Making the Invisible Visible:
The Economic Value of Socioemotional Skills

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The Economic Value of SEM skills

Introduction

What Are Socioemotional (SEM) Skills?

An umbrella term used to describe psychological constructs such as personality traits (e.g., BFI), motivation, values, attitude, grit (Duckworth and Yeager, 2025; Lechner et al., 2029; Crede et al., 2017; Alan et al., 2019), and patience (in this study).

Personality traits

Big Five Inventory:
➢ Open-Mindedness,
➢ Conscientiousness,
➢ Extraversion,
➢ Agreeableness,
➢ Emotional Stability

Non-BFI Patience

➢ Willingness to sacrifice now for future benefits

Related concepts

➢ Character strengths, non-cognitive skills, soft skills, 21st century skills

The Big Five Personality Traits

15

Motivation: Why SEM Skills Matter?

Automation Impact

➢ As routine tasks are automated, SEM skills become key differentiators.

Future-Ready

➢ Some SEM skills (e.g., resilience, flexibility, curiosity, logical reasoning, collaboration) becoming more important (WEF, 2025).

Beyond Cognition

SEM skills affect outcomes independent of cognitive abilities and even enhance value of cognitive skills.

Life Outcomes

Linked to education, income, employment, health, satisfaction (e.g., Danon et al., 2024; Palczynska, 2021; Belfi and Botghans, 2024).

Key Research Questions

Economic Value

How do SEM skills affect wages across countries?

Complementarity

Do SEM skills enhance value of cognitive skills?

Variation

How do returns differ by demographics and job-related factors?

Specific SEM skills

Which SEM skills create most and least economic value?

The Economic Value of SEM skills

Literature Review

Literature Review

☑ **Returns to SEM skills**

- SEM skills associated with a broad range of life outcomes:
  - ➢ Educational achievement (Poropat, 2009; Danon et al., 2024)
  - ➢ Income (Heineck & Anger, 2010; Danner et al., 2020; Palczynska, 2021)
  - ➢ Employment success (Gnambs, 2017),
  - ➢ Health (Bogg & Roberts, 2004; Belfi & Borghns, 2024)
  - ➢ Satisfaction (Rammstedt et al., 2017; Belfi and Borghans, 2024)

Literature Review

☑ **Noncognitive and Cognitive Complementarity**

- Noncognitive skills matter in combination with cognitive skills:

  ➢ Social skills complement youth cognitive skills in the US labor market (Deming, 2017)

  ➢ Employees who have high level of numeracy skills combined with self-organization, effective management, and communication skills are preferred (Grundke et al., 2018).

  ➢ Positive returns to cognitive skills are higher for non-neurotic individuals in Poland labor market (Palczynska, 2021)

  ➢ The **closest papers to ours** are (Deming, 2017) for USA, Edin et al. (2022) for Sweden, Izadi & Tuhkuri (2024) for Finland, and (Palczynska, 2021) for Poland.

Key Contributions to Literature

First cross-national analysis

Broadest international analysis of SEM skills returns – 21 advanced economies.

Heterogeneity exploration

Variations by population segments (gender, age, migration status), and **job-related factors** (economic sector, firm size, and skill match).

Digital Age Relevance

Most up-to-date evidence in the automation era.

Patience premium

First estimate of wage premium for patience.

The Economic Value of SEM skills

Methodology

Data and Sample

Data source

PIAAC Cycle 2 (2024) across 31 countries and economies:

> US, Japan and Korea did not administer SEM skills, data for the Netherlands is not yet available.

> Denmark, Norway, Sweden, Swiss, Finland, and Slovak R. some key variables including wages are suppressed in the PUF.

> **Final sample in this study consists of 21 countries and economies.**

Skills measurement

Cognitive: numeracy, literacy, problem-solving

SEM: BFI plus patience measure

Cognitive Skills

> Standardized composite of numeracy, literacy and adaptive problem solving.

Socioemotional Skills

> Standardized composite of Big Five Inventory (BFI-2XS) short 15-item personality traits plus patience.
> Each domain standardized within countries for comparability
> Captures non-cognitive traits linked to labor outcomes

Sample Characteristics

Table 1. Sample characteristics descriptive

Sample size	53,288 full-time employees across 21 countries
Age range	16-65 years
Gender balance	~50% female (varies by country)
Immigrant share	18.6% (first/second generation)
Education	Average 13.9 years of schooling
Wages	PPP-adjusted 2022 USD

Source: PIAAC Cycle 2.

Theoretical Model

- We develop a model based on Deming (2017) where SEM skills reduce coordination costs in team production, allowing workers to better collaborate and exploit comparative advantage. The model generates specific predictions including complementarity between social skills and task productivity.

- In this framework, a worker's production function for any task i is:

$$y_j(i) = C_j \alpha_j(i) l_j(i)$$

- Where C_j represents overall ability (cognitive skill), $\alpha_j(i)$ is productivity in the specific task, and $l_j(i)$ is labor supplied to task i.
- Workers can increase output by specializing in tasks where they have comparative advantage and "trading" with others.
- Workers supply a single unit of labor inelastically to the production of a continuum tasks indexed over the unite interval according to a **Cobb-Douglas** Technology:

$$Y_j = \exp\left[\int_0^1 \ln y_j(i)\,di\right]$$

For simplicity, each worker supplies one unit of labor inelastically: $\int_0^1 l_j(i)\,di = L_j = 1$

Theoretical Model: Coordination Cost

The model conceives of teamwork as "trading tasks" - workers can increase their total output by producing tasks in which they have **comparative advantage** and then trading with others for mutual benefit.

SEM Skills as Coordination

SEM skills reduce the cost of "trading tasks" with other workers, allowing for greater specialization and higher wages.

Note: Workers as countries and SEM skills as inverse "iceberg" trade costs.

Coordination Costs

➢ Coordination between workers is costly. Let $S_{j,k} \in (0, 1)$ be a depreciation factor applied to task trades between workers, where higher social skill means lower coordination cost.

➢ The coordination cost is defined as $S_{\{j,k\}} = S_j * S_k$ for different workers, while self-trade is costless ($S_{j,j} = 1$). Workers with higher **SEM** skills pay lower coordination costs to trade tasks, allowing them to earn higher wages by specializing in their most productive tasks.

Flexibility

Workers with high **SEM** skills can adjust their task mix based on the relative productivities of co-workers, representing greater flexibility.

Theoretical Model: Comparative Advantage in Task Production

◆ The model defines the comparative advantage schedule for worker 1 relative to worker 2 as:

$$\gamma_i = \frac{C_1 \alpha_1(i)}{C_2 \alpha_2(i)} \qquad \text{By assumption} \quad \gamma'(i) < 0$$

◆ Each worker maximize their wages by obtaining tasks from the lowest cost producer, including themselves
◆ If task trade is costless ($S_{\{j,k\}} = 1$), each worker`s price of supplying a task is:

$$p_j(i) = \frac{w_j}{C_j \alpha_j(i)}$$

◆ In equilibrium, relative wages $\omega = \frac{w_1}{w_2}$ depend on the share of tasks performed by each worker:

$$\omega = \frac{i^*}{1 - i^*}$$

Theoretical Model: equilibrium with SEM skills

◆ The equilibrium with SEM skills in the model, there are two task thresholds i_L *and* i_H and an untraded zone where coordination costs outweigh comparative advantage benefits. Worker 1 will self-produce rather than trade when:

$$\frac{w_1}{C_1 \alpha_1(i)} < \frac{w_2}{S^* C_2 \alpha_2(i)}$$

◆ Rearranging we have:

➢ Worker 1 produces their own tasks rather than trading when: $\omega < \frac{\gamma_i}{S^*}$

➢ Worker 2 produces their own tasks rather than trading when: $\omega > S^* \gamma_i$

◆ Worker 1 produces tasks in the interval $(0, i_L)$, worker 2 in the interval $(i_H, 1)$, and tasks in interval (i_L, i_H) remain nontraded (self-produced).

◆ Share of tasks that are nontraded: $\qquad i_H - i_L = -\frac{lnS^*}{\theta}$

Econometric Model

$$\ln wage_i = \beta_0 + \beta_1 Cog_i + \beta_2 SEM_i + \beta_3 Cog_i * SEM_i + \gamma X_i + \varepsilon_i \qquad (1)$$

- $\boldsymbol{ln\,wage_i}$ Log hourly wages (PPP-adjusted) by decile median

- $\boldsymbol{Cog_i}$ and $\boldsymbol{SEM_i}$ Cognitive and SEM skills measures

- $\boldsymbol{Cog_i * SEM_i}$ Interaction term showing complementarity $\frac{\partial^2 ln\,wage}{\partial Cog\, \partial SEM} = \frac{\partial^2 ln\,wage}{\partial SEM\, \partial Cog} = \boldsymbol{\beta_3} > 0$

- $\boldsymbol{X_i}$ Control variables (experience, gender, immigration) in the baseline model

The Moderating Effect of Tenure:

➢ Employers need time to observe employees' skills and reward them accordingly (Heineck & Anger, 2010; Nyhus & Pons, 2005)

➢ Tenure can moderate the impact of skills on wages (Palczyńska (2021)

$$\ln wage_i = \beta_0 + \beta_1 Cog_i * Tenure_i + \beta_2 SEM_i * Tenure_i +$$
$$\beta_3 Cog_i * SEM_i * Tenure_i + \gamma X_i + \varepsilon_i \qquad (2)$$

Heterogeneity Analysis

Gender

Returns by male/female

$$\ln wage_i = \beta_0 + \beta_1 Cog_i * SG_i + \beta_2 SEM_i * SG_i +$$

$$\beta_3 Cog_i * SEM_i * SG_i + \gamma X_i + \varepsilon_i \qquad (3)$$

Age Groups

Variation across generations

➤ SG = Subgroup

Migration Status

Native vs. immigrant differences

Job-related Factors

Economic sector, firm size, skill match
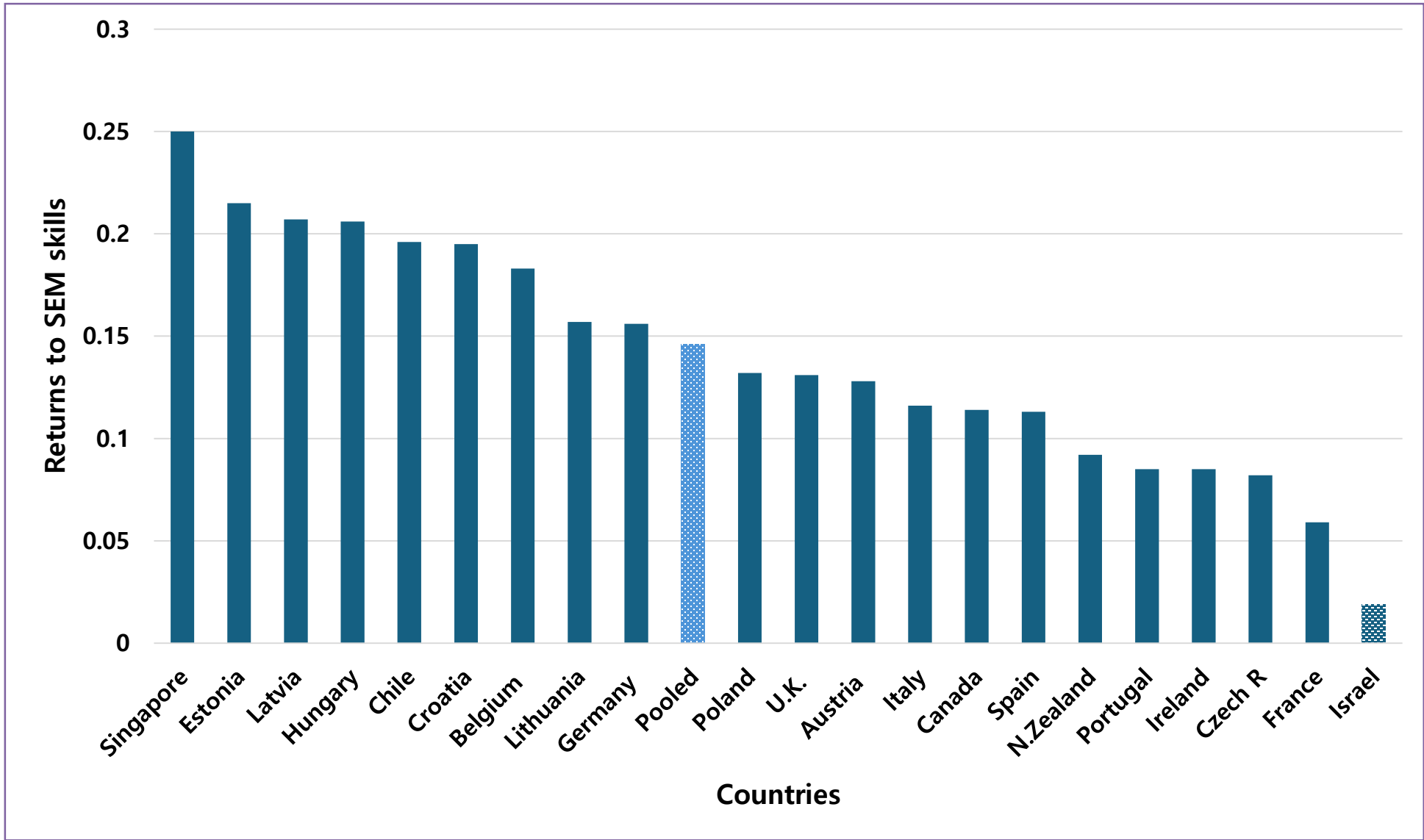
The Economic Value of SEM skills

Results

SEM skills

Baseline Results (1)

Fig.2. Cross-country variation in returns to SEM skill.

Source: Authors' calculation based on PIAAC cycle 2.

Baseline Results (1)

Table 2. Complementarity between SEM skill and cognitive skills

Log wage	Pooled	Austria	Belgium	Canada	Chile	Croatia	Czech	Estonia	France	Germany	Hungary
Cognitive	.175*** (.003)	.167*** (.01)	.198*** (.015)	.159*** (.009)	.285*** (.017)	.099*** (.011)	.144*** (.009)	.216*** (.008)	.148*** (.007)	.189*** (.009)	.212*** (.01)
SEM skill	.113*** (.004)	.107*** (.018)	.131*** (.024)	.11*** (.017)	.103*** (.029)	.154*** (.019)	.072*** (.015)	.147*** (.014)	.045*** (.013)	.12*** (.016)	.154*** (.017)
CogSEM	**.023*** (.005)**	.000 (.018)	-.004 (.028)	**.034** (.015)**	.054 (.035)	.021 (.02)	**.038** (.015)**	**.027** (.013)**	**.033*** (.013)**	.012 (.015)	**.030* (.016)**
Ind.Cont	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R²	.435	.319	.235	.307	.284	.173	.227	.299	.244	.272	.232
Obser	53,288	1,743	1,854	6,672	1,867	1,863	2,509	3,453	3,029	1,952	2,584

	Ireland	Israel	Italy	Latvia	Lithuania	N.Zealand	Poland	Portugal	Singapore	Spain	U.K.
Cognitive	.155*** (.012)	.161*** (.022)	.095*** (.013)	.214*** (.011)	.149*** (.01)	.14*** (.018)	.063*** (.009)	.189*** (.011)	.278*** (.012)	.138*** (.011)	.189*** (.010)
SEM skill	.059*** (.022)	-.010 (.033)	.081*** (.019)	.156*** (.023)	.12*** (.017)	.086*** (.019)	.113*** (.016)	.062** (.026)	.188*** (.018)	.095*** (.018)	.127*** (.019)
CogSEM	-.004 (.019)	.040 (.038)	-.012 (.019)	.022 (.025)	**.057*** (.016)**	**.051** (.02)**	-.006 (.016)	.033 (.022)	-.009 (.018)	.015 (.02)	.025 (.018)
Ind.Cont	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R²	.232	.11	.188	.263	.201	.296	.121	.218	.301	.204	.236
Obser	1,848	2,366	1,552	3,340	2,876	2,419	1,916	1,542	3,098	2,539	2,266

Note: Robust standard error in parenthesis. Pooled includes country fixed effect. Individual controls: experience, experience square, gender, and migration status. Source: PIAAC cycle 2. *** $p<.01$, ** $p<.05$, * $p<.1$

Table 3. Estimation with controlling for years of schooling

Results: in the presence of schooling

➢ Controlling for years of schooling shrink the coefficients on cognitive and SEM skills.

Log wage	Pooled	Austria	Belgium	Canada	Chile	Croatia	Czechia	Estonia	France	Germany	Hungary
Cognitive	.103***	.097***	.112***	.099***	.149***	.063***	.093***	.146***	.098***	.110***	.106***
	(.003)	(.011)	(.016)	(.01)	(.019)	(.01)	(.01)	(.009)	(.008)	(.010)	(.011)
SEM skill	.071***	.065***	.099***	.067***	.050*	.086***	.051***	.107***	.026**	.068***	.099***
	(.004)	(.016)	(.024)	(.016)	(.028)	(.017)	(.015)	(.014)	(.013)	(.016)	(.017)
CogSEM	.024***	-.010	-.014	.027*	.075**	.018	.030**	.015	.039***	.002	.029*
	(.005)	(.017)	(.029)	(.015)	(.034)	(.018)	(.014)	(.013)	(.013)	(.015)	(.015)
Ind.Cont	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Schooling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R²	.494	.410	.287	.389	.382	.347	.293	.359	.288	.356	.308
Obser.	53,288	1,743	1,854	6,672	1,867	1,863	2,509	3,453	3,029	1,952	2,584
	Ireland	**Israel**	**Italy**	**Latvia**	**Lithuania**	**N.Zealand**	**Poland**	**Portugal**	**Singapore**	**Spain**	**U.K.**
Cognitive	.094***	.095***	.049***	.146***	.100***	.086***	.032***	.060***	.113***	.045***	.135***
	(.012)	(.023)	(.013)	(.013)	(.011)	(.017)	(.009)	(.012)	(.012)	(.011)	(.012)
SEM skill	.032	-.036	.051***	.096***	.073***	.060***	.060***	.019	.099***	.028	.084***
	(.02)	(.032)	(.018)	(.023)	(.017)	(.018)	(.015)	(.022)	(.016)	(.017)	(.019)
CogSEM	.009	.025	.001	.041*	.050***	.056***	-.019	.036*	.029*	.018	.026
	(.018)	(.038)	(.018)	(.024)	(.016)	(.019)	(.015)	(.021)	(.017)	(.017)	(.017)
Ind.Cont	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Schooling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R²	.321	.157	.274	.341	.264	.353	.214	.378	.491	.367	.301
Obser.	1,848	2,366	1,552	3,340	2,876	2,419	1,916	1,542	3,098	2,539	2,266

Note: Robust standard error in parenthesis. Pooled includes country fixed effect. Source: PIAAC cycle 2. *** p<.01, ** p<.05, * p<.1

Results: mediating effect of occupation(1) and industry(2)

Table 4. Estimation with controlling for occupations and industries

➤ We are witnessing a decline in skills coefficients, including the interaction term, with a higher reduction in controlling for occupations.
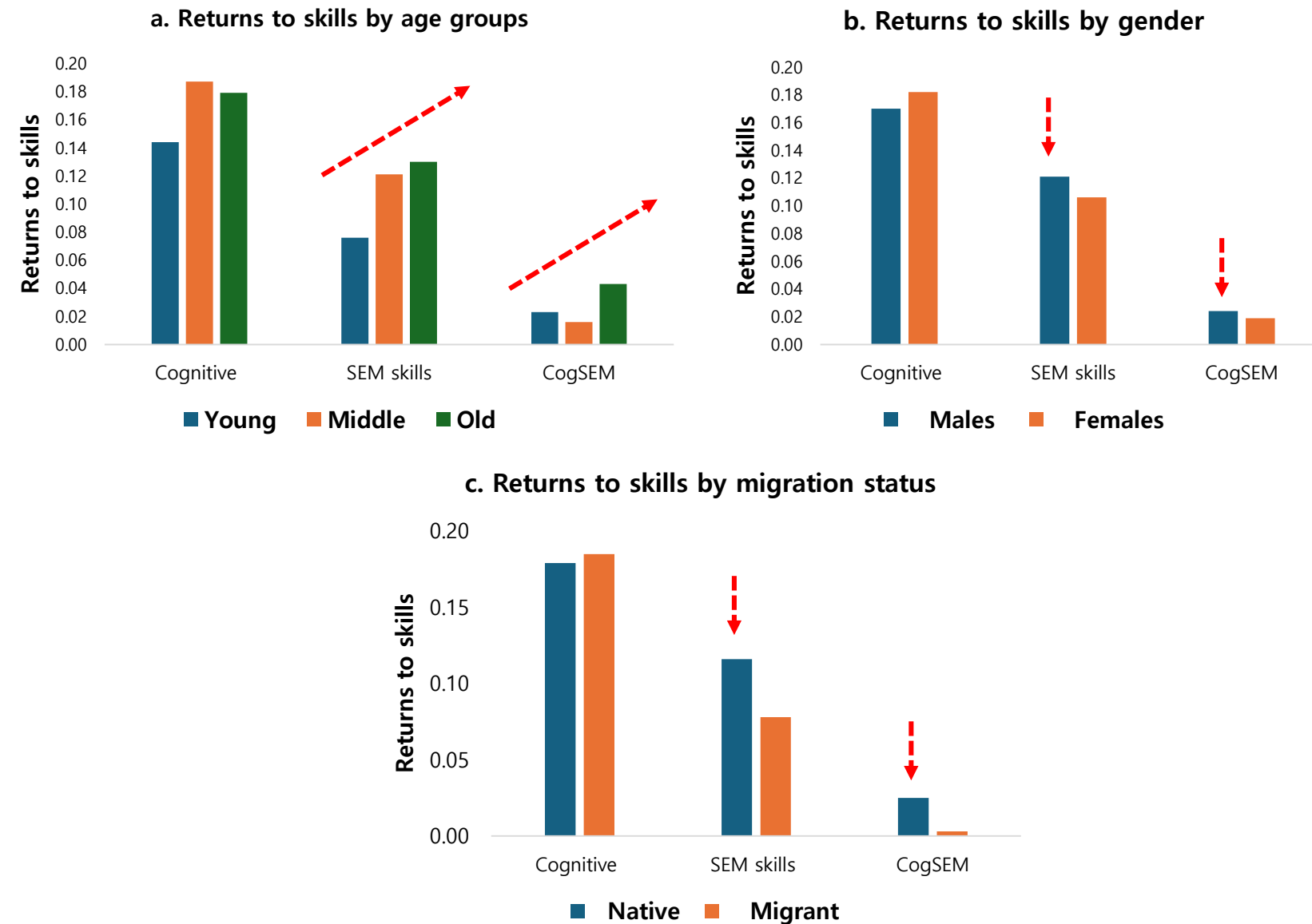
Log wage	Pooled		Belgium		Canada		Chile		Croatia		Czechia		Estonia	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Cognitive	.113***(.003)	.153***(.003)	.135***(.015)	.191***(.015)	.107***(.008)	.138***(.009)	.169***(.016)	.263***(.017)	.074***(.010)	.087***(.011)	.092***(.009)	.133***(.009)	.132***(.009)	.191***(.008)
SEM skill	.072***(.005)	.107***(.005)	.095***(.025)	.130***(.024)	.092***(.016)	.093***(.016)	.064**(.026)	.092***(.028)	.103***(.017)	.143***(.019)	.046***(.014)	.069***(.015)	.095***(.014)	.141***(.014)
CogSEM	.021***(.005)	.023***(.005)	-.010(.028)	-.003(.028)	.029**(.015)	.030**(.014)	.037(.032)	.046(.034)	.015(.018)	.019(.020)	.021(.013)	.032**(.015)	.019(.012)	.024*(.013)
Ind.Cont	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R²	.481	.439	.294	.257	.421	.379	.414	.313	.313	.213	.332	.252	.405	.339
Obser	49593	49593	1,854	1,854	6,672	6,672	1,867	1,867	1,863	1,863	2,509	2,509	3,453	3,453

	France		Hungary		Ireland		Israel		Italy		Latvia		Lithuania	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Cognitive	.099***(.007)	.136***(.007)	.137***(.011)	.191***(.010)	.099***(.013)	.131***(.012)	.084***(.023)	.129***(.022)	.065***(.013)	.085***(.013)	.139***(.011)	.186***(.012)	.098***(.010)	.133***(.010)
SEM skill	.028**(.013)	.052***(.013)	.111***(.017)	.151***(.017)	.021(.021)	.042**(.021)	-.058*(.032)	-.008(.032)	.048**(.019)	.072***(.019)	.102***(.024)	.153***(.023)	.076***(.016)	.115***(.017)
CogSEM	.032***(.012)	.027**(.012)	.024(.015)	.025*(.015)	-.013(.018)	-.006(.018)	.029(.037)	.050(.036)	-.006(.018)	-.013(.020)	.023(.024)	.017(.023)	.056***(.015)	.057***(.016)
Ind.Cont	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R²	.331	.300	.289	.264	.34	.303	.158	.170	.284	.238	.358	.300	.314	.239
Obser	3,029	3,029	2,584	2,584	1,848	1,848	2,366	2,366	1,552	1,552	3,340	3,340	2,876	2,876

	N.Zealand		Poland		Portugal		Singapore		Spain		U.K.	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Cognitive	.090***(.017)	.119***(.016)	.042***(.008)	.052***(.009)	.105***(.011)	.155***(.011)	.175***(.011)	.239***(.012)	.109***(.011)	.113***(.011)	.128***(.011)	.162***(.011)
SEM skill	.059***(.016)	.081***(.019)	.068***(.016)	.104***(.016)	.023(.024)	.043*(.025)	.122***(.016)	.181***(.018)	.069***(.017)	.087***(.018)	.075***(.02)	.128***(.018)
CogSEM	.044**(.017)	.054***(.019)	-.022(.015)	-.007(.016)	.033(.020)	.044**(.022)	.023(.016)	-.002(.018)	.006(.019)	.008(.019)	.036**(.017)	.022(.018)
Ind.Cont	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R²	.401	.348	.207	.159	.370	.288	.452	.365	.285	.279	.333	.308
Obser	2,419	2,419	1,916	1,916	1,542	1,542	3,098	3,098	2,539	2,539	2,266	2,266

Note: Robust standard error in parenthesis. Pooled includes country fixed effect. Source: PIAAC cycle 2. *** $p<.01$, ** $p<.05$, * $p<.1$

Results: Heterogeneity by demographic factors
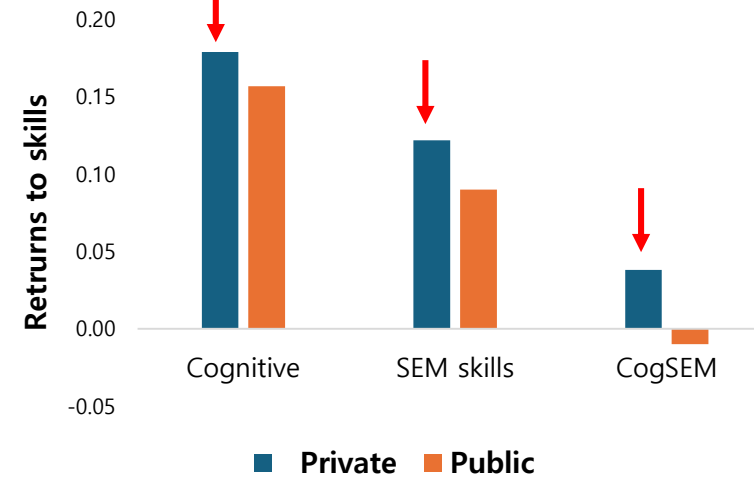
Fig. 2a. Heterogeneity by demographic factors

➢ Returns to SEM skills and complementarity increase by **age.**

➢ Returns to SEM skills and complementarity are higher for **males.**

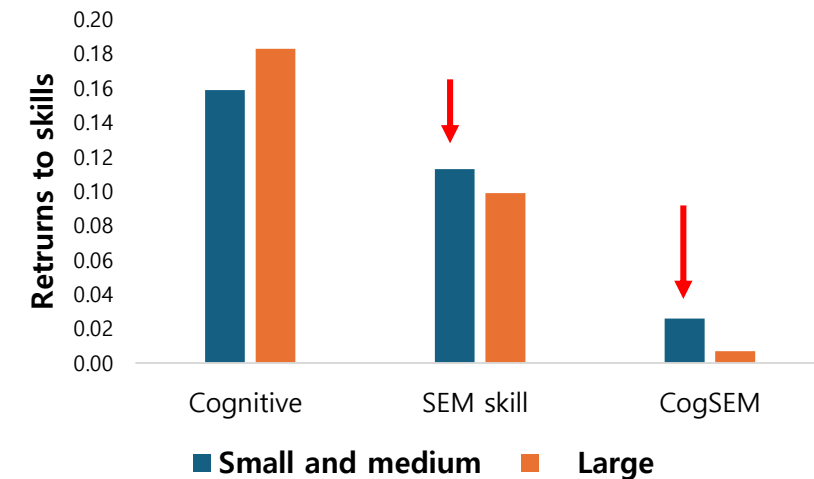➢ Returns to SEM skills and complementarity are higher for **natives.**

a. Returns to skills by age groups

b. Returns to skills by gender

c. Returns to skills by migration status

Results: Heterogeneity by job-related factors

Fig. 2b. Heterogeneity by job-related factors

d. Returns to skills by sector

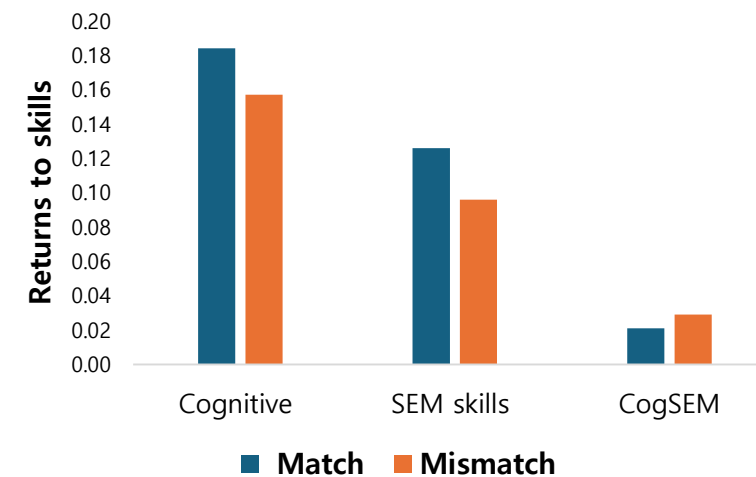**e. Returns to skills by firm size**

f. Returns to skills by skill match

➢ Returns to all measures of skills are higher for **private sector** employees .

➢ Returns to SEM skills and complementarity are higher for **small and medium size firms/organizations**.

➢ Returns to skills are higher for matched employees but complementarity is higher(insignificant) for **mismatched** employees.

Results: Estimation with disaggregated skills

Table 6. Returns to skills by numeracy and disaggregated SEM skills

➤ **On average**, all SEM skills except agreeableness are positively associated with wages.

➤ Extraversion (18), Emotional stability (15), Open-mindedness (11), Conscientiousness (7)\, and Non-BFI patience (16) countries.

➤ There is a wage penalty for agreeableness in all countries.

Log wage	Pooled	Austria	Belgium	Canada	Chile	Croatia	Czechia	Estonia	France	Germany	Hungary
Numeracy	.163***	.153***	.182***	.162***	.279***	.105***	.141***	.192***	.14***	.177***	.195***
	(.003)	(.009)	(.015)	(.008)	(.017)	(.010)	(.008)	(.008)	(.007)	(.009)	(.01)
Agree	-.006**	.006	-.011	.003	.001	-.030***	-.013	.006	.001	-.001	-.005
	(.002)	(.009)	(.012)	(.008)	(.016)	(.010)	(.009)	(.008)	(.007)	(.009)	(.010)
Cons	.012***	.011	.009	.027***	.019	.023**	.024***	.004	.006	.032***	.012
	(.002)	(.009)	(.012)	(.009)	(.018)	(.011)	(.009)	(.007)	(.007)	(.008)	(.010)
Emos	.029***	.006	.050***	.049***	.073***	.038***	.024***	.028***	.021***	.024***	.030***
	(.002)	(.010)	(.012)	(.009)	(.017)	(.010)	(.009)	(.007)	(.007)	(.008)	(.010)
Extra	.031***	.025***	.042***	.030***	.039**	.024***	.020**	.056***	.015**	.019**	.048***
	(.002)	(.009)	(.013)	(.009)	(.016)	(.009)	(.009)	(.008)	(.007)	(.008)	(.009)
Opem	.022***	.034***	.016	-.017*	-.027	.064***	-.013	.027***	.007	.036***	.038***
	(.002)	(.009)	(.012)	(.009)	(.017)	(.009)	(.008)	(.008)	(.007)	(.009)	(.009)
Patien	.030***	.021**	.024**	.010	-.004	.032***	.018**	.034***	-.007	.017**	.030***
	(.002)	(.009)	(.011)	(.010)	(.016)	(.009)	(.008)	(.009)	(.007)	(.008)	(.010)
Num*Agree	.000	-.007	.010	-.007	-.009	.027**	-.002	.002	.018***	-.010	-.009
	(.002)	(.009)	(.015)	(.007)	(.016)	(.011)	(.008)	(.008)	(.006)	(.009)	(.010)
Num*Cons	.014***	.011	.028*	.022***	.010	.010	.008	.006	.020***	.009	.032***
	(.002)	(.008)	(.015)	(.008)	(.018)	(.011)	(.008)	(.007)	(.006)	(.008)	(.010)
Num* Emos	-.001	-.004	-.017	.007	.051***	-.012	-.010	-.003	-.003	.002	.005
	(.002)	(.010)	(.014)	(.008)	(.017)	(.011)	(.008)	(.006)	(.007)	(.008)	(.010)
Num*Opem	-.003	.001	-.003	-.014*	-.007	-.003	.020***	-.004	.000	.001	-.007
	(.002)	(.009)	(.015)	(.008)	(.018)	(.010)	(.007)	(.008)	(.007)	(.008)	(.009)
Num*Extr	.004*	.012	-.006	-.002	.019	-.007	-.006	.000	-.012*	.010	.008
	(.002)	(.008)	(.014)	(.008)	(.015)	(.010)	(.007)	(.007)	(.007)	(.008)	(.010)
Num* Patien	.011***	.000	-.016	.022***	-.014	.014	.018**	.019**	-.001	.000	.006
	(.002)	(.008)	(.013)	(.007)	(.016)	(.009)	(.008)	(.007)	(.006)	(.007)	(.009)
Ind. controls	X	X	X	X	X	X	X	X	X	X	X
R-squared	.439	.328	.249	.334	.326	.217	.258	.304	.252	.281	.238
Observations	53,288	1,743	1,854	6,672	1,867	1,863	2,509	3,453	3,029	1,952	2,584

Note: Robust standard error in brackets. Pooled includes country fixed effect. Source: PIAAC cycle 2. *** $p<.01$, ** $p<.05$, * $p<.1$

Results: Estimation with disaggregated skills

Table 6. Returns to skills by numeracy and disaggregated SEM skills

- ➤ **On average,** cons, extra, and patience complement numeracy skills.
- ➤ Substantial variation exists across countries.
- ➤ Complementarity exists between disaggregated SEM skills and numeracy in **more countries (15 countries)**

	Ireland	Israel	Italy	Latvia	Lithuania	N.Zealand	Poland	Portugal	Singapore	Spain	U.K.
Numeracy	.154***	.122***	.09***	.187***	.129***	.137***	.06***	.174***	.258***	.139***	.179***
	(.011)	(.021)	(.011)	(.01)	(.010)	(.014)	(.008)	(.011)	(.011)	(.010)	(.010)
Agree	-.007	-.028	-.020*	.004	-.027***	.008	.014	-.004	-.015	.002	-.002
	(.011)	(.018)	(.011)	(.011)	(.010)	(.010)	(.009)	(.012)	(.011)	(.009)	(.010)
Cons	-.005	-.034**	.008	.019	.036***	.004	-.024**	.007	.040***	-.018*	.023**
	(.011)	(.017)	(.012)	(.012)	(.011)	(.011)	(.010)	(.012)	(.011)	(.009)	(.011)
Emos	.026**	.053***	.011	-.005	.019*	.016	-.003	.035***	-.014	.050***	.042***
	(.011)	(.018)	(.011)	(.012)	(.011)	(.010)	(.010)	(.011)	(.012)	(.010)	(.011)
Extra	.012	.020	.018*	.041***	.033***	.024**	.062***	-.006	.053***	.027***	.034***
	(.011)	(.016)	(.011)	(.012)	(.011)	(.010)	(.009)	(.012)	(.011)	(.010)	(.011)
Opem	.011	-.037**	.052***	.037***	.011	.003	.041***	.032***	.078***	.025***	.007
	(.012)	(.018)	(.011)	(.011)	(.011)	(.009)	(.009)	(.012)	(.011)	(.009)	(.010)
Patien	.029**	.051***	.028***	.074***	.044***	.027**	.049***	-.007	.079***	-.001	.020*
	(.012)	(.019)	(.010)	(.011)	(.010)	(.011)	(.008)	(.013)	(.011)	(.009)	(.011)
Num*Agree	.009	-.012	-.015	.010	.005	-.002	-.025***	.011	.014	-.014	.014
	(.011)	(.019)	(.01)	(.012)	(.010)	(.010)	(.008)	(.010)	(.011)	(.009)	(.010)
Num*Cons	.007	.023	.019*	.013	.036***	.039***	.000	-.003	.002	.007	.002
	(.012)	(.019)	(.011)	(.012)	(.009)	(.014)	(.010)	(.011)	(.011)	(.009)	(.009)
Num* Emos	-.013	.009	-.017	-.007	-.019*	.000	-.004	.014	-.026**	.009	.008
	(.012)	(.019)	(.012)	(.012)	(.010)	(.012)	(.009)	(.01)	(.011)	(.009)	(.009)
Num*Opem	.003	-.039**	-.022**	.006	.003	-.002	.000	.011	-.002	.004	.000
	(.010)	(.018)	(.010)	(.011)	(.010)	(.011)	(.009)	(.011)	(.011)	(.009)	(.010)
Num*Extr	-.017	.022	.015	.005	-.001	.009	.019**	.018*	.006	-.002	.003
	(.011)	(.02)	(.01)	(.011)	(.01)	(.01)	(.008)	(.011)	(.01)	(.009)	(.009)
Num* Patien	-.003	.044**	.022**	.002	.019*	.009	.016*	-.001	.026***	.008	-.002
	(.012)	(.02)	(.010)	(.01)	(.010)	(.012)	(.008)	(.010)	(.009)	(.009)	(.010)
Ind. controls	X	X	X	X	X	X	X	X	X	X	X
R-squared	.258	.120	.224	.264	.213	.302	.191	.223	.324	.228	.249
Observations	1,848	2,366	1,552	3,340	2,876	2,419	1,916	1,542	3,098	2,539	2,266

Note: Robust standard error in parenthesis. Pooled includes country fixed effect. Source: PIAAC cycle 2. *** p<.01, ** p<.05, * p<.1

The Economic Value of SEM skills

Conclusion

Results Summary

Cross-Country Variation

Substantial differences in returns to SEM skills between countries

Complementarity

SEM skills enhance value of cognitive skills

Disaggregated Finding

Extraversion and patience are leading SEM skills
Agreeableness doesn't create economic value

demographics and economic factors

Returns vary by gender, age, migration status, economic sector, firm size, and skill match.

Implications for Policy and Practice

Education reform

Include SEM skill development in curricula alongside cognitive training.

Workplace training

Invest in SEM development for employee productivity

Economic planning

National investment in SEM skills for competitiveness

Research agenda

Further study on skill development and interactions with focus on causality.

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Thank You

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