

# **Returns to Digital Skills Around the World: Evidence from PIAAC's Second Cycle (2022-2023)**

**The Scientific Conference  
„Understanding and Addressing Digital Inequalities”  
EUI Centre for a Digital Society  
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# Digital Inequality and Human Capital

Helsper (2021):

- **First level (Access):** inequalities in access to computers & Internet.
- **Second level (Digital skills):** disparities in digital skills & usage.
- **Third level (Outcomes):** differences in benefits from ICT use (jobs, education, social life).

# Econometric Strategy: Model Specification

- **Economic Frame**      **Grounding in SBTC / Task-Based Approach:** Technology complements nonroutine abstract tasks and substitutes routine tasks.
  
- **Precedent**              Falck et al. (2021) established the mechanism: Occupational selection into abstract task jobs explained approximately *two-thirds* of the PS-TRE wage effect.
  
- **Our Model**              Mincerian Earnings Function:  
$$\ln(y_i) = \beta_0 + \beta_1 * \text{sex} + \beta_2 * \text{education} + \beta_3 * \text{experience} + \beta_4 * \text{experience}^2 + \beta_5 * \text{ICTWORK} + \beta_6 * \text{Literacy} + \beta_7 * \text{Numeracy} + \beta_8 * \text{APS} + \varepsilon_i$$

Our **Main Variable of Interest: ICT Use at Work (ZCITWORKC)**, a comprehensive index of digital application frequency on the job (5 activities, IRT-derived).

# Econometric Strategy: Addressing Bias

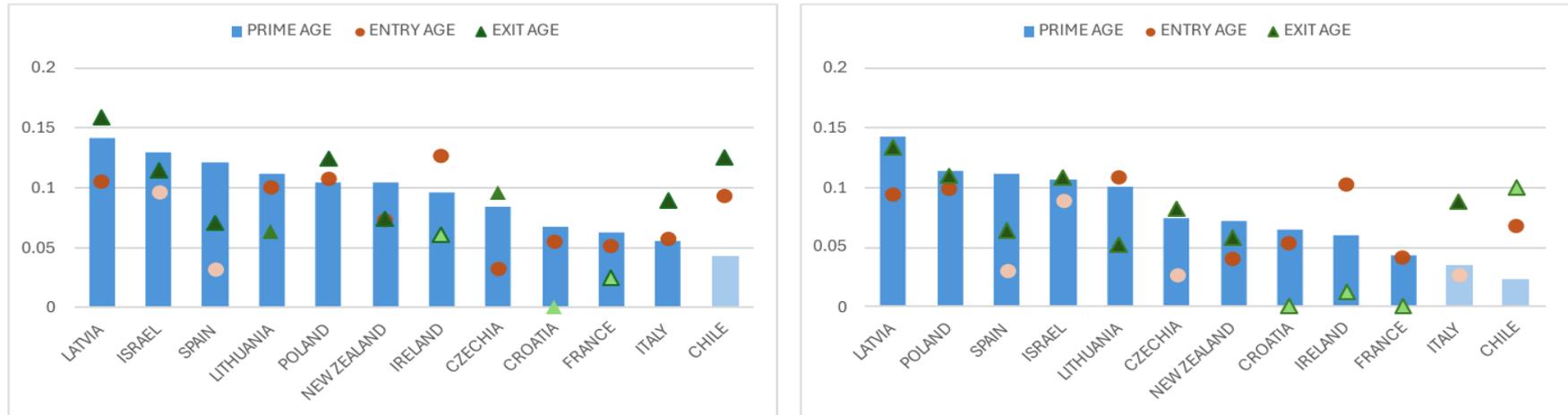
- **Core Innovation** Solving the "Unobserved Skills" Endogeneity (DiNardo & Pischke, 1997) our model includes Full Cognitive Controls (ZPV\*): Literacy, Numeracy, AND Adaptive Problem Solving (APS).
- **Addressing Bias** Goal:  $\beta_5$  isolates the pure premium for **digital practice/capital conversion**, controlling for cognitive capacity.

# Testing the Conveyor Belt: Returns Across the Work Life (I)

- **Method**                      **Segmentation (Hanushek et al. 2015):** Entry Age (25-34), Prime Age (35-54), Exit Age (55-65).
- **Hypothesis**                We test if the return to **on-the-job digital practice** (ZCITWORKC2) declines sharply for older workers, supporting the depreciation/obsolescence risk identified by Richiardi et al. (2025)
- **Key Result (Prime Age)**    **Highest Returns are in the Prime Age (35-54):** Digital skill return ( $\beta_5$ ) ranges from **4.3%** to **14.2%** (Chile to Latvia/Israel) in the baseline model
- **Key Result (Life Cycle)**    **Returns generally persist across the life course:** Returns to ICT Use in the **Exit-Age (55-65)** cohort often remain statistically significant, suggesting that *active digital practice prevents skill depreciation*.

# Testing the Conveyor Belt: Returns Across the Work Life (II)

Figure 2. Returns to ICT skills use



Source: Own elaboration based on PIAAC 2023 data (PUF).

Notes: The plots present the estimated parameters next to ICT skills use index in the Mincerian regressions estimated separately in prime age, entry age and exit age groups. The index on ICT skills use at work was standardized within each country. The right plot presents estimates in the baseline specification and the left plot in the extended specification (when occupational groups are also controlled for). The bars or dots marked in lighter colors denote estimate not statistically significant ( $p\text{-value} > 0.1$ ).

# The Complementary Role of Numeracy

- **Numeracy Dominance**

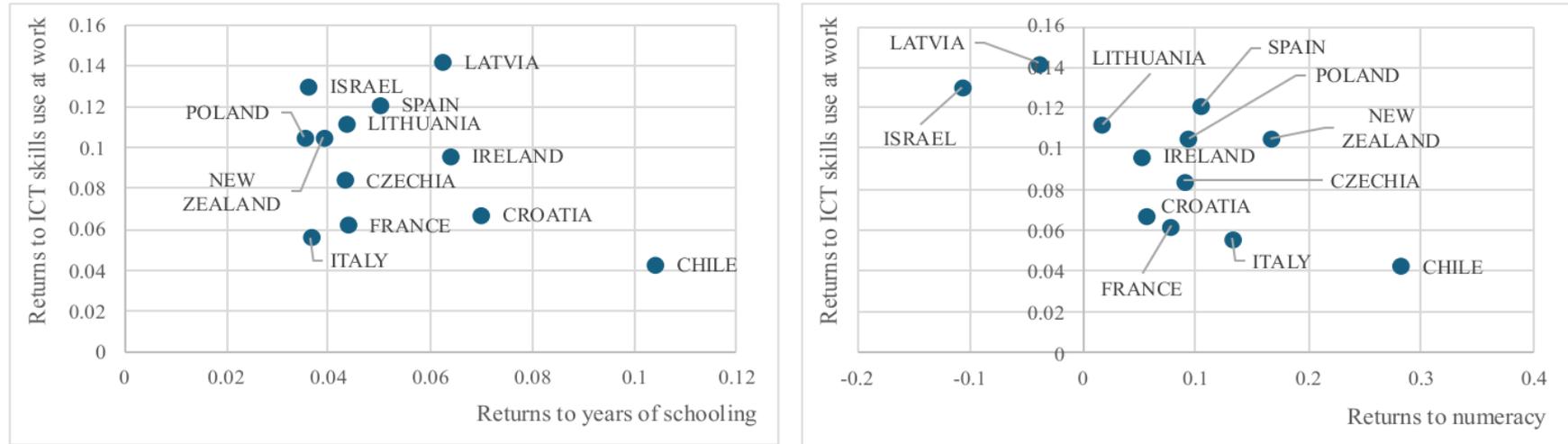
**Numeracy (ZPVNUM1) remains the strongest cognitive predictor of wages.**

In Prime Age (35-54), Numeracy returns range from **5.6%** to **28.2%** (Croatia to Chile) and are frequently the most significant control.

**Interpretation:** Digital practice (ZCITWORK) may be most complementary to fundamental *quantitative* and *analytical* skills required for abstract tasks.

# Relation between returns to ICT use, education, and numeracy

Figure 3. The relation between the returns to ICT skills use at work, years of schooling and numeracy.



Source: Own elaboration based on PIAAC 2023 data (PUF).

Notes: The plots present the estimated parameters next to ICT skills use index, years of schooling and numeracy skills in the Mincerian regressions (baseline specification) estimated for prime age group (35-54 years).

# Policy Implications: Addressing Structural Exclusion

- **The Structural Link**    **High ( $\beta_5$ ) confirms high demand:** If the premium for digital application is consistently high, it reveals a persistent *supply-side failure* to equip enough workers with these skills.
  
- **Challenge**                    **Digital Lifelong Learning:** The persistence of returns across the life course (Slide 4) demands targeted intervention.  
  
                                         **Action:** Expand adult education/re-skilling programs focused on ICT Use and Adaptive Problem Solving to prevent skill obsolescence and address the Richiardi-defined vulnerability of older workers.

## Conclusions and Next Steps

- **Summary**

**Core finding:** Digital skills (ICT Use at Work) yield a significant, measurable premium (3-16%), even after controlling for full cognitive ability (Lit, Num, APS).

- **Challenge**

**Structural Relevance:** Confirms that the economic mechanism of the **Task-Based Approach** drives wage inequality in the digital age.

**Policy Focus:** Results support the need for targeted lifelong learning and institutional buffers to mitigate the economic outcomes of the third-level digital divide.

## References

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# Thank you very much for your attention!!!

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