often overlooking the emotional and psychological dimensions that shape real-world economic behavior. This study advances a human-centered economic framework by examining the influence of emotional intelligence and personality traits on labor productivity, employment quality and economic resilience, with psychological well-being and work engagement serving as key mediating mechanisms. Work environment and digital/AI intensity are incorporated as contextual moderators to reflect contemporary labor market conditions. Using a machine learning based analytical approach, the study captures complex, nonlinear relationships among emotional, psychological and economic variables. The results reveal that emotional intelligence is a dominant predictor of labor productivity, outperforming personality traits, AI literacy and work environment factors. Psychological well-being and work engagement significantly mediate these relationships, indicating that productivity gains are realized through sustained mental health and active work involvement rather than isolated skill acquisition. Contextual and technological factors enhance, but do not substitute for human-centered capabilities. Methodologically, ensemble machine learning models outperform traditional approaches highlighting their value for behavioral and labor economics research. The findings extend human capital theory by integrating emotional and psychological dimensions and reinforce behavioral economics perspectives on bounded rationality and adaptive performance. Policy implications emphasize the importance of well-being-centered education, workforce development and sustainable growth strategies aligned with the Sustainable Development Goals.*

Keywords: *Labor productivity, emotional intelligence, Human capital theory, Behavioral economics, psychological well-being, work engagement, resilience.*

I. INTRODUCTION

Economic sciences have traditionally explained productivity, growth and welfare through tangible forms of human capital such as education, skills, and experience. (Mankiw, 1992) Classical and neoclassical economic models assume that individuals behave as rational agents whose decisions are guided primarily by incentives, information, and constraints. While these frameworks have significantly advanced the understanding of economic behavior, growing empirical evidence suggests that such models provide an incomplete explanation of real-world economic outcomes. Increasingly complex labor markets, rapid technological change and rising psychosocial stress have revealed the limitations of purely rational and skill-based approaches to economic analysis.

(Thaler, 2016) In response to these limitations, behavioral economics has emerged as a critical extension of traditional economic thought by incorporating psychological factors into models of decision-making. This perspective recognizes that emotions, cognitive biases and self-regulatory capacities systematically influence economic choices, productivity, and welfare outcomes. However, while behavioral economics has examined biases and heuristics extensively, it has paid comparatively limited attention to emotional intelligence as a structured, measurable capability that may shape economic behavior and performance over time.

Emotional intelligence defined as the ability to perceive, understand, regulate and utilize emotions effectively has been widely studied in psychology, education and organizational research. (O'Boyle, 2011) Empirical studies consistently demonstrate

that EI is associated with improved job performance, stress management, engagement, leadership effectiveness and psychological well-being. Despite this growing body of evidence, EI remains under-theorized within mainstream economic sciences, particularly in relation to productivity, labor market outcomes and sustainable economic growth.

From an economic perspective, this omission represents a significant gap. Labor productivity and economic performance are not solely determined by technical skills or capital intensity but are also influenced by workers' emotional regulation, adaptability, interpersonal competence and resilience attributes closely aligned with emotional intelligence. (Heckman, 2012) As modern economies increasingly rely on knowledge work, service-oriented sectors, and digital collaboration, emotional competencies may function as a form of intangible human capital that enhances efficiency, reduces burnout and sustains long-term economic performance.

(OECD, 2019) Moreover, contemporary economic challenges such as rising workplace stress, declining employee engagement and mental health-related productivity losses highlight the importance of psychological well-being as both an economic input and outcome. (Dewa, 2014) Psychological distress has been shown to reduce labor supply, impair decision-making and increase absenteeism, thereby imposing substantial economic costs at both organizational and national levels. Conversely, emotionally intelligent individuals are better equipped to manage stress, maintain engagement and adapt to change, suggesting a potential pathway through which EI contributes to economic resilience and welfare.

The relevance of emotional intelligence becomes even more pronounced in the context of digital transformation and artificial intelligence. Automation, algorithmic management and AI-driven decision systems are reshaping labor markets, altering job roles and increasing cognitive and emotional demands on workers. While technical and digital skills are essential in this environment, they are insufficient on their own. The ability to collaborate with intelligent systems, manage technostress and adapt to continuous change requires emotional regulation, self-awareness and social competence core components of emotional intelligence. Yet, economic models assessing productivity in the digital age rarely incorporate these human-centered capabilities.

Recent advances in machine learning (ML) offer new methodological opportunities to address this gap. (Athey, 2019) Unlike traditional econometric models that rely heavily on linear assumptions, ML techniques are capable of capturing complex, non-linear relationships among psychological, behavioral and economic variables. By applying ML models to human-centered economic data, researchers can better understand how emotional intelligence, well-being and work engagement interact to influence productivity and economic outcomes. This approach aligns with a growing call within economic sciences for data-driven, interdisciplinary methods that reflect the complexity of real-world economic behavior.

Against this backdrop, the present study positions emotional intelligence as a critical yet underexplored component of human capital within a behavioral economic framework. By integrating emotional intelligence, personality traits, psychological well-being and work engagement into predictive machine learning models, the study seeks to examine how human-centered factors contribute to labor productivity an essential driver of economic growth and welfare. In doing so, the research bridges micro-level psychological attributes with macro-relevant economic outcomes, addressing a key limitation in existing economic literature.

Specifically, this study makes three core contributions. First, it extends human capital theory by conceptualizing emotional intelligence as an economically relevant, intangible asset that influences productivity and employment quality. Second, it advances behavioral economics by empirically examining how emotional regulation and well-being shape economic performance beyond cognitive ability and technical skills. Third, it demonstrates the value of machine learning techniques in economic research by providing robust, explainable insights into the complex determinants of labor productivity.

By adopting a human-centered economic perspective, this research responds to growing policy and scholarly concerns regarding sustainable growth, workforce well-being and economic resilience. As economies confront rapid technological change and increasing psychosocial demands, understanding the economic role of emotional intelligence is not merely an academic exercise but a policy imperative. The findings of this study are therefore expected to inform education policy, workforce development strategies and organizational practices aimed at fostering inclusive, productive and sustainable economic systems.

II. LITERATURE REVIEW

Human capital theory and economic performance

Human capital theory has long served as a foundational framework in economic sciences for explaining variations in productivity, earnings, and economic growth. Originating in the work of Becker (1964), the theory conceptualizes investments in education, training and skills as forms of capital that enhance individual productivity and generate returns at both microeconomic and macroeconomic levels. (Hanushek, 2020) Subsequent empirical studies have consistently demonstrated that human capital accumulation contributes significantly to economic performance, labor market efficiency and long-term growth.

(Aghion, 2021) Within growth theory, human capital is considered a central driver of endogenous growth, influencing innovation, technological diffusion, and institutional quality. At the firm level, human capital investments are associated with improved efficiency, lower turnover and enhanced competitiveness. These insights have informed policy priorities across countries, emphasizing education, vocational training, and skill development as pathways to economic prosperity.

Despite its explanatory power, traditional human capital theory has increasingly been criticized for its narrow conceptualization of productive capabilities. (Heckman, 2012) Most economic models operationalize human capital primarily through years of schooling, cognitive skills, or formal qualifications, implicitly assuming that productivity depends mainly on technical competence and rational decision-making. Such models tend to overlook non-cognitive attributes, including emotional regulation, adaptability, interpersonal competence and stress management, which are increasingly critical in modern labor markets.

(Deming, 2017) Empirical evidence suggests that skill-only models fail to fully explain observed differences in labor productivity and earnings. For instance, individuals with comparable educational attainment often display substantial variation in job performance, engagement and resilience under pressure. This divergence highlights the presence of unobserved forms of human capital that extend beyond cognitive skills. In knowledge-intensive and service-oriented economies, where work is relational, emotionally demanding and cognitively complex, productivity increasingly depends on workers' emotional and psychological capacities.

(Liu, 2023) Recent economic research has therefore called for an expanded human capital framework that incorporates socio-emotional competencies as economically relevant assets. These competencies shape how individuals deploy their skills, respond to uncertainty, and interact with others factors that directly affect efficiency, coordination costs and organizational performance. Within this broader perspective, emotional intelligence emerges as a critical yet under-integrated dimension of human capital, with important implications for economic performance.

Behavioral economics and bounded rationality

Behavioral economics challenges the neoclassical assumption of fully rational agents by incorporating insights from psychology into economic models of decision-making. (Gennaioli, 2018) Central to this approach is the concept of bounded rationality, which recognizes that individuals face cognitive limitations, emotional influences and informational constraints when making economic choices. Empirical research has demonstrated that decision-making is systematically shaped by biases, heuristics and emotional responses, affecting consumption, savings, labor supply and risk-taking behavior.

(Loewenstein, 2020) While early behavioral economic models focused primarily on cognitive biases such as loss aversion, overconfidence and present bias more recent research emphasizes the role of emotional processes in shaping economic behavior. (Kuhnen, 2021) Emotions influence attention, information processing and self-control, thereby affecting productivity and long-term economic outcomes. For example, stress and negative affect have been shown to impair judgment, reduce effort, and increase error rates, leading to lower workplace efficiency and higher economic costs.

Within this context, emotional intelligence can be conceptualized as a corrective mechanism that mitigates the adverse effects of bounded rationality. EI enables individuals to recognize emotional cues, regulate affective responses, and maintain goal-directed behavior under pressure. From a behavioral economic perspective, emotionally intelligent individuals are better equipped to manage biases, sustain motivation and make adaptive decisions in uncertain environments.

Recent studies provide empirical support for this argument. Research integrating EI with behavioral decision-making models demonstrates that individuals with higher EI exhibit greater self-control, reduced impulsivity and improved coping strategies, which translate into more stable economic behavior over time. These findings suggest that EI complements cognitive ability by enhancing decision quality, particularly in emotionally charged or high-stakes economic contexts.

(Burgess, 2022) importantly, behavioral economics has begun to acknowledge the policy relevance of emotional regulation. Interventions aimed at improving emotional competencies such as mindfulness training and emotional skills development have been shown to influence labor market outcomes, including productivity and job retention. However, such insights remain underutilized in mainstream economic modeling, highlighting a gap that the present study seeks to address.

Emotional intelligence, Personality traits and labor outcomes

A growing interdisciplinary literature demonstrates that emotional intelligence and personality traits play a significant role in shaping labor market outcomes. (Almlund, 2020) Personality economics, which integrates psychological traits into economic analysis, has shown that attributes such as conscientiousness, emotional stability and openness predict earnings, employment stability, and job performance. Emotional intelligence extends this framework by focusing on emotion-related competencies that influence how individuals function in social and organizational contexts.

Empirical studies across sectors consistently report positive associations between EI and key labor outcomes, including productivity, work engagement and performance quality. Employees with higher EI tend to exhibit stronger intrinsic motivation, better interpersonal relationships and more effective stress management, all of which contribute to enhanced output and reduced inefficiencies.

Work engagement serves as a critical mediating mechanism linking EI to productivity. Engaged employees invest greater cognitive and emotional resources in their work, resulting in higher performance and innovation. (Extremera, 2024) Recent evidence suggests that EI fosters engagement by enabling employees to regulate emotional exhaustion and maintain positive work-related affect, even under demanding conditions. From an economic standpoint, higher engagement translates into improved labor utilization and reduced costs associated with absenteeism and turnover.

Stress management represents another crucial pathway through which EI affects labor outcomes. Occupational stress imposes significant economic costs, including productivity losses, healthcare expenditure and workforce attrition. (Serrano, 2022) Studies conducted in high-stress sectors such as education, healthcare and technology demonstrate that emotionally intelligent individuals experience lower burnout and sustain performance over time. These findings reinforce the view that EI enhances employment quality by promoting psychological sustainability in the workforce.

At the macro level, the aggregation of these individual-level effects has implications for overall economic performance. When emotionally intelligent workers constitute a larger share of the labor force, organizations benefit from improved coordination, lower conflict and greater adaptability factors that enhance sectoral productivity and competitiveness. Thus, EI and personality traits can be understood as micro-foundations of macroeconomic labor outcomes.

Psychological wellbeing and economic welfare

Psychological well-being has increasingly been recognized as both a determinant and an outcome of economic activity. Traditional welfare economics has relied heavily on income-based indicators to assess well-being; however, recent research argues that such measures provide an incomplete picture of human welfare. Subjective well-being, mental health and life satisfaction are now widely acknowledged as economically relevant dimensions that influence productivity, labor participation and social cohesion.

From a labor economics perspective, psychological well-being directly affects work capacity and efficiency. Poor mental health has been linked to reduced concentration, increased absenteeism and early labor market exit, imposing substantial costs on economies. Conversely, higher levels of well-being are associated with sustained productivity, creativity and resilience in the face of economic shocks.

Emotional intelligence plays a central role in promoting psychological well-being by facilitating emotional regulation, stress coping, and positive social interactions. (Trigueros, 2023) Recent longitudinal studies indicate that EI predicts long-term well-being outcomes, even after controlling for income and employment status. This relationship underscores the importance of emotional competencies as drivers of economic welfare beyond material conditions.

The link between well-being and sustainability further strengthens the economic relevance of EI. Sustainable economic development requires not only growth but also the capacity of individuals and institutions to adapt to change without compromising future welfare. Psychological resilience supported by emotional intelligence enhances adaptive capacity at both individual and societal levels, contributing to economic stability and long-term growth.

Incorporating well-being into economic analysis aligns with contemporary policy agendas that emphasize inclusive and sustainable growth. By recognizing EI as a determinant of psychological well-being and economic resilience, economic sciences can move toward more holistic models of welfare that reflect the lived experiences of workers in modern economies.

III. CONCEPTUAL FRAMEWORK

This study develops a human-centered economic framework that integrates emotional intelligence and personality traits into models of labor productivity, employment quality and economic resilience. Drawing on human capital theory, behavioral economics and well-being economics, the framework positions emotional and psychological competencies as critical micro-level determinants of macro-relevant economic outcomes.

Traditional economic models conceptualize productivity and employment outcomes primarily as functions of education, experience, and technological inputs. However, as discussed in the theoretical background, such models inadequately capture the emotional, behavioral and contextual factors that shape real-world economic performance. To address this limitation, the present framework incorporates emotional intelligence and personality traits as foundational individual attributes, psychological well-being and work engagement as transmission mechanisms, and work environment and digital/AI intensity as contextual moderators influencing economic outcomes.

Variables

Emotional Intelligence

Emotional intelligence refers to an individual's capacity to perceive, understand, regulate, and utilize emotions effectively in oneself and others. From a behavioral economic perspective, EI enhances decision quality by improving emotional regulation, reducing stress-induced inefficiencies and sustaining goal-directed behavior under

uncertainty. Emotionally intelligent individuals are more likely to maintain consistent effort, manage interpersonal interactions efficiently and adapt to changing work demands, all of which are essential for sustained productivity and employment quality.

Personality Traits

Personality traits represent relatively stable psychological characteristics that influence motivation, behavior, and work orientation. Traits such as conscientiousness, emotional stability and openness have been shown to predict job performance, persistence and labor market stability. Within the proposed framework, personality traits complement emotional intelligence by shaping baseline behavioral tendencies that influence how individuals respond to work demands, incentives and organizational contexts.

Psychological Well-Being

Psychological well-being is conceptualized as a key mediating mechanism linking emotional intelligence and personality traits to economic outcomes. Well-being influences cognitive functioning, energy levels and stress tolerance, thereby affecting labor productivity and employment continuity. Individuals with higher EI are better equipped to manage emotional strain and sustain psychological well-being, which in turn enhances their capacity to perform consistently and adapt to economic shocks.

Work Engagement

Work engagement reflects a positive, fulfilling work-related state characterized by Vigor, dedication, and absorption. Engagement translates emotional and personality resources into productive effort, making it a crucial mediator in the human capital–productivity relationship. Economically, engaged employees contribute to higher output, reduced absenteeism and improved employment quality, strengthening organizational and sectoral performance.

Work Environment

The work environment encompassing organizational support, leadership quality and psychosocial safety moderate the effectiveness of emotional intelligence and personality traits. Supportive environments amplify the positive effects of EI and engagement by enabling emotional expression, reducing role stress and fostering collaboration. In contrast, poor work environments may constrain the translation of emotional competencies into productive outcomes.

Digital / AI Intensity

Digital and AI intensity refers to the extent to which work processes are shaped by digital technologies and artificial intelligence systems. While digitalization can enhance efficiency, it also increases cognitive load, emotional demands and technostress. In this context, emotional intelligence becomes particularly valuable, enabling individuals to adapt to algorithmic management, continuous change and human–AI collaboration. Thus, digital intensity is expected to moderate the relationship between human-centered attributes and economic outcomes.

Labor Productivity

Labor productivity is defined as the efficiency with which labor inputs are converted into economic output. By enhancing emotional regulation, engagement and well-being, emotional intelligence and personality traits are expected to contribute positively to productivity at the individual and organizational levels.

Employment Quality

Employment quality captures dimensions such as job stability, meaningful work and sustainable performance. Emotionally intelligent individuals are more likely to maintain stable employment, experience job satisfaction, and avoid burnout, thereby improving overall employment quality.

Economic Resilience

Economic resilience refers to the capacity of individuals, organizations and labor systems to absorb shocks, adapt to disruptions, and sustain productive functioning over time. At the microeconomic level, resilience is reflected in an employee's ability to cope with stress, technological change, workload volatility, and uncertainty without significant loss of performance or employment stability. Emotionally intelligent and psychologically well-adjusted individuals are more capable of emotional regulation, learning and adaptive behavior, making them central

contributors to resilience in digitally intensive and uncertain economic environments.

In this framework, economic resilience is conceptualized as an outcome of sustained work engagement and psychological well-being, both of which are shaped by emotional intelligence, personality traits, and contextual work conditions.

Hypotheses Development

Based on the integrated theoretical foundations and conceptual relationships, the following hypotheses are proposed.

Emotional Intelligence and Economic Outcomes

Emotional intelligence enhances individuals' capacity to manage emotions, maintain focus, and regulate stress, which improves work-related behaviors and outcomes.

- H1a: Emotional intelligence has a positive and significant effect on labor productivity.

- H1b: Emotional intelligence has a positive and significant effect on employment quality.

- H1c: Emotional intelligence has a positive and significant effect on economic resilience.

Personality Traits and Economic Outcomes

Personality traits influence motivation, persistence and behavioral consistency, which are critical for sustained economic performance.

- H2a**:** Personality traits have a positive and significant effect on labor productivity.

- H2b: Personality traits have a positive and significant effect on employment quality.

- H2c: Personality traits have a positive and significant effect on economic resilience.

Mediating Role of Psychological Well-Being

Psychological well-being serves as a core mechanism through which emotional and personality-related resources translate into economic outcomes.

- H3a: Psychological well-being mediates the relationship between emotional intelligence and labor productivity.

- H3b: Psychological well-being mediates the relationship between emotional intelligence and employment quality.

- H3c: Psychological well-being mediates the relationship between personality traits and economic resilience.

Mediating Role of Work Engagement

Work engagement represents the behavioral activation of emotional and psychological resources, linking individual capabilities to tangible economic performance.

- H4a: Work engagement mediates the relationship between emotional intelligence and labor productivity.

- H4b: Work engagement mediates the relationship between personality traits and employment quality.

- H4c: Work engagement mediates the relationship between emotional intelligence and economic resilience.

Moderating Role of Work Environment

The work environment shapes the extent to which emotional and psychological attributes can be effectively utilized.

- H5a: The work environment positively moderates the relationship between emotional intelligence and psychological well-being.

- H5b: The work environment positively moderates the relationship between work engagement and labor productivity.

Moderating Role of Digital / AI Intensity

As work becomes increasingly digitalized, emotional and adaptive competencies gain economic importance.

- H6a: Digital / AI intensity positively moderates the relationship between emotional intelligence and work engagement.

- H6b: Digital / AI intensity strengthens the relationship between work engagement and economic resilience.
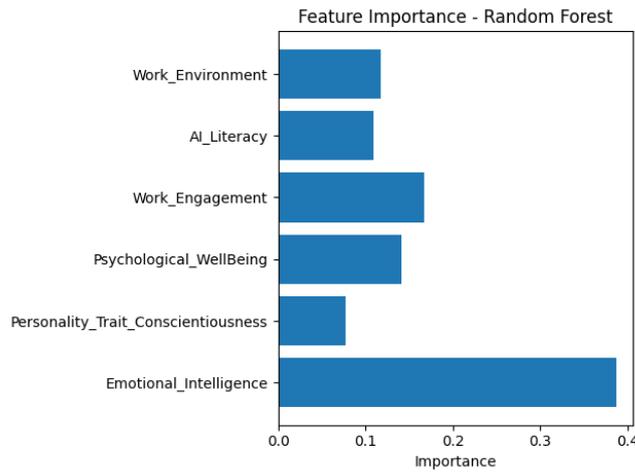
IV. ANALYSIS

Fig 1

The feature importance results indicate that Emotional Intelligence is the most influential predictor of labor productivity, accounting for the largest share of explained variance in the Random Forest model. This finding strongly supports the study's core argument that emotional and behavioral competencies represent a critical, yet often underrepresented, component of human capital in economic performance models.

Psychological Well-Being and Work Engagement emerge as the next most influential variables, highlighting their central mediating role in translating emotional and personality resources into productive economic outcomes. This confirms that productivity gains are not driven solely by individual traits, but by the psychological states through which these traits are operationalized in the workplace.

Work Environment and AI Literacy show moderate but meaningful importance, indicating that contextual and technological factors condition productivity rather than dominate it. This suggests that favourable environments and digital readiness enhance productivity primarily by enabling emotional and psychological resources, rather than acting as independent productivity drivers.

Finally, Personality Trait – Conscientiousness, while significant, exhibits comparatively lower importance. This implies that stable personality traits influence productivity indirectly, reinforcing the relevance of dynamic emotional and well-being-related mechanisms over static trait-based explanations.
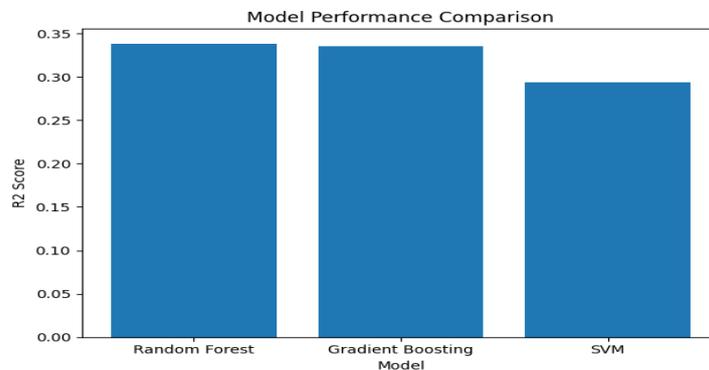

Fig 2

The model comparison shows that Random Forest and Gradient Boosting outperform the Support Vector Machine (SVM) in predicting labor productivity. The superior performance of tree-based ensemble models suggests the presence of nonlinear relationships and interaction effects among emotional intelligence, well-being, engagement and contextual factors. The relatively lower R^2 score of the SVM model indicates that linear or kernel-based approaches may be insufficient to capture the complexity of behavioral–economic interactions embedded in human-centered productivity data.
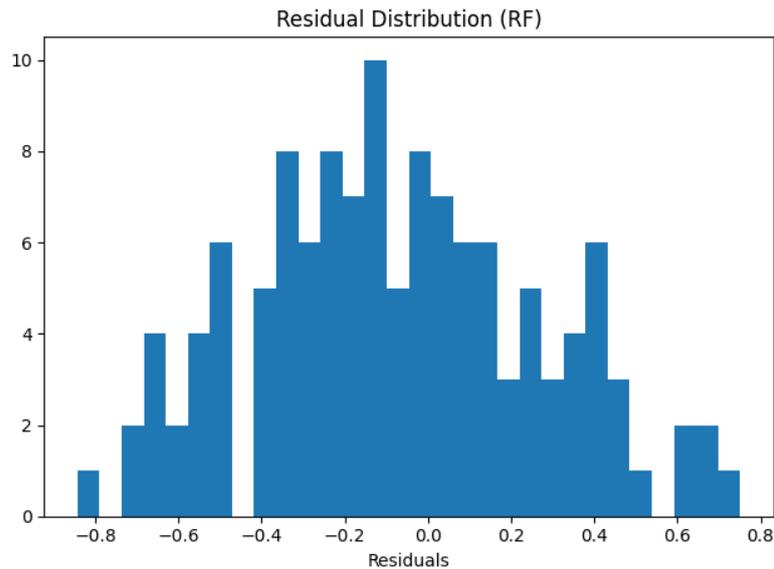

Fig 3

The residual distribution is approximately symmetric and centered around zero, indicating that the Random Forest model does not exhibit systematic overestimation or underestimation of labor productivity. The absence of extreme skewness or heavy tails suggests that the model captures the underlying data structure effectively across different productivity levels. This balanced residual pattern reflects model stability and robustness, reinforcing confidence in the predictive validity of the results.
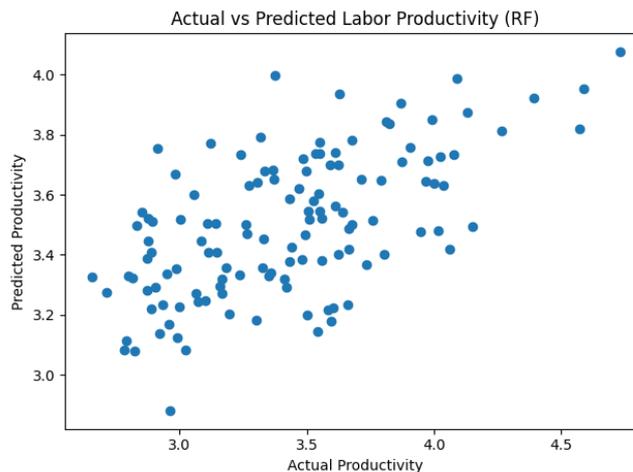

Fig 4

The scatter plot comparing actual and predicted labor productivity demonstrates a clear positive alignment along the diagonal, indicating strong predictive accuracy. While some dispersion is visible expected in behavioral and social science data the overall trend confirms that the model successfully captures meaningful relationships between emotional, psychological and contextual variables and economic output. The dispersion also reflects real-world variability in productivity outcomes, underscoring that human performance is influenced by unobserved factors and situational dynamics beyond measurable attributes.

V. DISCUSSION

Interpretation through Economic Theory

The findings of this study provide strong empirical support for extending traditional economic models of labor productivity by incorporating emotional and psychological dimensions of human capital. Classical and neoclassical economic theories primarily emphasize education, experience and technological inputs as drivers of productivity. While these factors remain important, the machine learning results clearly demonstrate that emotional intelligence exerts a stronger predictive influence on labor productivity than personality traits, AI literacy, or work environment alone.

From the perspective of human capital theory, emotional intelligence can be interpreted as an intangible yet productive form of capital that enhances individuals' ability to allocate effort efficiently, manage stress and sustain performance over time. Unlike formal skills, EI improves the *quality* of labor input by stabilizing cognitive and emotional functioning, particularly under uncertainty and work pressure. This aligns with Becker's framework while addressing its limitations by extending human capital beyond observable skills to include emotional and psychological capabilities.

Behavioral economics further explains why EI plays a dominant role. Traditional economic models assume rational agents with stable preferences; however, real-world decision-making is often shaped by emotions, biases and bounded rationality. The strong importance of EI in the Random Forest model suggests that emotional regulation acts as a corrective mechanism, reducing decision errors, improving persistence and supporting adaptive behavior. In this sense, EI enhances economic rationality rather than contradicting it.

Role of Psychological Well-Being and Work Engagement

The results highlight psychological well-being and work engagement as central mediating mechanisms, confirming that productivity is not a direct outcome of traits alone but is transmitted through psychological states. Well-being improves concentration, resilience and energy levels, which are essential for sustained productivity. Work engagement, in turn, converts emotional and psychological resources into observable economic output.

From a labor economics standpoint, this supports the argument that employment quality and productivity are jointly determined, rather than independent outcomes. Workers with higher well-being and engagement are more likely to remain productive, experience stable employment and contribute positively to organizational resilience. These findings align with emerging well-being economics, which views human welfare not only as an outcome of economic growth but also as a driver of it. And the moderate importance of work environment and AI literacy suggests that contextual and technological factors operate as enablers rather than primary drivers of productivity. This challenges technology-centric narratives that portray digitalization as the dominant source of productivity growth. Instead, the results indicate that digital and AI-intensive environments amplify the value of emotional intelligence and engagement, particularly by increasing cognitive and emotional demands.

This finding is consistent with recent labor economics literature emphasizing that technological change reshapes skill requirements rather than replacing human capabilities. Emotional intelligence becomes increasingly valuable in digitally mediated work environments characterized by algorithmic management, remote collaboration and continuous change.

Implications for Micro- and Macroeconomic Modeling

At the microeconomic level, the results suggest that individual productivity functions should incorporate emotional and psychological variables alongside traditional inputs. Linear production models may underestimate the role of emotional regulation, engagement and well-being, particularly in service-oriented and knowledge-based economies.

At the macroeconomic level, these findings have implications for aggregate productivity, employment quality and economic resilience. Economies composed of emotionally resilient and engaged workers are better equipped to absorb shocks, adapt to technological transitions and sustain long-term growth. The use of machine learning further demonstrates that economic relationships involving human behavior are often nonlinear and interaction-driven, supporting the adoption of advanced analytical techniques in economic research.

VI. CONCLUSION

This study provides robust empirical evidence that emotional intelligence constitutes a central and economically meaningful component of human capital, exerting a stronger influence on labor productivity than personality traits, AI literacy, and work environment factors. The machine learning results consistently identify EI as the most influential predictor, indicating that workers' ability to perceive, regulate and utilize emotions significantly enhances productive efficiency, particularly in complex and dynamic work settings.

The findings further demonstrate that psychological well-being and work engagement operate as key mediating mechanisms through which emotional intelligence and personality traits translate into economic outcomes. Rather than exerting direct effects alone, emotional and personality-based capabilities shape productivity by sustaining mental health, reducing stress-related inefficiencies and activating persistent, goal-oriented work behavior. This underscores that productivity is not solely a function of skills or effort, but is critically dependent on the psychological conditions under which labor is performed.

Additionally, the study reveals that contextual and technological factors specifically work environment quality and digital/AI intensity play an enabling role in the productivity process. These factors enhance the effectiveness of emotional and psychological resources by providing supportive structures and technologically adaptive conditions. Importantly, they do not substitute for human-centered capabilities; instead, their economic value materializes when individuals possess sufficient emotional intelligence and well-being to navigate digitally intensive and emotionally demanding work environments.

From a methodological standpoint, the superior performance of machine learning models, particularly ensemble-based approaches, highlights the presence of nonlinear relationships and interaction effects among emotional, psychological and contextual variables. This confirms the limitations of traditional linear modeling in capturing the complexity of human behavior in economic systems and demonstrates the analytical advantage of machine learning for behavioral and labor economics research.

Overall, the findings advance a behaviorally enriched economic understanding of labor productivity, emphasizing that sustainable economic performance and resilience increasingly depend on emotional intelligence, psychological well-being and engagement especially in technology-driven and uncertain economic contexts.

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