



ICT and Productivity: How Strong is the Link Really?

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“The economic and social impacts of broadband communications:
From measurement to policy implications”

Session: The Productivity Impacts

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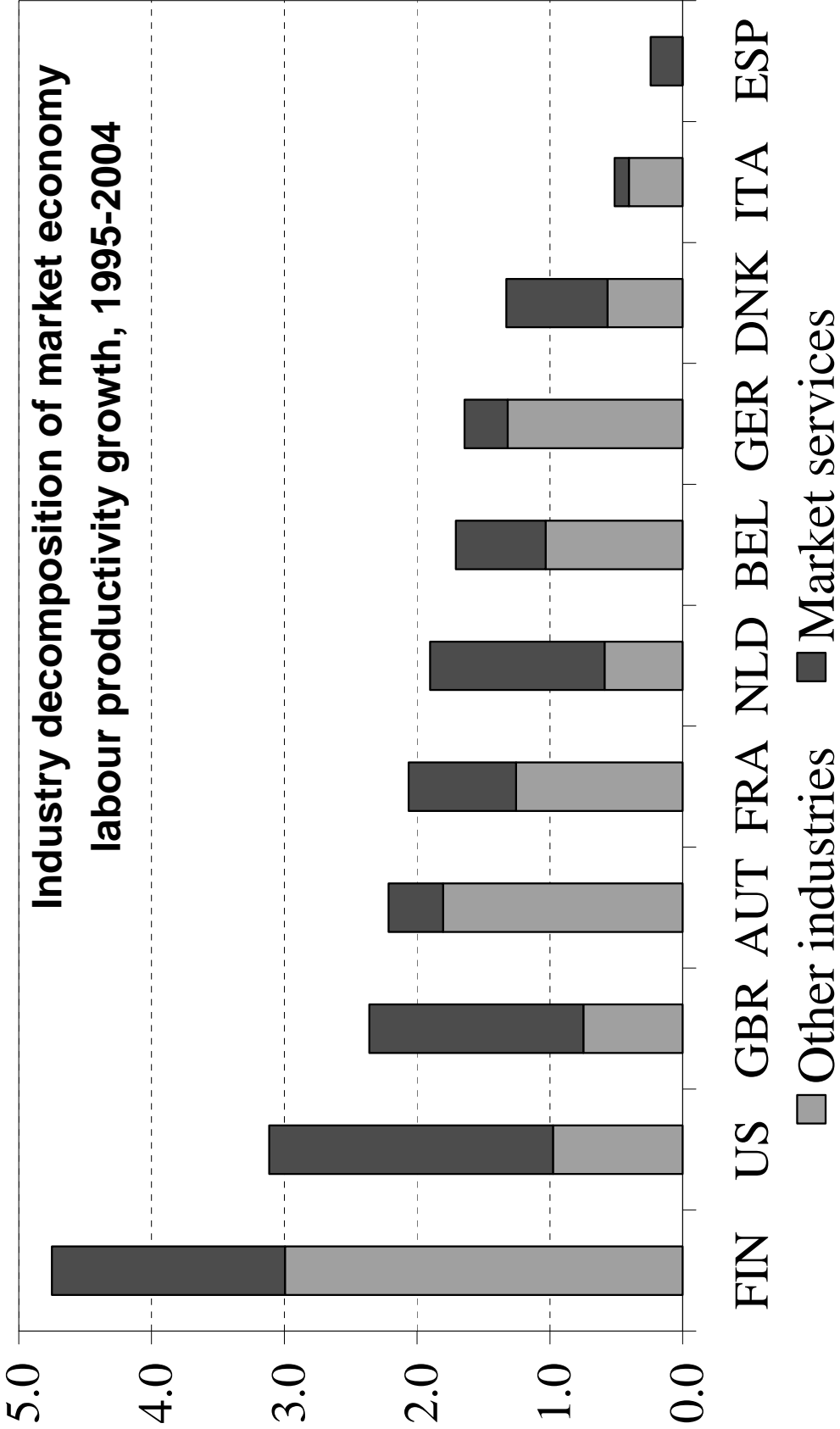
Common Wisdom

- ⇒ **ICT is a major vehicle in supporting productivity growth**
- ⇒ **Differences in ICT production intensity drive part of growth differential between countries**
- ⇒ **ICT investment intensity have strongly converged across countries**
- ⇒ **The key to long run growth differential is productive use of ICT, in particular in services**
- ⇒ **Productive use of ICT requires:**
 - ⊙ Strong skill complementarity
 - ⊙ A conducive regulatory environment
 - ⊙ Organizational capabilities linked to intangible investment
- ⇒ **Europe has problems to exploit ICT's productivity benefits compared to other parts of the world**

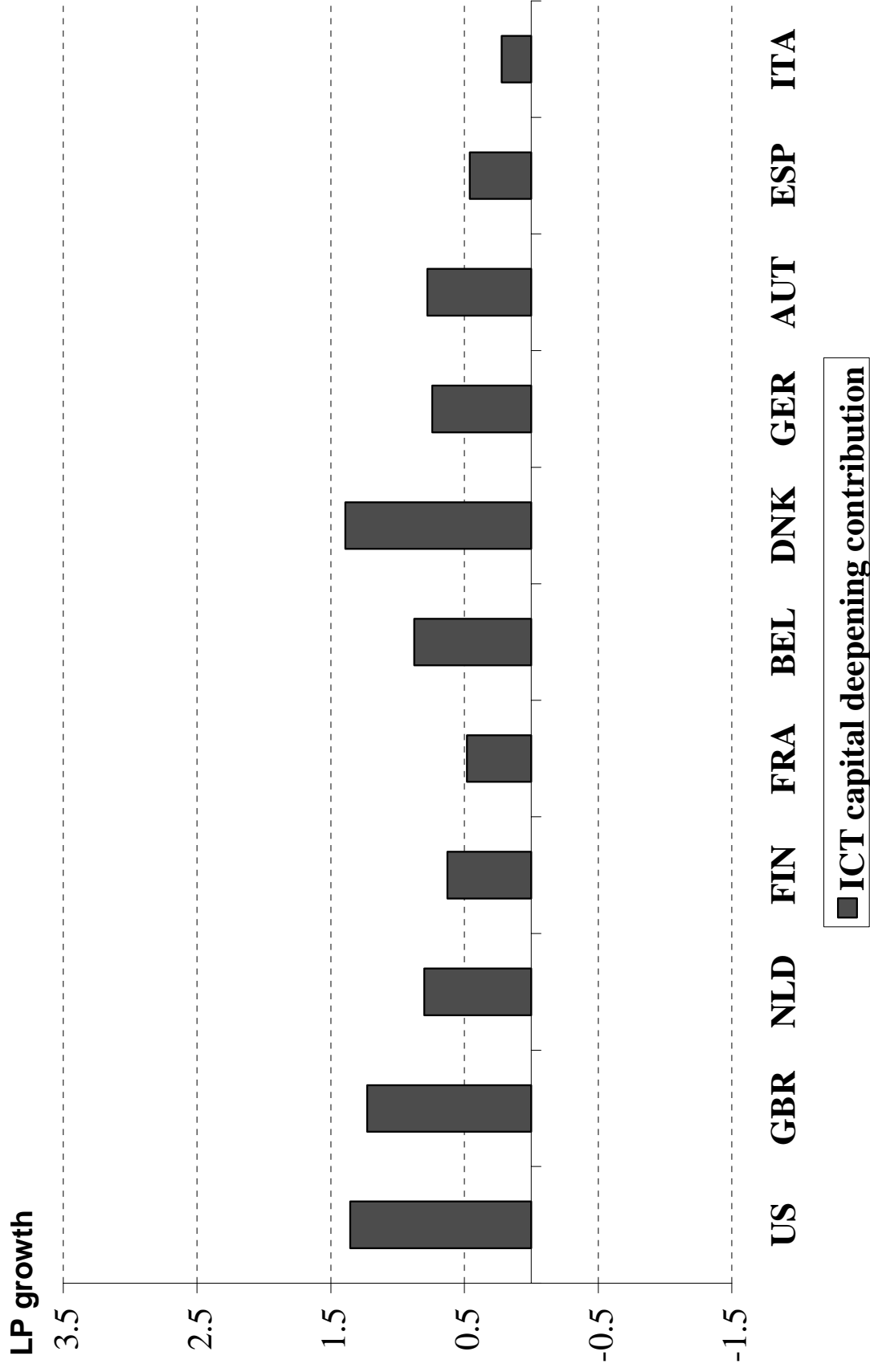
Some key findings from EU KLEMS Project

- ⇒ **Productivity convergence halted both across European countries as well as relative to US**
 - ⊙ Mainly driven by developments in market services
 - ⊙ Investment in ICT and skills are important, but
 - ⊙recent divergence is driven by MFP growth
- ⇒ **Drivers of MFP growth not well understood**
 - ⊙ Returns to skills and ICT investment appear captured by investor
 - ⊙ At industry level regulatory practice has no clear impact on MFP
- ⇒ **Measurement matters !!**
 - ⊙ Detailed accounting of labor and capital measurement
 - ⊙ Output measurement in services
 - ⊙ Measurement of intangibles

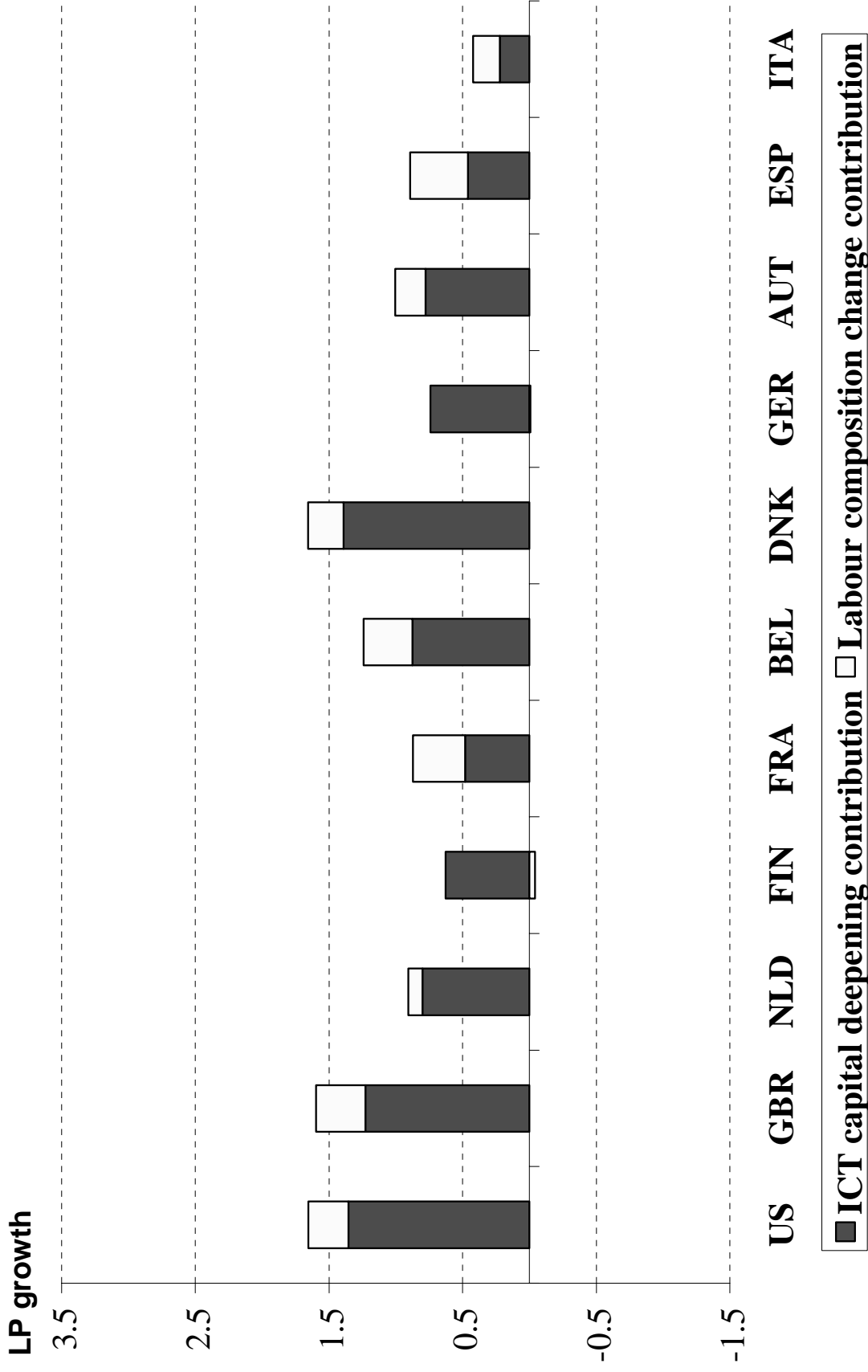
Market services are main source of growth differentials across Europe and relative to US



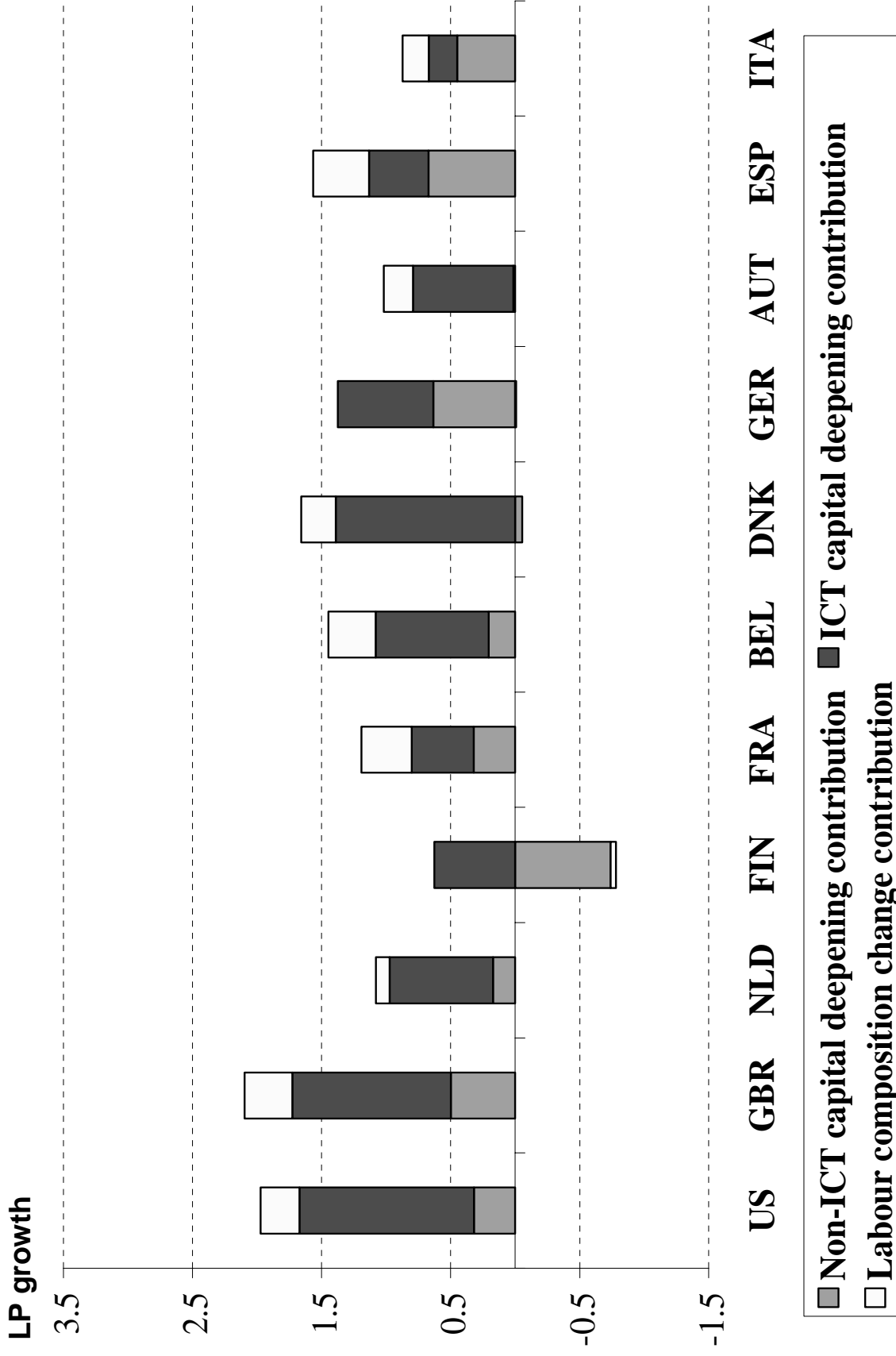
ICT investment contributes to labour productivity growth market services, 1995-2004



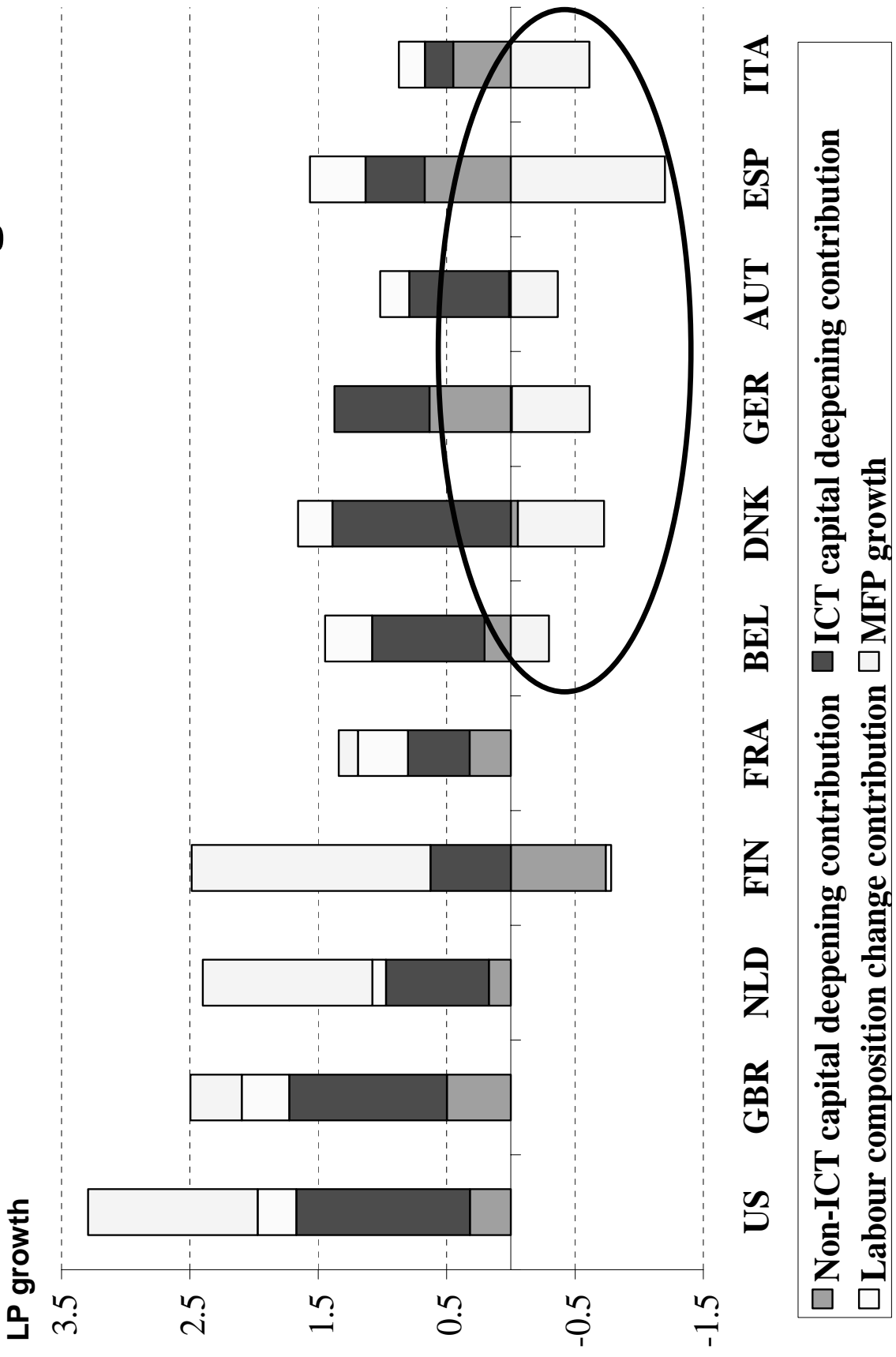
Complementarity with labour composition is strong



Non-ICT Capital Deepening Matters Less for Fast Growers



... but MFP contribution makes the biggest difference between fast and slow growers



How to unravel the “mystery” of MFP growth differentials?


Unconditional convergence:

$$\Delta \ln MFP^i = \beta \ln(MFP^F / MFP^i)$$
The equation is $\Delta \ln MFP^i = \beta \ln(MFP^F / MFP^i)$. There are two arrows: one pointing up to the MFP^F term in the numerator, and another pointing down to the MFP^i term in the denominator.

Frontier country

Follower country

Conditional convergence:

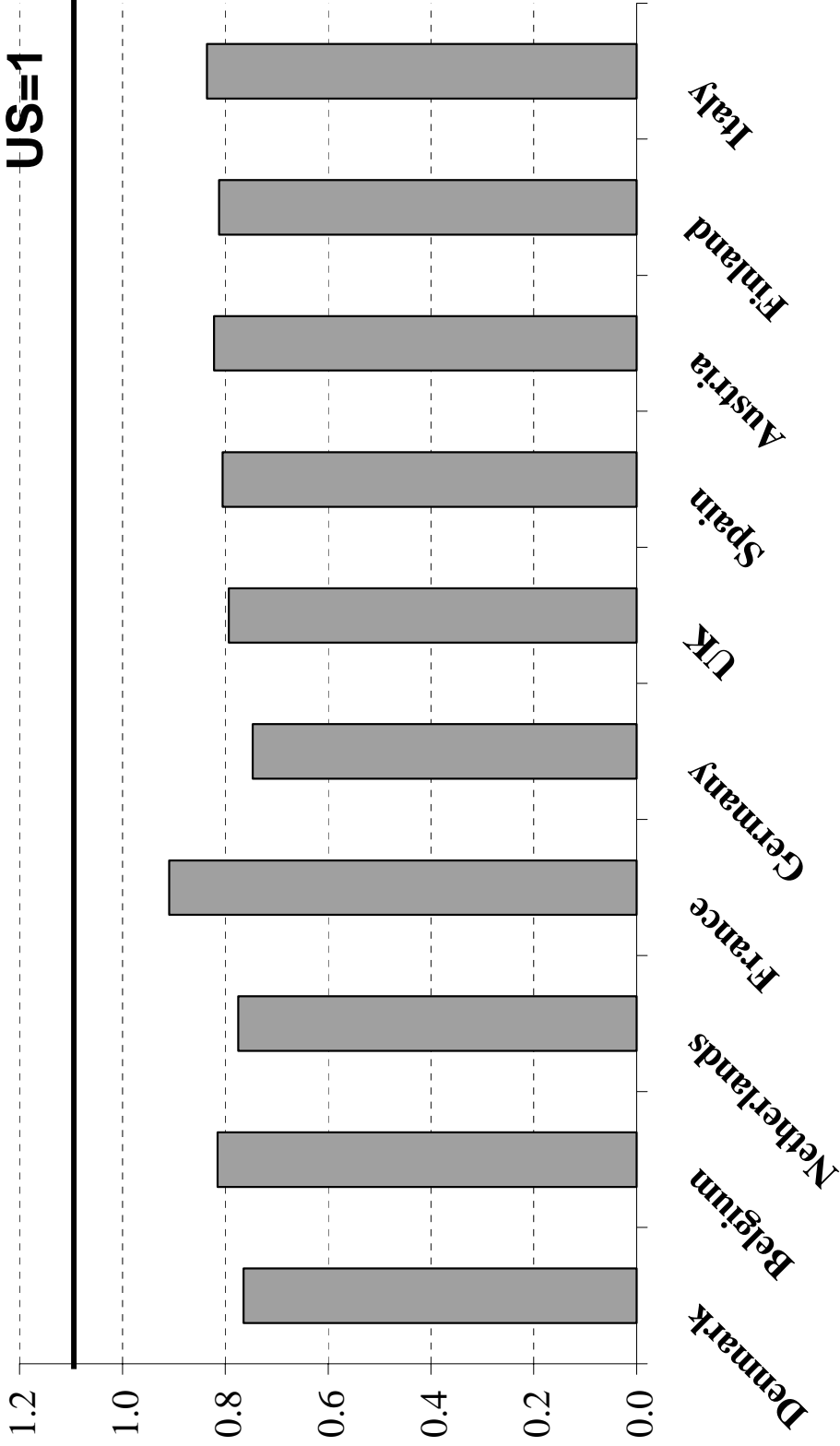
$$\Delta \ln MFP^i = \beta \ln(MFP^F / MFP^i) + \gamma Z + \delta Z * \ln(MFP^F / MFP^i)$$
The equation is $\Delta \ln MFP^i = \beta \ln(MFP^F / MFP^i) + \gamma Z + \delta Z * \ln(MFP^F / MFP^i)$. There are three arrows: one pointing up to the MFP^F term in the first log, one pointing up to the Z term, and one pointing up to the MFP^F term in the second log.

Imitation

Innovation

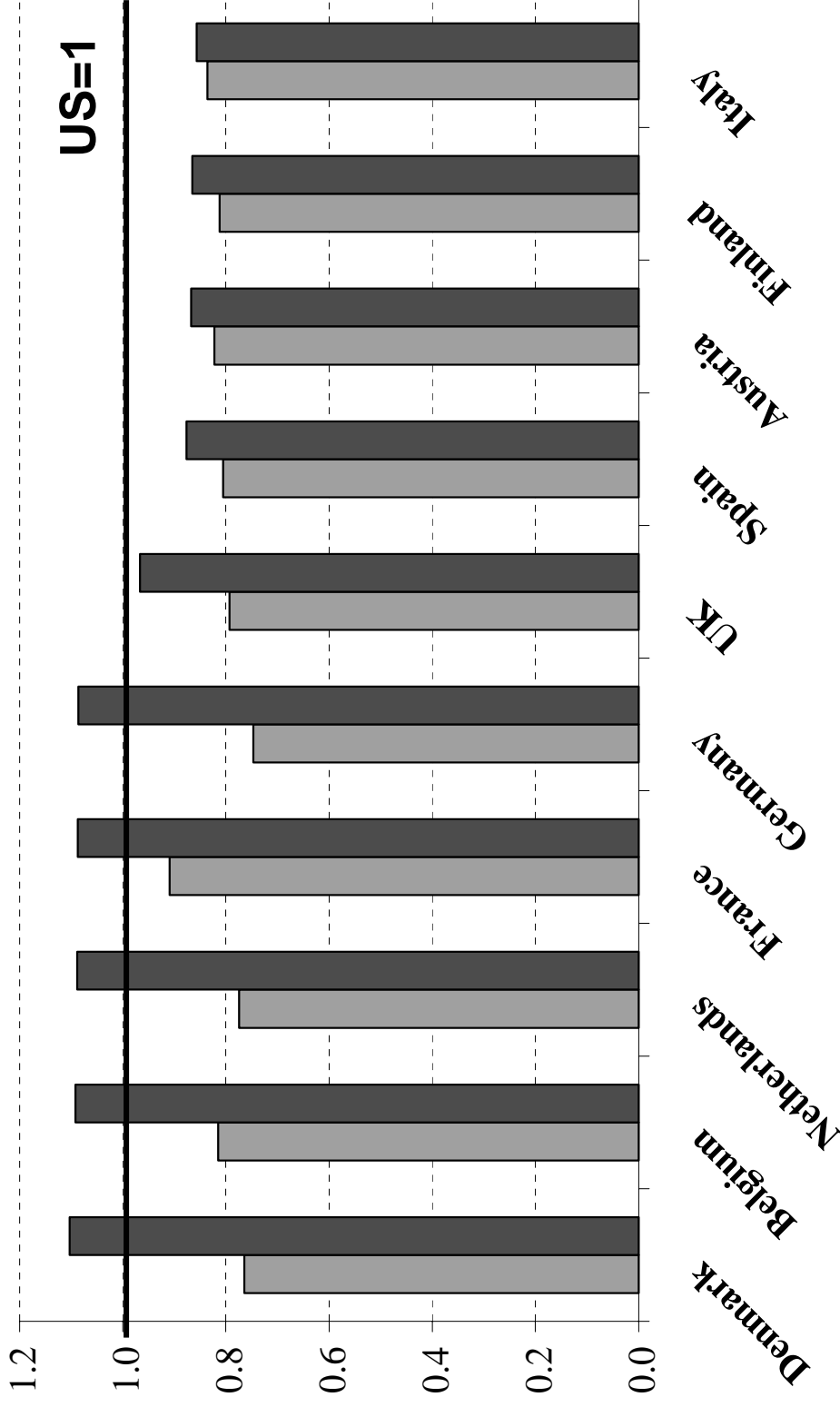
Interaction

Crude level measures show US leading in market services MFP



Crude measure: value added, GDP PPPs, persons engaged, capital stocks

**...but detailed EU KLEMS MFP level
measures show U.S. is not always leading**



Crude measure: value added, GDP PPPs, persons engaged, capital stocks
Detailed: gross output, output & inputs PPPs, hours by type, capital services

Unconditional convergence of MFP levels in market services ended after 1995

Standard deviation of MFP levels relative to the leading country, average
across market services, 1980-2004



ICT: no additional impact on MFP growth since 1995

Explanatory variable: Contribution of ICT to output growth

<i>Period</i>	<i>MFP gap</i>	<i>Variable</i>	<i>Inter- action</i>
1980-2004	0.017***	-0.381	-0.056
1980-1995	0.029***	0.006	-0.496
1995-2004	-0.003	-1.039*	-1.229

Also no explanatory value at industry level when using skills or regulations as variables

Research priorities

- ➔ **Heterogeneity between industries**
 - ⊙ Variable lags and interactions in effects of ICT, skills, and regulation
 - ⊙ Growth accounts provide starting point/benchmark but need to understand subtleties of drivers of productivity at industry level (retail, finance)
- ➔ **Firm-level heterogeneity and impact on industry level results**
 - ⊙ How does firm level heterogeneity drive industry level differentials?
 - ⊙ What is impact of scale effects?
 - ⊙ How do regulations affect firm dynamics?
- ➔ **Measurement issues are key:**
 - ⊙ Are we measuring input with sufficient detail?
 - ⊙ How big are the measurement problems, in particular for services output?
 - ⊙ Need to explicitly measure intangibles

We need to keep challenging the common wisdom

- ⇒ **Implications for research:**
 - ⊙ Investment in ICT and skills are important, but without additional impact on MFP, returns from investment appear captured by investor
 - ⊙ Link between regulations and MFP differentials still weakly established (Nicoletti/Scarpetta and others)
 - ⊙ Importance of having detailed measures of inputs and productivity at industry level
- ⇒ **Implication for policies**
 - ⊙ What is foundation for industry-level policies focused on strengthening ICT use?
 - ⊙ Should focus be at optimizing investment climate at macro level ...
 - ⊙ ... and/or should focus be on recognizing firm level diversity?