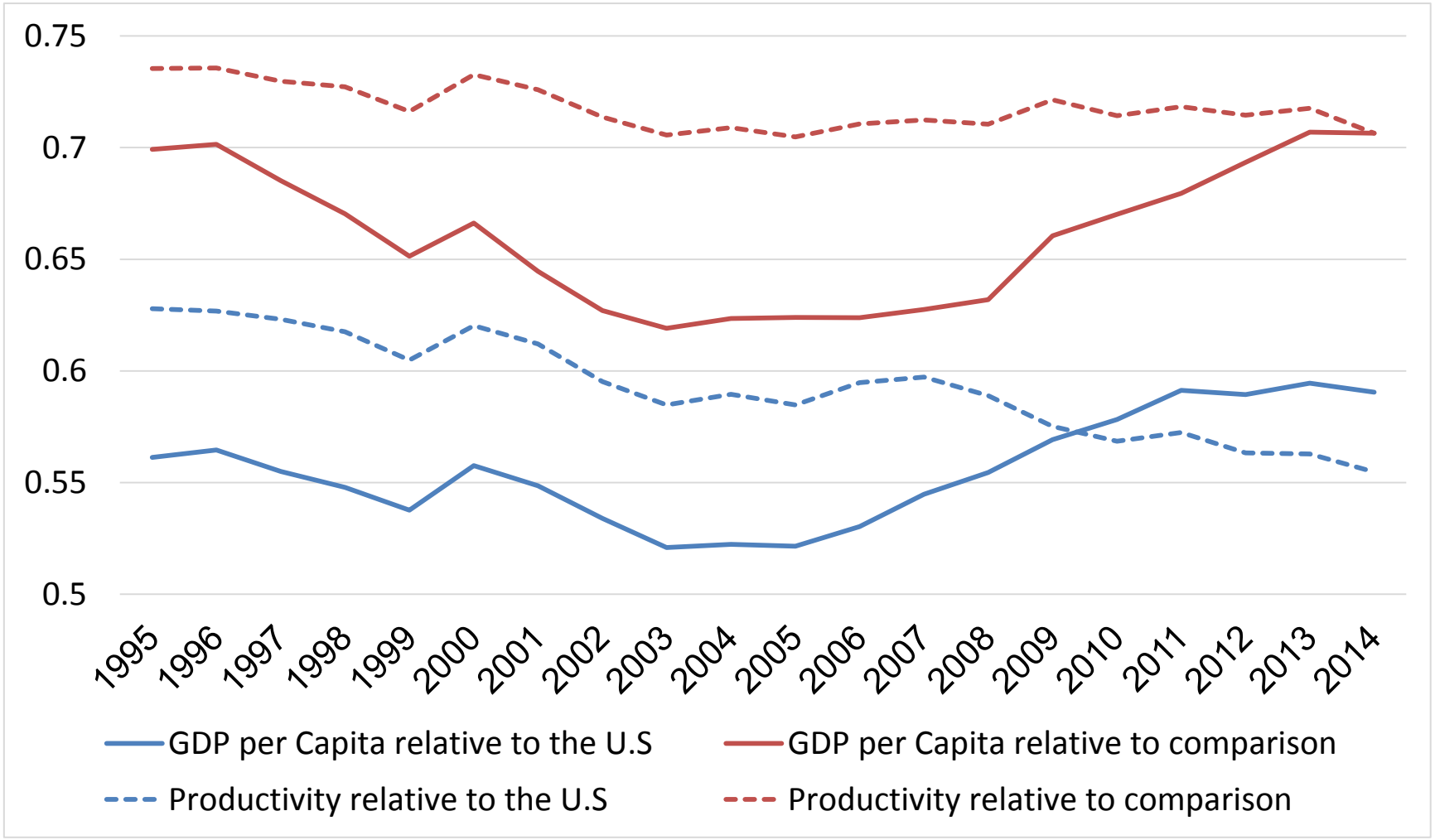
Economic Growth, Productivity, and The Quality of Human Capital in Israel

Moshe Hazan & Shay Tsur

GDP per Capita and productivity in Israel have stayed low relative to the U.S and to a "comparison group"



comparison group: Austria, Ireland, Denmark, Netherlands, Finland and Sweden.

The Questions

1. What are the relative contributions of physical capital, human capital, and TFP to negative gap in productivity?
2. Can we find any composition effect on the level of physical and human capital?
3. Is there a correlation between Physical and human capital over industries and countries?

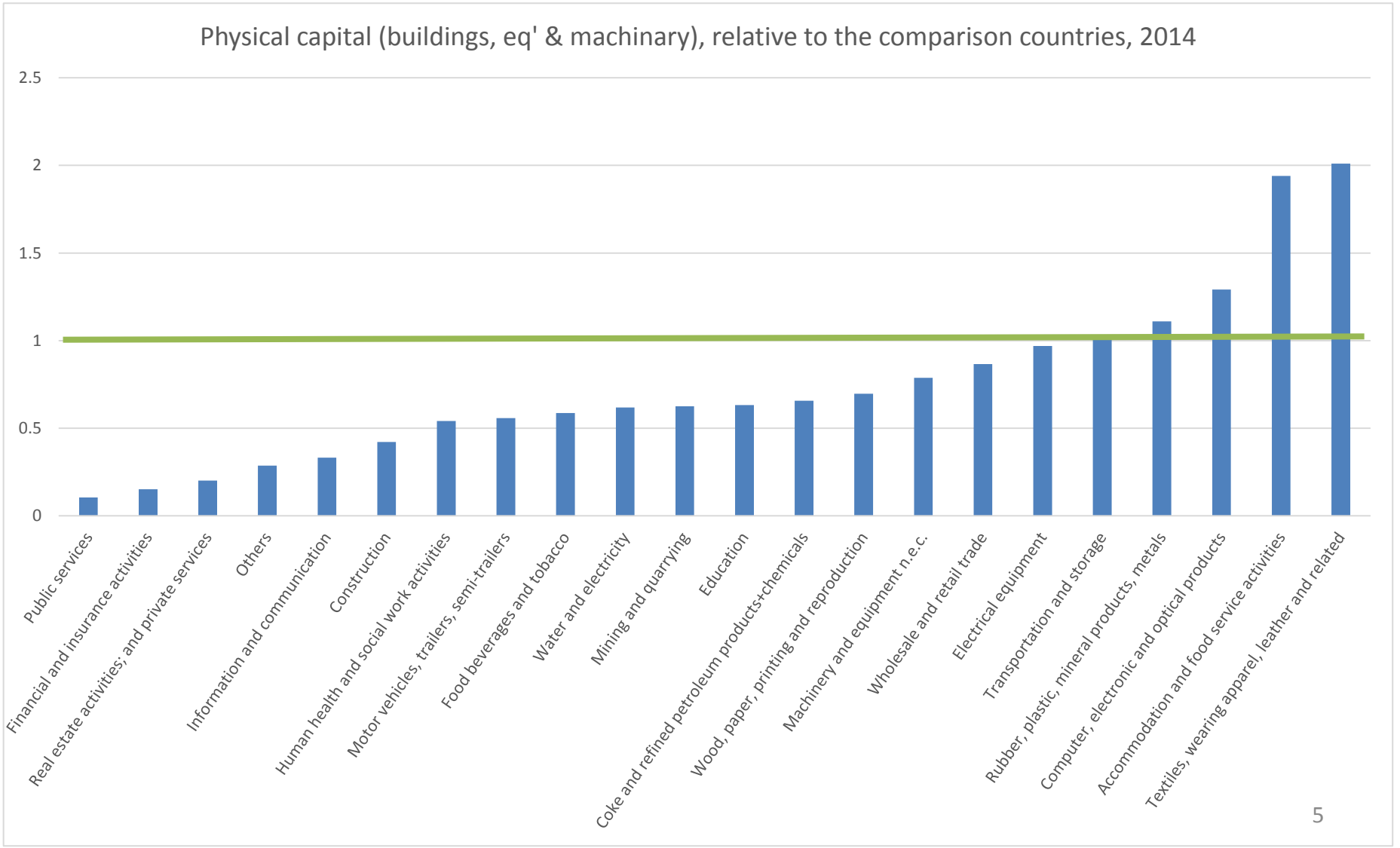
Development Accounting

$$Y_i = A_i K_i^{\alpha} (L_i h_i)^{1-\alpha} \rightarrow y_i = A_i k_i^{\alpha} h_i^{1-\alpha}$$

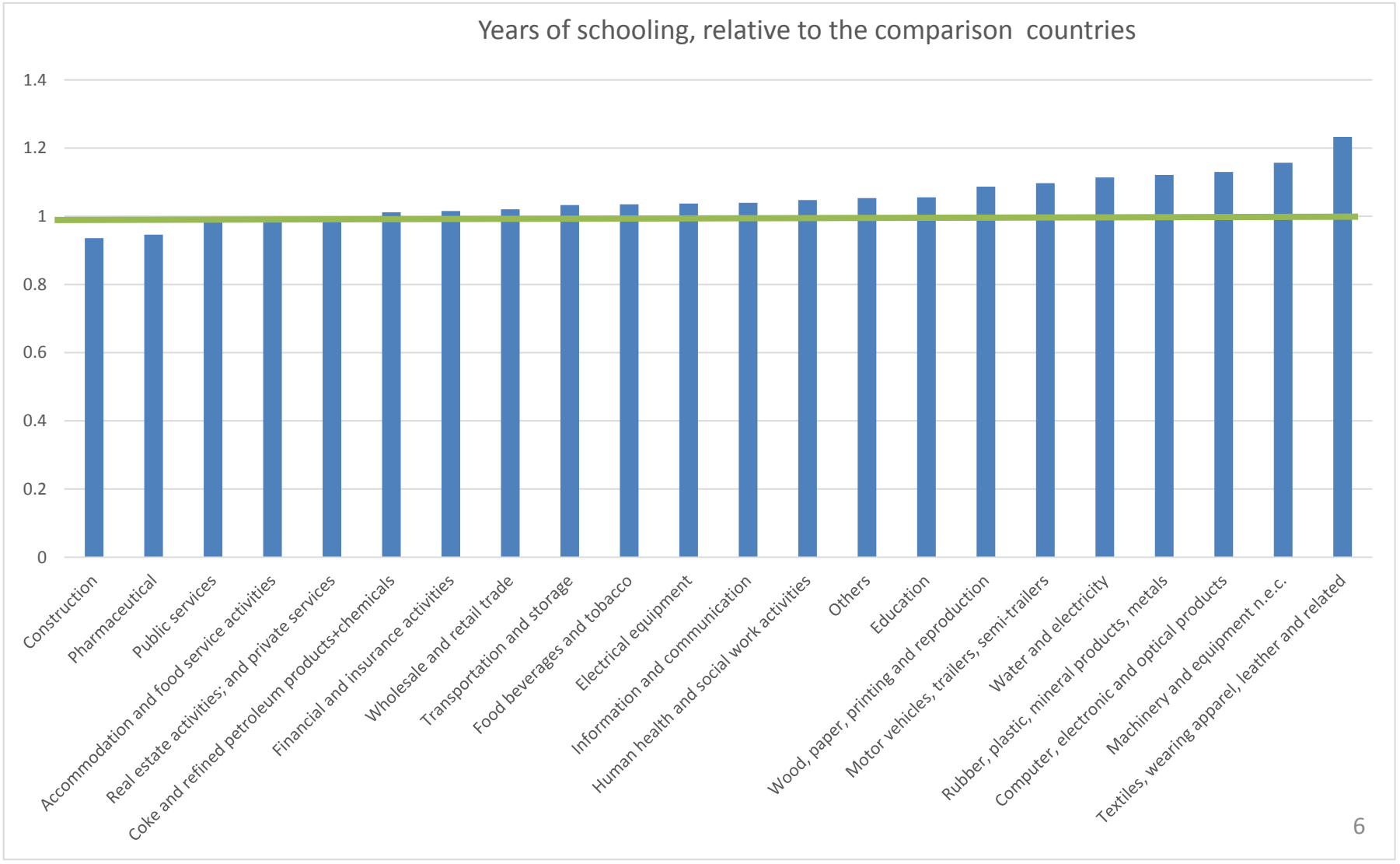
$$\frac{y_{IL}}{y_C} = \frac{A_{IL}}{A_C} \frac{k_{IL}^{\alpha}}{k_C^{\alpha}} \frac{h_{IL}^{1-\alpha}}{h_C^{1-\alpha}}$$

$$\frac{A_{IL}}{A_c} = \frac{\frac{y_{IL}}{y_c}}{\frac{k_{IL}^{\alpha} h_{IL}^{1-\alpha}}{k_c^{\alpha} h_c^{1-\alpha}}} = \frac{0.695}{\frac{X_{IL}}{X_c}}$$

The Physical capital constitutes 50% from the capital in the comparison countries



Formal education is relatively higher in Israel



Development Accounting

- Case 1: Human capital is built only using the quantity of education
- $h_i = e^{rs_i}$ with *r*=0.1

➔ $\frac{196{,}844_{IL}^{0.4}\,3.58_{IL}^{0.6}}{398{,}559_{c}^{0.4}\,3.14_{c}^{0.6}} = \frac{X_{IL}}{X_c} \sim 0.82;\ \frac{A_{IL}}{A_c} \sim 0.85$

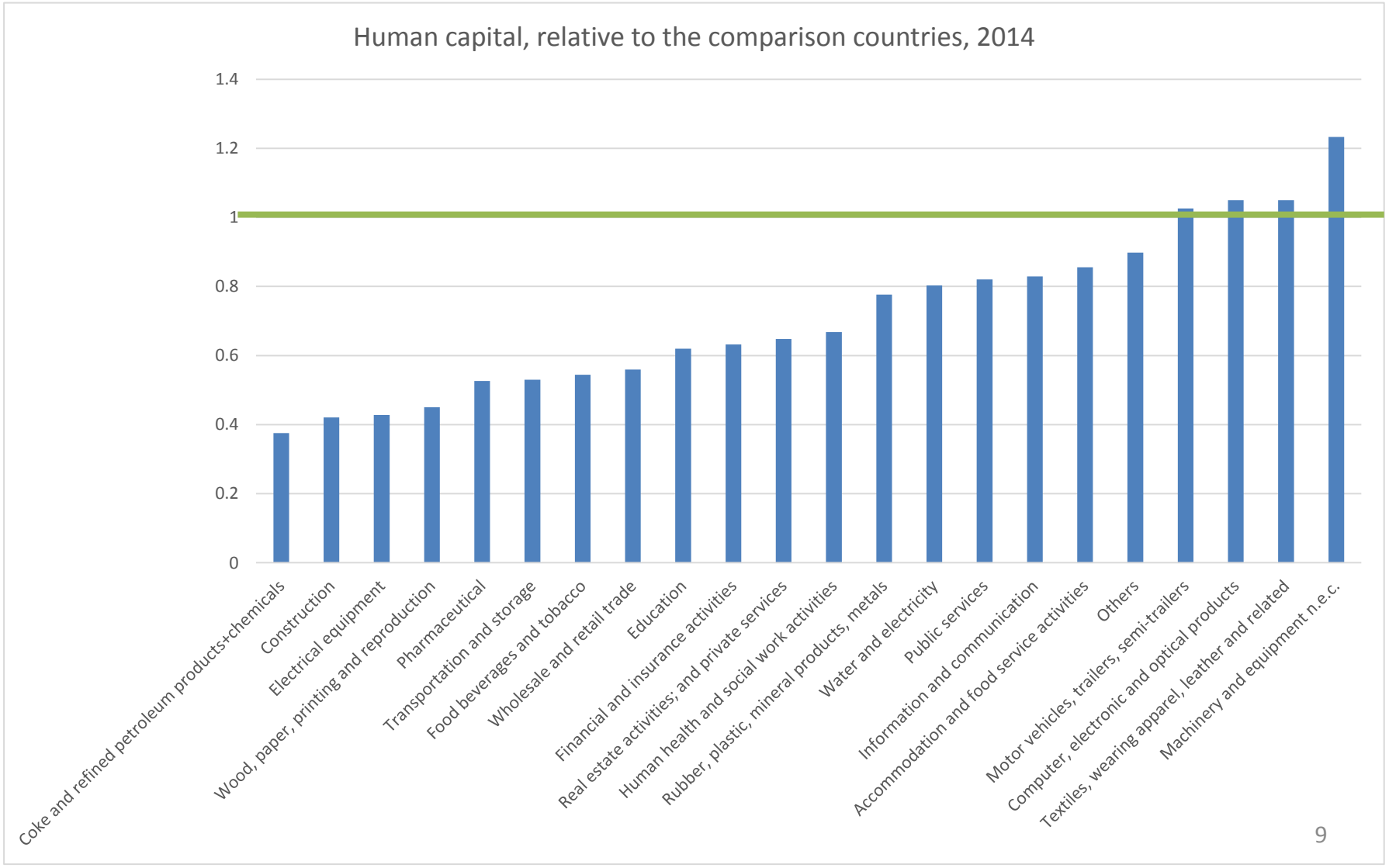
➔

- ~ 56% of the gap due to factors of production;
- ~44% of the gap due to TFP.

Development Accounting

- Case 2: Human capital is built using both – years of schooling and skills from PIAAC
- $h_i = e^{rs_i + wT_i}$ with *r*=0.1 and *w*=0.2 (Hanusheck et al 2015)

Taking skills into account decreases the relative human capital in Israel



Development Accounting

- Case 2: Human capital is built using both – years of schooling and skills from PIAAC
- $h_i = e^{rs_i + wT_i}$ with *r*=0.1 and *w*=0.2 (Hanusheck et al 2015)

$$\rightarrow \frac{196{,}844_{IL}^{0.4}\,2.80_{IL}^{0.6}}{398{,}559_{c}^{0.4}\,3.77_{c}^{0.6}} = \frac{X_{IL}}{X_c} \sim 0.63;\ \frac{A_{IL}}{A_c} \sim 1.10$$

$\rightarrow$

- ~ 127% of the gap due to factors of production;
- ~ - 27% of the gap due to TFP.

The Questions

1. What are the relative contributions of physical capital, human capital, and TFP to negative gap in productivity? 
2. Can we find any composition effect on the level of physical and human capital?
3. Is there a correlation between Physical and human capital over industries and countries?

Answering the first question

- Development Accounting
  - The main contribution – Measuring human capital using both the quantity and the quality of education.
  - The main result: Israel is behind both in physical and human capital.
  - TFP is similar (even higher) to the TFP of the comparison countries.

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Building industrial physical capital

- Investment data from 1995 to 2014
- Source: data for Israel – CBS; data for other countries - Eurostat
- Aggregated data based on the industrial human capital constitutes to 52% relative to the comparison countries (very close to macro data from PWT - 49%)
- What would the level of physical capital per worker in Israel be if it's industrial composition was the same as in the comparison countries?

- $k_{IL}^{h} = \sum_{j} \omega_{j,c} k_{j,IL}$

- Physical capital in Israel would be 2% higher

Industrial Human capital

- What would the level of human capital per worker in Israel be if it's industrial composition was the same as in the comparison countries?

- $h_{IL}^{h} = \sum_j \omega_{j,c} h_{j,IL}$

- Human capital in Israel would have been 4% lower

The Questions

1. What are the relative contributions of physical capital, human capital, and TFP to negative gap in productivity? 
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Answering the second question

- Detailed calculation of physical capital per worker
  - Industrial composition might explain only 2% of the disadvantage
  - Both machinery & equipment, and buildings are low relative to the comparison countries – 58% and 50% respectively.
- Detailed calculation of human capital
  - If Israel's Industrial composition was the same as in the comparison countries, then it's human capital would have been 4% lower.

Third question: can we find a correlation between physical and human capital?

- Using cobb-douglas:

$$y_i = A_i k_i^{\alpha} h_i^{1-\alpha}$$

- The optimum condition for the physical capital:

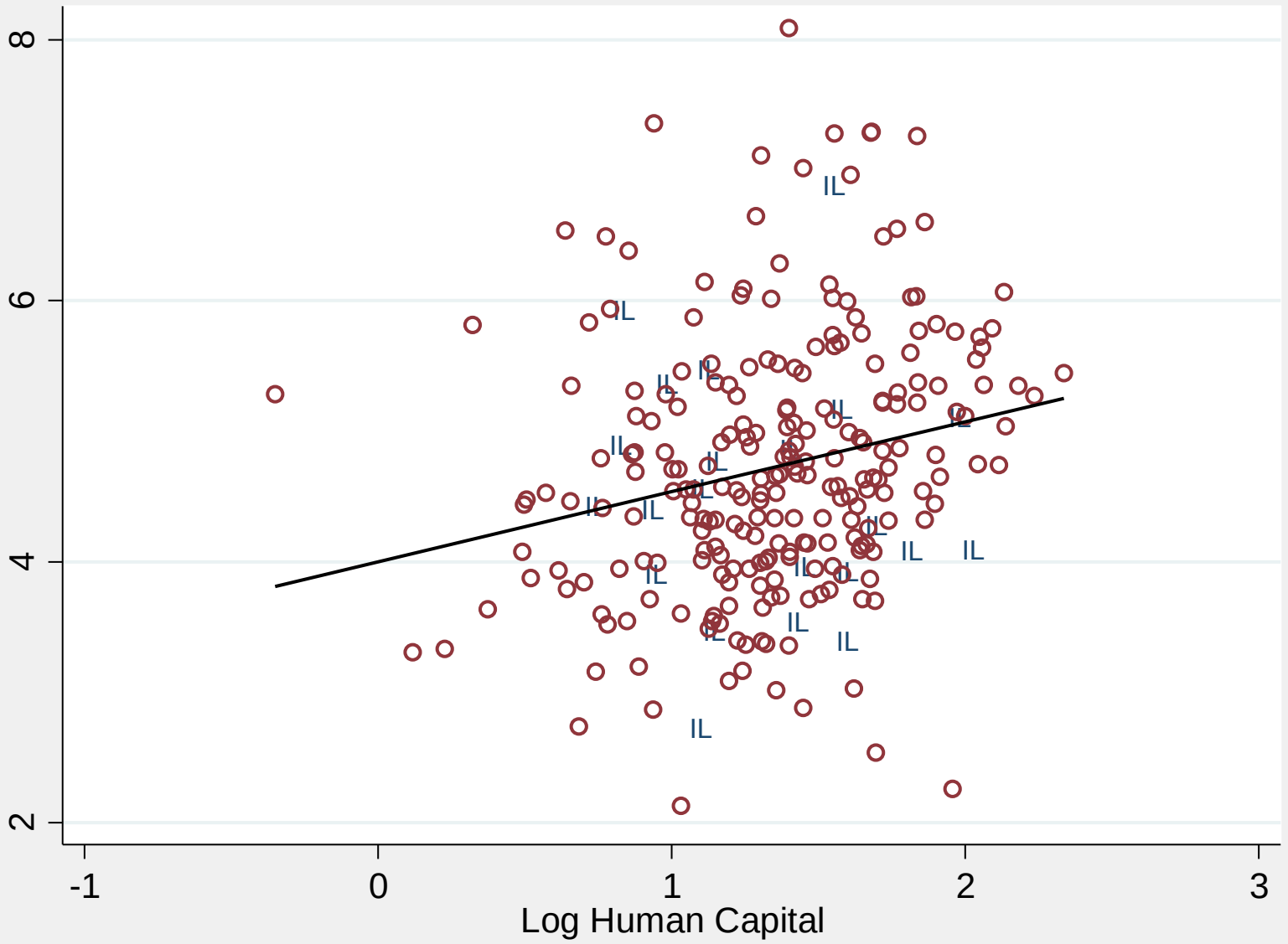
$$\frac{\partial y_i}{\partial k_i} = A_i \left(\frac{h_i}{k_i}\right)^{1-\alpha} = \text{rental rate(i)}$$

- If human capital increases in 1%, physical capital should increase in 1%, and productivity as well.

We calculated industrial physical and human capital for more countries

- Data limitations
  - Industrial investment data from 1995
  - PIAAC industrial data
- Total of 20 industries in 13 countries

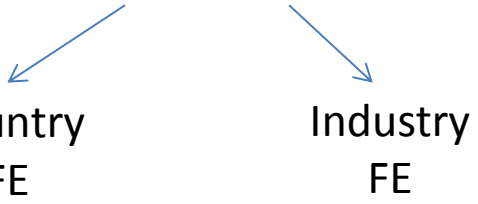
Positive correlation between human and physical capital



Regressions

- $\ln k_{ic} = \alpha + \beta lnh_{ic} + \epsilon_{ic}$

- $\ln k_{ic} = \alpha + \beta lnh_{ic} + \delta_c + \delta_i + \epsilon_{ic}$



The correlation holds after adding both fixed effects

Log Physical Capital and Log Human Capital

	Log Capital per Worker		
	(1)	(2)	(3)
Log Human capital	0.539**	0.533*	0.277**
	(0.215)	(0.304)	(0.116)
Country FE	No	Yes	Yes
Industry FE	No	No	Yes
N	260	260	260
R^2	0.050	0.149	0.769

Standard errors in parentheses are clustered at the Industry level.
$^{+}$ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Answering the third question

- We found a positive, economically important and statistically significant, relationship between human and physical capital.
- If some of the relation is casual, then closing the gap in human capital might contribute to closing the gap in physical capital as well.
- Productivity gap will narrow following closing the gap in human capital by 17 percentage points, and by an extra 3.5-7 percentage points thanks to a narrowing of the gap in physical capital.

Thank you for your attention!