

# *Why should we be concerned about balancing the supply and demand of skilled workers?*

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# Why should we be concerned about balancing the supply and demand of skilled workers?

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## ABSTRACT

This study explores the dynamics between technological advancements, educational reforms, and their consequent impact on the labor market in Chile over 1980–2018 reported by Campos-González and Balcombe (2024). The authors analyze the evolution of the skill premium in response to significant policy changes and global technological trends revealing a pivotal shift in the Chilean labor market: the transition from a technology-driven phase, where rapid technological advancements heightened the demand for skilled labor in the pre-2000 period, to an education-driven phase post-2000, marked by comprehensive educational reforms. These reforms effectively increased the supply of educated workers, leading to the stabilization, and posterior decrease of the skill premium. The authors contribute to the broader understanding of how nations can navigate the challenges posed by the digital age, providing valuable insights for policymakers and educators in fostering equitable and sustainable economic growth. The study's findings are particularly relevant to emerging economies undergoing similar transitions, offering a framework for policy formulation that synchronizes educational advancements with technological progress to ensure inclusive economic development.

## Specification table.

|   |  |
|---|--|
| <b>Subject area</b>   | Economics and Econometrics (Code 2002)   |
| <b>Category/categories of societal impact</b>                           | Economic<br>Education<br>Societal<br>Technological   |
| <b>Sustainable Development Goals (SDGs) the research contributes to</b> | GOAL 4: Quality Education<br>GOAL 8: Decent Work and Economic Growth   |
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| <b>Please provide a link to the webpage if relevant</b>                 | <a href="https://doi.org/10.1016/j.econmod.2023.106616">https://doi.org/10.1016/j.econmod.2023.106616</a>  |
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## Unveiling the social impact of the race between education and technology: Insights from Chile.

Understanding how technological and educational changes affect labour markets is crucial today. Campos-González and Balcombe [5] studied the Chilean case, contributing to the effort to improve society.

The authors examine the race between education and technology, represented by the supply of skilled workers and a skill-biased technological change factor (SBTC), respectively, showing the importance of balancing these forces. Their findings provide valuable insights, enabling informed decision-making by policymakers and stakeholders since this balance can affect the wage gap between skilled and less educated workers, i.e., the skill premium, a factor in income inequality [2,13]. Still, it also provides information on the characteristics of economic development, particularly how these forces may affect the evolution of the supply and demand of skilled workers [7]. By highlighting the transition in Chile from a technology-driven to an education-driven labour market and the subsequent rise and fall of the skill premium, Campos-González and Balcombe [5] provide a roadmap for countries pursuing a stabilisation of the skill premium given its importance as a labour outcome that reflects the relative price of skills. Consequently, how it evolves will imply if we observe a rise or fall in demand for qualified workers. Developing economies need responsive educational policies to avoid skill gaps and income inequality. However, expanding education without market demand awareness can lead to a disbalance between supply and demand for skilled labour, challenging the high returns on educational investments done by societal agents. While most

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of the studies focus on consolidated high-income economies like the US [3], the analysis explores the case of a country moving recently to the high-income category. Thus, Campos-González and Balcombe's [5] study provides a template for other nations dealing with similar challenges in their economic development journeys.

Furthermore, Campos-González & Balcombe [5] help to understand how societal impacts, particularly in terms of labour market equity and economic sustainability, can be shaped by policy decisions. Chile's study period (1980–2018) represents a microcosm of the global challenges faced in synchronising educational reforms with technological advancements. It underscores the importance of evidence-based policy decisions, where educational reforms are about increasing access and aligning curriculum and training with the evolving demands of the labour market. This approach ensures that education is a powerful tool for societal advancement, equipping individuals with the skills needed to thrive in a digital age. In this regard, this research is particularly relevant to achieving the Sustainable Development Goals (SDGs), specifically SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth). The author's findings illuminate pathways for enhancing post-secondary education's role and employment quality – goals that resonate across diverse socio-economic landscapes.

### Methodology: broadening the horizon of research approaches

To evaluate the impacts of the race between education and technology on the skill premium, as in most of this literature, we can obtain the skill premium and the relative supply using observed wages and skilled and unskilled labour quantities, respectively, using labour or households' surveys. Regarding the technology or SBTC factor, it has been assumed that its dynamics can be captured by a linear trend (see e.g., [1,3,11]). Campos-González & Balcombe [5] applied an Unobserved Component Model (UCM) using Bayesian estimation (UCM-Bayesian henceforth). This approach was chosen for its ability to delve into complex, long-term economic relationships, such as those between technological advancement, educational policy, and labour market dynamics, which show changing patterns. Other techniques, such as cointegration techniques, were also used by the authors. Still, their results were contrary to the economic theory due to methodological difficulties, as in past studies for Chile [12]. In this context, UCM-Bayesian estimation is especially pertinent for studies dealing with complex data sets where underlying patterns are not immediately apparent.

Overall, methodological difficulties in estimating the race between education and technology have not been a central issue in much of the literature. One reason for this lack of interest might be that most research focuses on high-income countries (e.g., the US) where key variables like the skill premium still show a long-run increasing pattern [3]. In contrast, in Chile and other economies (e.g., Latin American countries), the skill premium has shown an inverted U-shaped pattern in recent decades [2]. In this context, researchers warned that the evaluation of skill premium drivers in the context of changing patterns is difficult, and it risks imposing incorrect interpretations or assumptions concerning economic theory [2,10]. Therefore, it becomes imperative to recognise these empirical difficulties while simultaneously offering alternative approaches, such as the UCM-Bayesian applied by Campos-González & Balcombe [5].

### Recognising limitations about modelling and estimation

As noted above, Campos-González & Balcombe's [5] study uses a linear trend to proxy SBTC as a technological change measure in their modelling approach. Some warned the limitations of linear trends in a context of complex nature of technological developments during recent decades, particularly with the advent and diffusion of, among others, computer-based technologies [6]. These technologies introduced non-linear innovation, diffusion, and saturation patterns that a linear model might not fully capture. However, using linear trends to proxy

SBTC in economic models is grounded in established academic conventions and methodology. Prominent studies in the literature employed linear trends to estimate the unobservable component of SBTC due to the practical challenges of directly measuring technological change (e.g., [1, 11]). A linear trend is commonly used to represent technological progression to facilitates the analysis of long-term trends in the skill premium. This approach reflects the continuous and relatively predictable nature of skilled-biased technological advancements over time and their effects on the labour market.

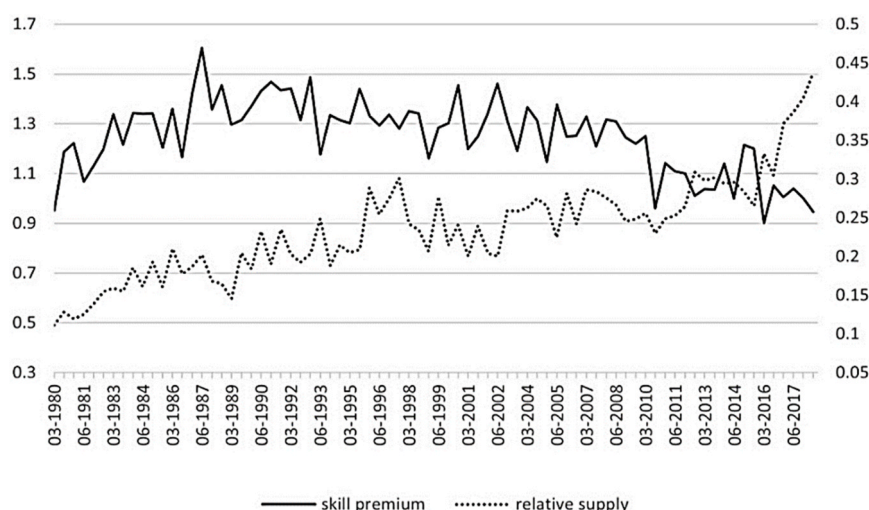
In addition, since Campos-González & Balcombe (2024) extended the analysed period of past studies and offered new approaches to tackle methodologies difficulties, the SBTC specification using a linear trend also allows comparison with past studies for Chile [7,12] and other Latin American countries [14]. Some used alternative indicators such as R&D expenditure, patent counts, or the importation of innovative capital goods might offer a more nuanced and direct measure of technological change (see e.g., [8,9]). However, these indicators also come with their limitations, including the difficulty of linking specific R&D activities or patents directly to changes in the labour market and the skill premium. Moreover, availability and comparability of such data across time is limited. For example, public available data about patents for the Chilean case is only available from the 2000s.

### Implications: Offering empirical evidence for social change

Campos-González and Balcombe [5] provide a nuanced understanding of how Chile's labour market has evolved in response to technological and educational shifts. Fig. 1 displays the evolution of the skill premium. It shows an inverted U-shaped pattern, growing up in most of the pre-2000 period and then reducing, although with fluctuations. On the one hand, Gallego [7] suggested that the increase in the relative demand for skilled labour in the 1980 s and 1990 s is related mainly to trade liberalisation implemented in Chile in the pre-2000 period. One of the implications of this trade openness was the absorption of foreign technologies biased towards skilled labour, suggesting a *skill-biased technological change effect* (SBTC) leading to the increasing skill premium.

On the other hand, the significant increase in educational attainment in recent decades, as shown by the measure of the relative skilled labour supply in Fig. 1, is one of the critical forces behind the skill premium fall according to results reported by Campos-González & Balcombe [5]. On average, this indicator grew from 0.16 to 0.22 in the 1980s and 1990s to 0.30 in 2010–2018. Thus, the relative supply of skilled labour is suggested as a critical driver pushing the skill premium down and Campos-González & Balcombe [5] found evidence of this relationship within the race between education and technology model along with the effect of SBTC, as discussed above. Summarising up, Campos-González & Balcombe [5] reveal a pivotal transition: from a period where technological advancements biased toward qualified workers predominantly drove the demand for skilled labour (pre-2000) to a phase where the supply of educated workers, shaped by educational reforms, began to play a more dominant role. This shift observed predominantly post-2000, has significant implications for understanding the dynamics of the supply and demand of skilled labour, which may provide information on the countries' economic processes. It highlights the need for educational systems to evolve in tandem with technological advancements.

For societies grappling with similar challenges, the authors suggest several actionable paths. First, educational reforms should be responsive to the changing technological landscape. This means increasing access to education and ensuring that the education provided is aligned with the skills required in an increasingly digital and automated world. Second, by understanding the interplay between technology and education, policies can be more effectively designed to foster inclusive growth and reduce the inequality gap. Lastly, there is potential for cross-country comparative studies examining how various educational



**Fig. 1.** Evolution of the skill premium and the relative supply (secondary axis), 1980–2018. (Source: [5]. Data for replication purposes available in Campos-González & Balcombe [4]).

policies impact labour market outcomes in the face of technological change. Thus, Campos-González and Balcombe [5] urge a trans-disciplinary conversation in a collaborative effort to shape a future where technological advancements and educational reforms work in synergy to promote equitable and sustainable economic development.

### Ethics statement

As this is a co-submission, no ethics statement is needed.

### CRedit authorship contribution statement

**Jorge Campos-González:** Writing – review & editing, Writing – original draft.

### Declaration of Competing Interest

The author declare that he have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### References

- [1] D. Acemoglu, D. Autor, Skills, Tasks and Technologies: Implications for Employment and Earnings, in: O. Ashenfelter, D. Card (Eds.), *Handbook of Labor*

- Economics, Vol. 4B, Elsevier Science & Technology, Oxford, UK, 2011, pp. 1043–1171, [https://doi.org/10.1016/S0169-7218\(11\)02410-5](https://doi.org/10.1016/S0169-7218(11)02410-5).
- [2] P. Acosta, G. Cruces, S. Galiani, L. Gasparini, Educational upgrading and returns to skills in Latin America: evidence from a supply–demand framework, *Lat. Am. Econ. Rev.* 28 (2019) 1–20, <https://doi.org/10.1186/s40503-019-0080-6>.
- [3] D. Autor, C. Goldin, L.F. Katz, Extending the Race between Education and Technology, *AEA Pap. Proc.* 110 (2020) 347–351, <https://doi.org/10.1257/pandp.20201061>.
- [4] J. Campos-González, K. Balcombe, Data and materials for ‘The race between education and technology in Chile and its impact on the skill premium’ [dataset], Mendeley Data. (2023), <https://doi.org/10.17632/8424ky469w.1>.
- [5] J. Campos-González, K. Balcombe, The race between education and technology in Chile and its impact on the skill premium, *Econ. Model.* 131 (2024) 106616, <https://doi.org/10.1016/j.econmod.2023.106616>.
- [6] D. Card, J.E. DiNardo, Skill-biased technological change and rising wage inequality: Some problems and puzzles, *J. Labor Econ.* 20 (4) (2002) 733–783, <https://doi.org/10.1086/342055>.
- [7] F.A. Gallego, Skill Premium in Chile: studying skill upgrading in the South, *World Dev.* 40 (3) (2012) 594–609, <https://doi.org/10.1016/j.worlddev.2011.07.009>.
- [8] S. Gera, W. Gu, Z. Lin, Technology and the demand for skills in Canada: an industry-level analysis, *Can. J. Econ.* 34 (1) (2001) 132–148, <https://doi.org/10.1111/0008-4085.00066>.
- [9] C.H. Hahn, Y.S. Choi, Trade Liberalisation and the Wage Skill Premium in Korean Manufacturing Plants: do Plants’ R&D and Investment Matter? *World Econ.* 40 (6) (2017) 1214–1232, <https://doi.org/10.1111/twec.12438>.
- [10] T. Havranek, Z. Irsova, L. Laslopova, O. Zeynalova, Skilled and Unskilled Labor Are Less Substitutable than Commonly Thought (IES Working Paper), Institute of Economic Studies, 2020, (<https://www.econstor.eu/bitstream/10419/223060/1/skill.pdf>) (IES Working Paper).
- [11] L.F. Katz, K. Murphy, Changes in Relative Wages, 1963–1987: supply and Demand Factors, *Q. J. Econ.* 107 (1) (1992) 35–78, <https://doi.org/10.2307/2118323>.
- [12] Y. Murakami, Trade liberalization and the skill premium in Chile, México Y. La Cuenca Del. Pac.ífico 3 (6) (2014) 77–101, <https://doi.org/10.32870/mycp.v3i6.418>.
- [13] F. Parro, L. Reyes, The rise and fall of income inequality in Chile, *Lat. Am. Econ. Rev.* 26 (3) (2017) 31, <https://doi.org/10.1007/s40503-017-0040-y>.
- [14] M. Manacorda, C. Sanchez-Paramo, N. Schady, Changes in returns to education in Latin America: the role of demand and supply of skills, *Ind. Labor Relat. Rev.* 63 (2) (2010) 307–326. <http://www.jstor.org/stable/40649501>.