



# The Potential of ICT for Development and Economic Restructuring in the New EU Member States

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**Marcin Piątkowski**

[www.tiger.edu.pl](http://www.tiger.edu.pl)





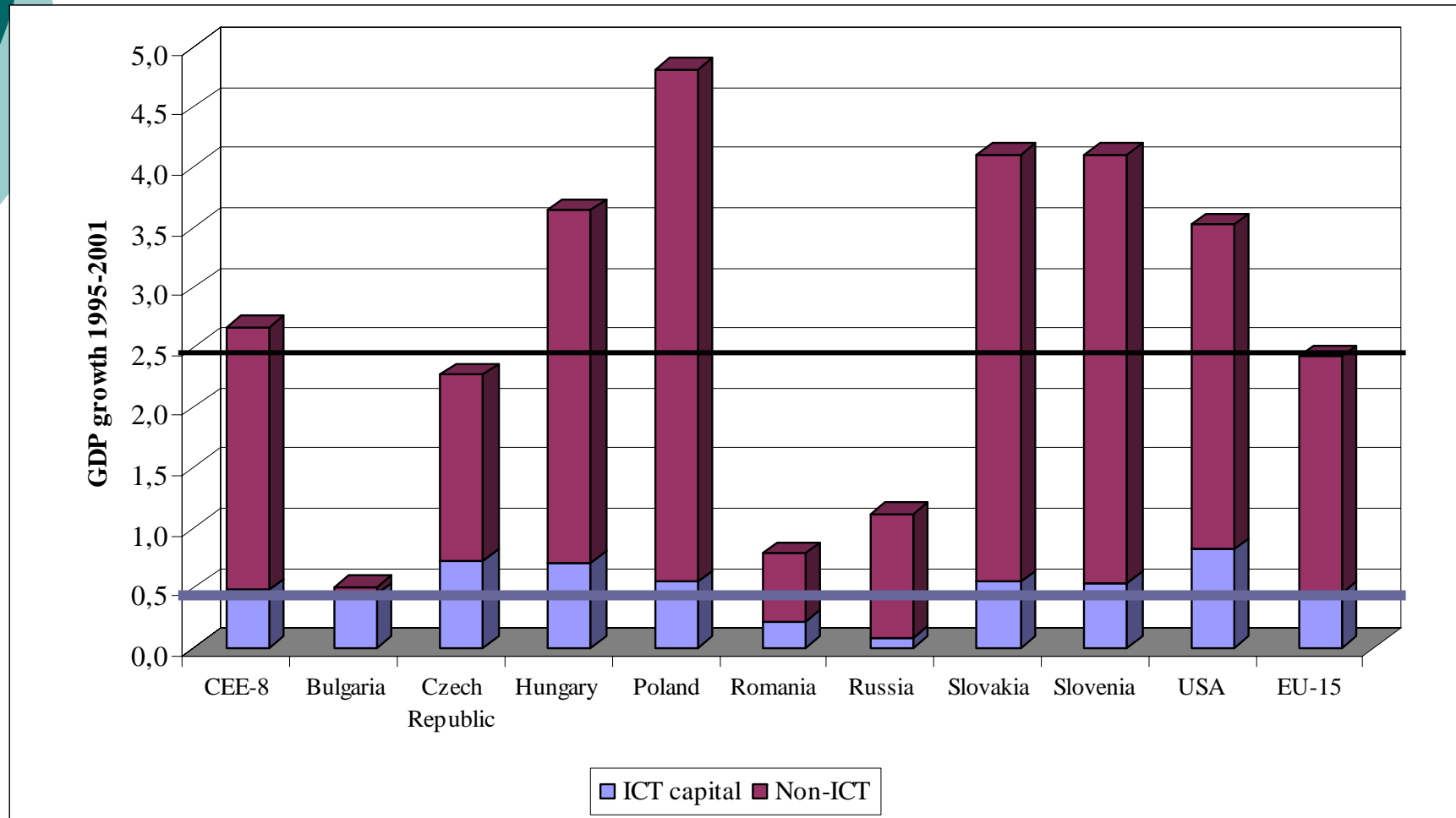
## Summary and agenda

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- ICT investment contributed to accelerated growth in some post-communist countries (technological leapfrogging), which allowed them to shorten the distance to the EU-15 average GDP. ICT-producing sector is too small to impact overall growth. Yet, the potential of ICT is far from being exhausted.
- The divergence among countries in the size of ICT investments is due to significant differences in the quality of economic and institutional environment.
- Intensive use of ICT in industries contributes to faster productivity growth.
- Some industries could benefit more than others from the use of ICT to increase productivity. This could significantly contribute to faster economic growth in CEE countries.
- Policy recommendations.

Some CEE countries accelerated growth thanks to investment in ICT and thus partly caught-up with the EU-15 GDP average. However, Russia and Romania lagged behind....

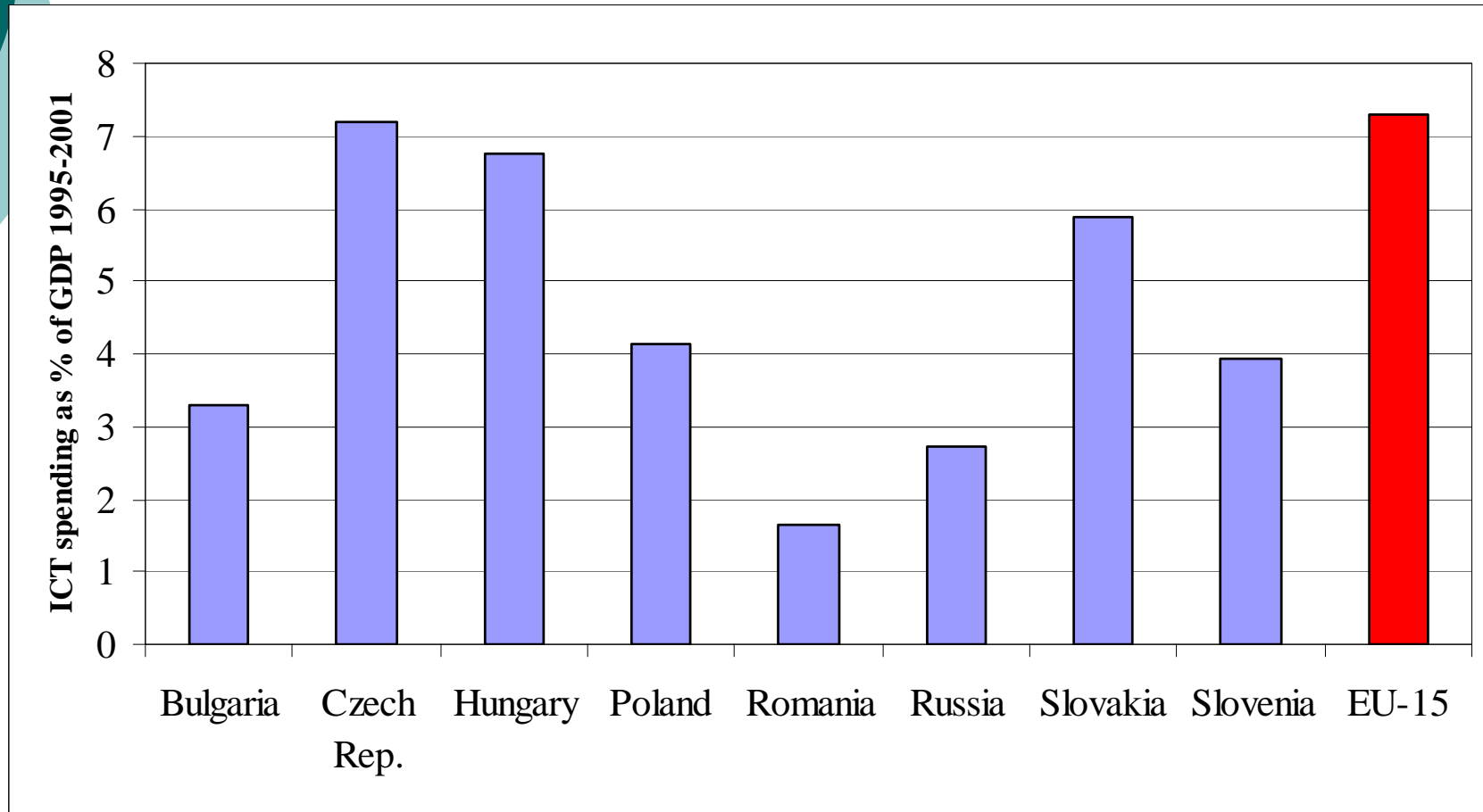
Figure 1. The contribution of ICT investment to GDP growth in CEE countries, EU-15 and the US, 1995-2001



Source: Piatkowski (2004)

...due to low investment in ICT...

Figure 2. ICT spending in eight transition countries 1995-2001, as % of GDP



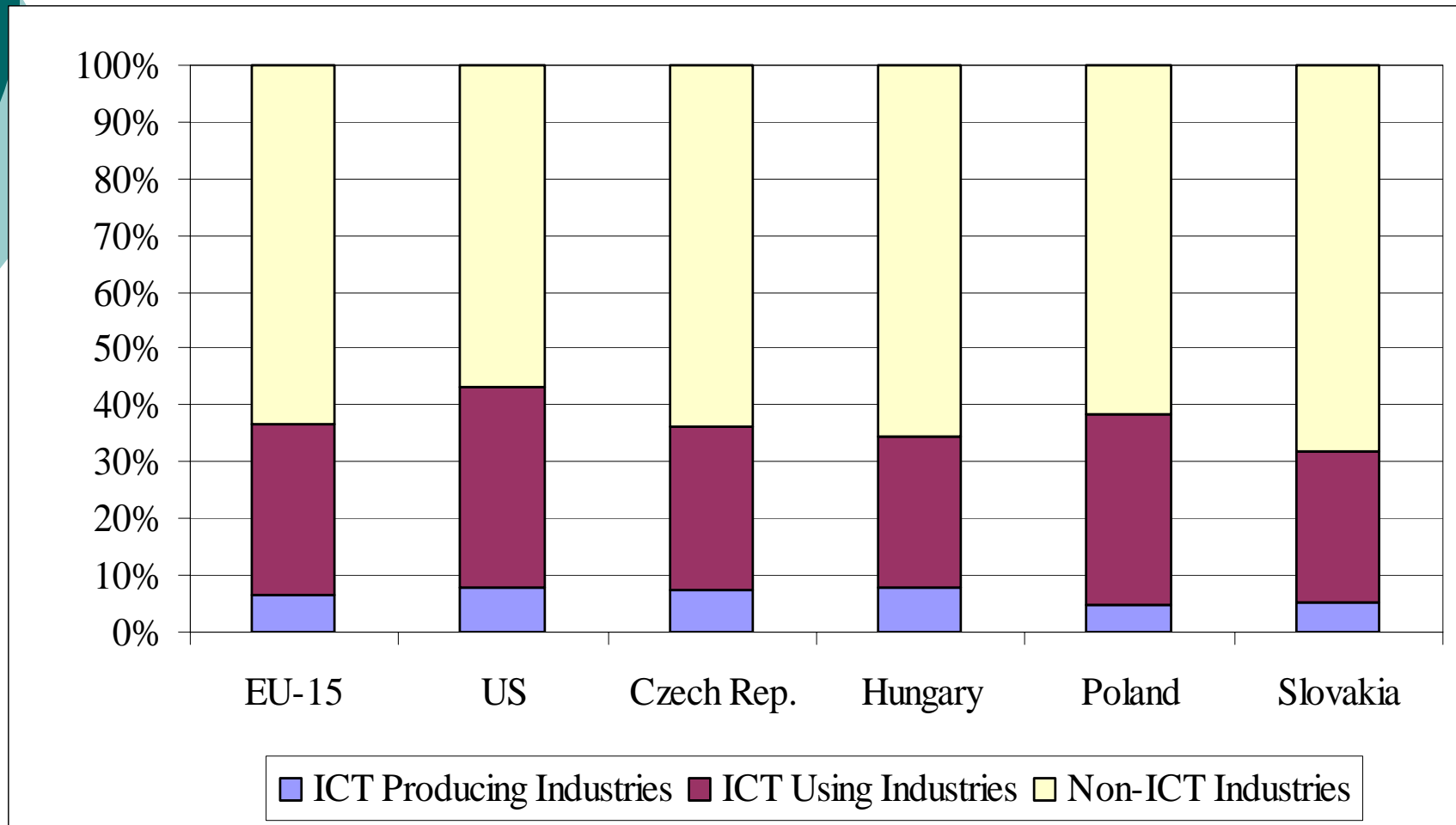
Source: WITSA (2002)

... which in turn was due to significant differences in the quality of economic and institutional environment as shown by „New Economy Indicator”...

Country	Rank	Value 1995-2001
Sweden	1	9.882
Netherlands	2	8.001
Denmark	3	7.331
Ireland	5	6.210
UK	4	6.343
Belgium	6	5.624
Finland	9	4.857
Austria	8	5.021
USA	7	5.162
Germany	10	3.105
Portugal	11	2.076
France	12	1.340
<b>Slovenia</b>	<b>13</b>	<b>-0.180</b>
<b>Czech Rep.</b>	<b>14</b>	<b>-1.060</b>
<b>Hungary</b>	<b>15</b>	<b>-2.163</b>
Italy	17	-3.141
Spain	16	-3.102
Greece	18	-5.399
<b>Slovakia</b>	<b>19</b>	<b>-5.670</b>
<b>Poland</b>	<b>20</b>	<b>-7.042</b>
<b>Bulgaria</b>	<b>21</b>	<b>-10.372</b>
<b>Romania</b>	<b>22</b>	<b>-12.063</b>
<b>Russia</b>	<b>23</b>	<b>- 13,375</b>

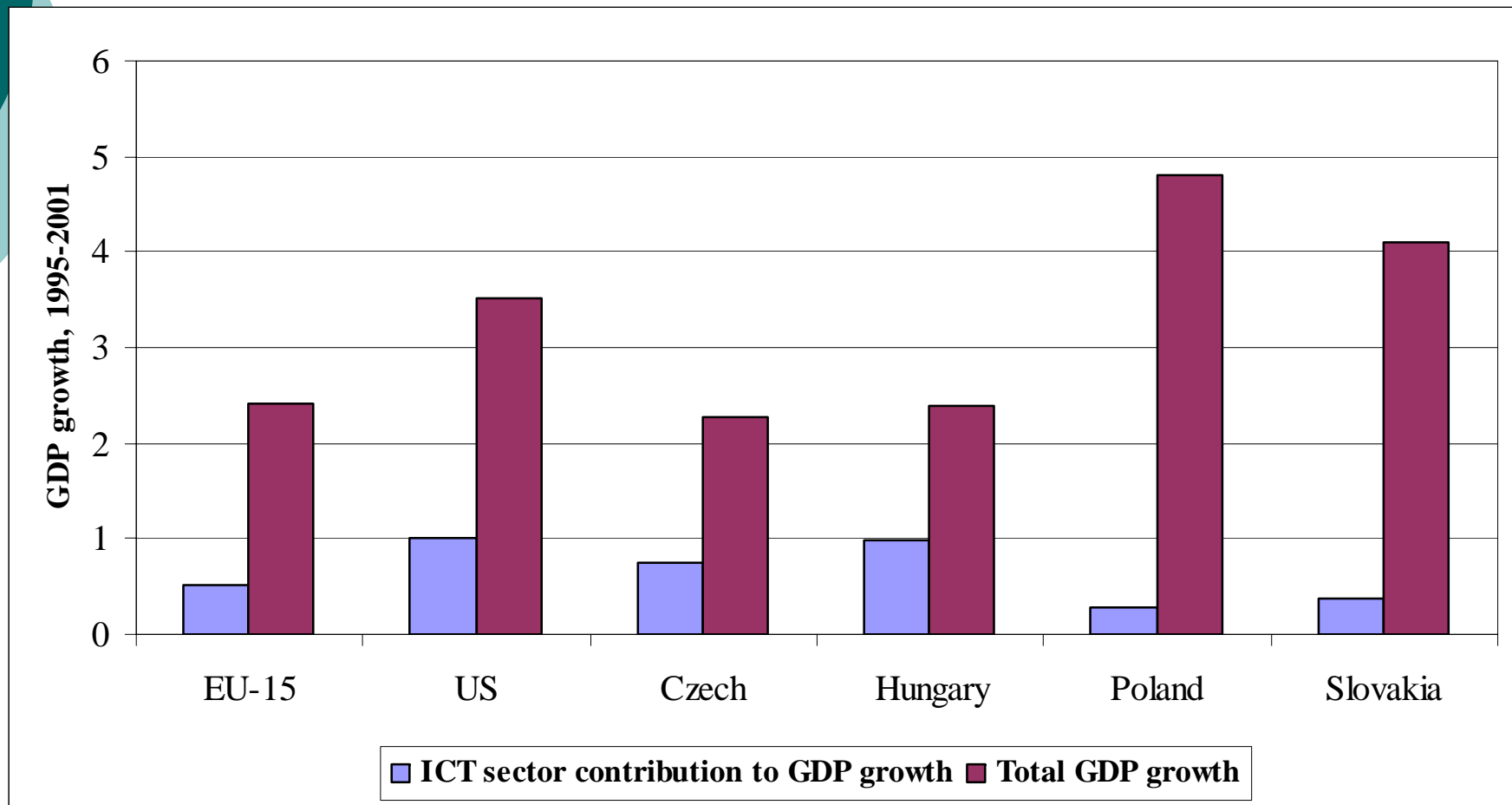
ICT production is still too small to be a driver of growth in CEE economies. ICT use has a much larger potential...

Figure 4. Share of ICT-producing, ICT-using, and non-ICT industries in GDP in 2002



Nonetheless, ICT sector can have some impact on GDP thanks to its high productivity growth, as evidenced by the Czech Republic and Hungary

Figure 5. ICT-producing sector contribution to GDP growth, 1995-2001 average





Still, ICT use will have to be the main driver of growth, particularly as its potential is far from being exhausted...

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Simple, post-transition growth reserves are by now almost exhausted (institution-building mostly complete, managerial skills upgraded, macroeconomic stability, EU accession etc.)

- Hence, economic growth and fast catching-up will have to rely on sustained progress in productivity
- However, what would drive the productivity growth? Investment in ICT, managerial skills, human capital, infrastructure, innovation (R&D)? What should be the priority?

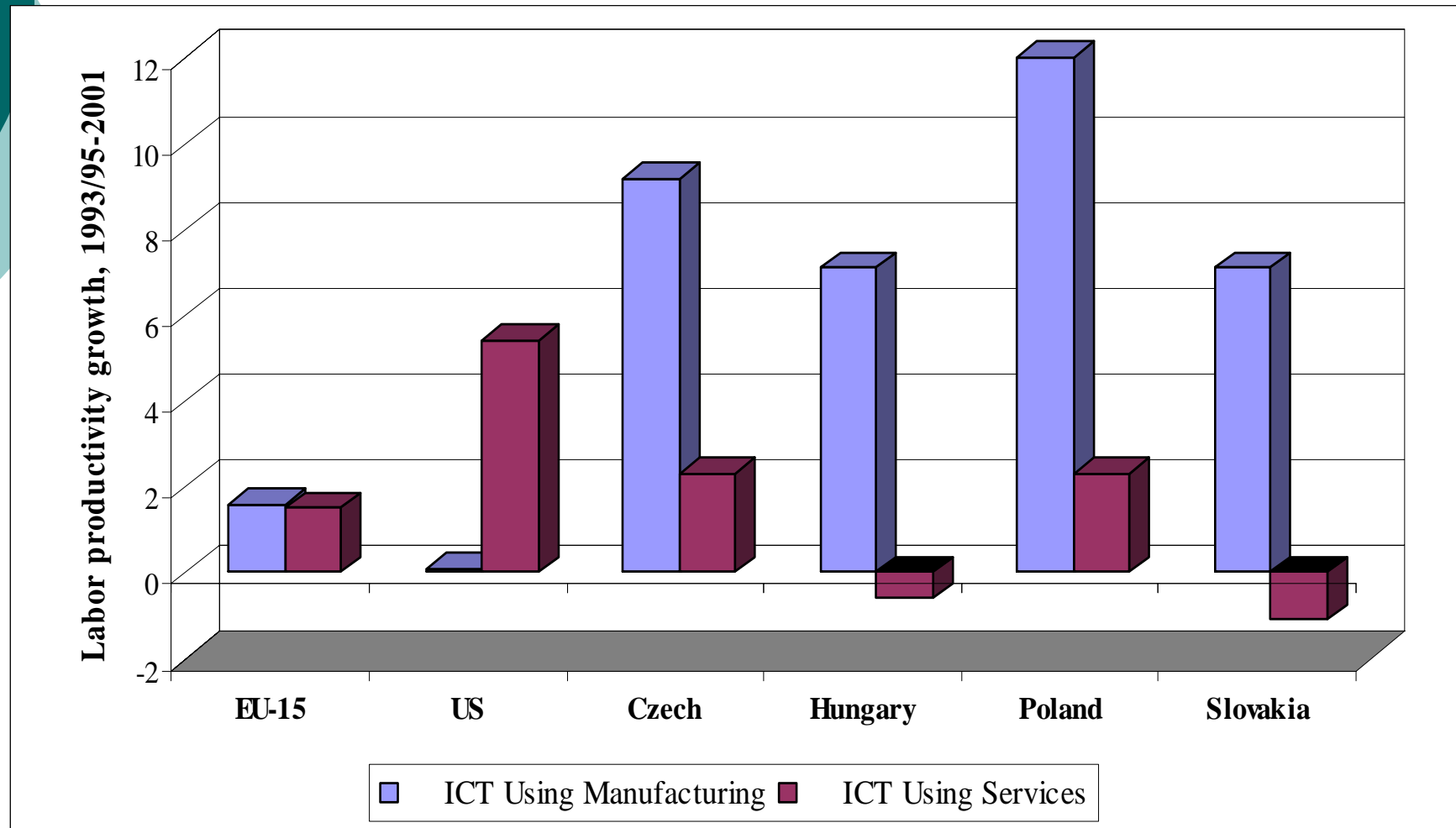


ICT use increased productivity growth on the industry-level, particularly in ICT producing and using manufacturing...

**Table 6: Labour productivity growth of ICT-producing, ICT-using and non-ICT industries**

	EU 1995-2001	US 1995-2001	Czech 1993-2001	Hungary 1993-2001	Poland 1993-2001	Slovakia 1993-2001
Total Economy	1.5	2.2	2.8	2.4	3.3	2.5
ICT Producing Industries	6.2	8.2	13.0	7.8	5.8	8.5
ICT Producing Manufacturing	18.7	22.3	15.4	7.5	8.1	7.1
ICT Producing Services	5.6	1.6	12.9	8.6	4.6	9.2
ICT Using Industries	1.6	4.6	4.4	1.0	4.8	1.8
ICT Using Manufacturing	2.1	1.6	9.2	7.1	12.0	7.1
ICT Using Services	1.6	5.2	2.3	-0.6	2.3	-1.1
Non-ICT Industries	0.7	-0.2	1.3	2.3	2.4	2.4
Non-ICT Manufacturing	1.3	-0.2	5.3	2.6	4.6	3.4
Non-ICT Services	0.2	0.0	-1.5	2.1	1.9	4.1
Non-ICT Other	1.9	0.2	2.3	2.6	1.3	-1.8
<i>Pro Memoria: Using national ICT deflators</i>						
Total Economy	1.3		2.8	2.9	3.5	2.3
ICT Producing Manufacturing	7.1		14.1	22.1	17.9	-7.4

Yet, productivity growth in the ICT using service sector is much lower in all countries, with the exception of the US...




Source: based on Van Ark and Piatkowski (2004)



This may suggest that ICT-led growth and catching-up is a “two-stage” process...

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- In the first stage, ICT drives productivity growth in ICT-using manufacturing..
  - Later however, productivity growth slows down as the restructuring process in ICT-using manufacturing nears completion...
  - Hence, in the second stage, the continued productivity growth must be dependent on faster growth in non-ICT using industry and in the whole service sector...
  - ... which however requires ICT investment, particularly in the case of services, to be complemented with managerial skills, human capital, organizational innovations as well as a more conducive business environment. These are much harder to achieve.
  - It seems that only the US have so far succeeded in moving to the “second stage” thanks to organizational changes on the firm-level and better business environment.




“Second-stage” can only be achieved when non-ICT using sectors start investing in ICT. This is however dependent on...

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- FDI (Clarke 2003)
  - Competition (OECD 2003, 2004)
  - Nature of the industry (tangible vs. intangible)
  - Share of foreign trade in total revenue (Salsas, Muller 2004)
  - Company size (Salsas, Muller 2004)
  - Degree of liberalization of the telecommunication market (Salsas, Muller 2004)
  - ICT skills, quality of human capital (OECD 2003, Peneder 2003)
  - History of innovation (Kretschmar 2002)
  - Level of awareness?

... as well as on management skills and practices...

Table 2. Changes in firm-level productivity based on a survey by LSE and McKinsey on 100 manufacturing companies in France, Germany, UK and USA



<b>MANAGEMENT PRACTICE</b>	HIGH (top 25%)	+ 8%	+ 20%
	LOW (bottom 25%)	0	+ 2%
		LOW (bottom 25%)	HIGH (top 25%)
		<b>IT USE</b>	

IT investment has to go hand-in hand with management skills

Source: Dorgan and Dowdy (2004)



But which non-ICT using industries stand to benefit the most from ICT use?

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It can be measured through building a matrix, which combines industrial taxonomies on capital and educational input (Peneder 2002) with a taxonomy on ICT production and use (Van Ark, Piatkowski 2004) => **industries of the same nature should exhibit the same patterns in ICT use and consequently in productivity growth rates.**

Industrial taxonomy based on capital input versus ICT use: in spite of the same nature, there is a divergence in ICT use...

	<b>ICT-producing</b>	<b>ICT-using</b>	<b>Non-ICT</b>
<b>Mainstream manufacturing</b>	1.manufacture of office machinery and computers (30)	<b>1.Machinery and equipment (29)</b> <b>2.Other transport equipment (351, 353, 352+359)</b>	<b>1.Rubber and plastic products (25)</b> <b>2.Other non-metallic mineral products (26)</b> <b>3. Motor vehicles, trailers and semio-trailers (34)</b>
<b>Labor-intensive</b>		<b>1.Wearing apparel and furriery (18)</b> <b>2.Electrical machinery and apparatus (31-313)</b> <b>3.Furniture; other manufacturing (36-37)</b>	<b>1.Leather and manufacture of leather products (19)</b> <b>2.Wood and wood products (20)</b> <b>3.Metal products (except machinery and equipment) (28)</b>
<b>Capital-intensive</b>			1.Textiles (17) 2.Coke, refined pretroleum products and derivatives (23) 3.Pulp and paper (21) 4.Chemicals and chemical products (24) 5.Basic metals (27)
<b>Marketing driven</b>		1.Publishing and printing (22)	1.Food products and beverages (15-16) 2.Tobacco products (16)
<b>Technology driven</b>	1.manufacture of radio, TV and communications equipment (32)	1.Medical precision and optical instruments, watches and clocks (33-331)	

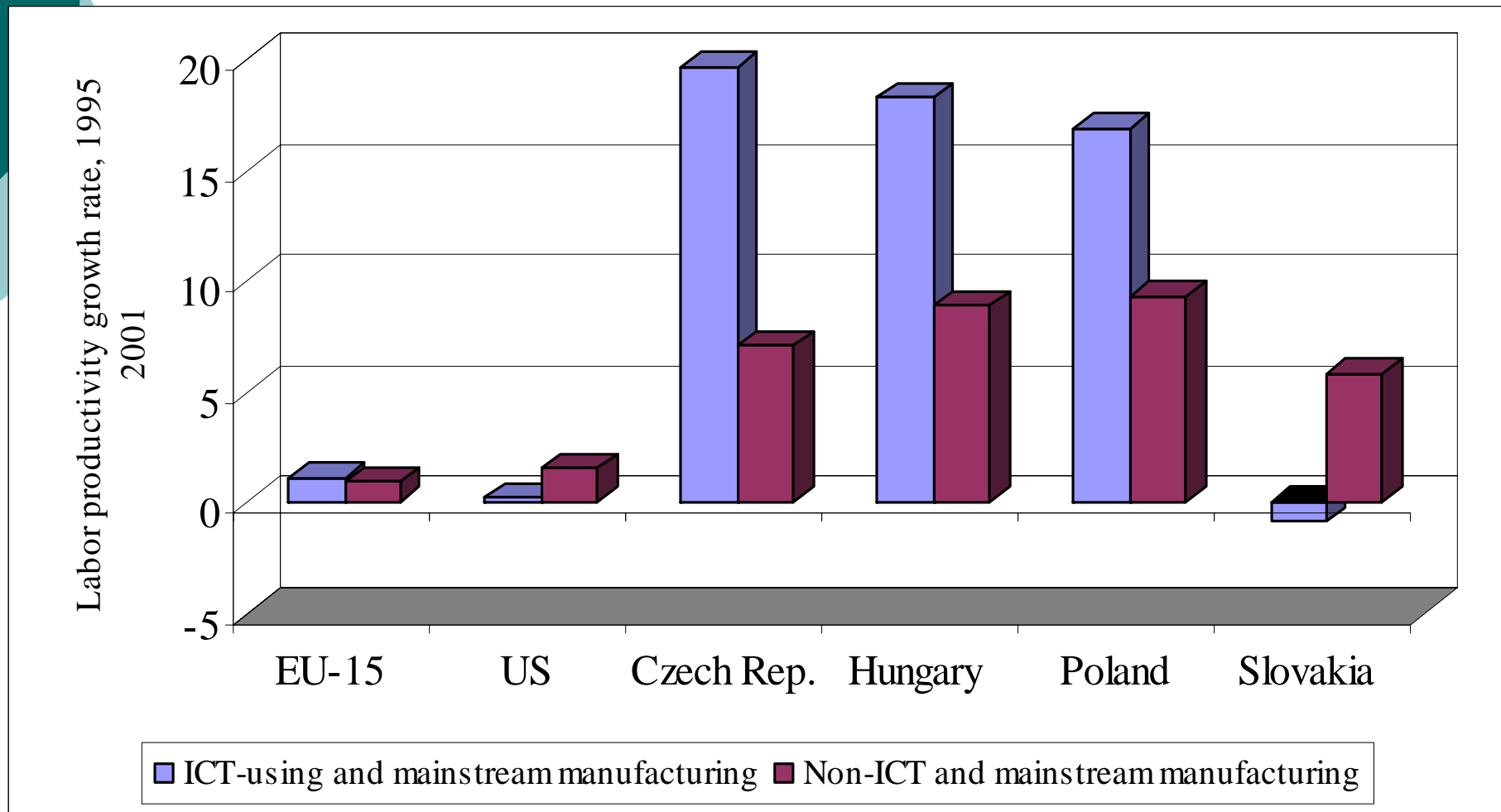


Similar conclusions can be drawn from ICT use vs. labor skills matrix...

	<b>ICT-producing</b>	<b>ICT-using</b>	<b>Non-ICT</b>
<b>Low skill</b>		1. Wearing apparel and furriery (18)	1. Rubber and plastic products (25) 2. Other non-metallic mineral products (26) 3. Leather and manufacture of leather products (19) 4. Textiles (17) 5. Basic metals (27) 6. Food products and beverages (15-16) 7. Tobacco products (16)
<b>Medium-skill blue collar</b>		1. <b>Other transport equipment (351, 353, 352+359)</b> 2. <b>Furniture; other manufacturing (36-37)</b>	1. <b>Motor vehicles, trailers and semio-trailers (34)</b> 2. <b>Wood and wood straw and wicker products (20)</b> 3. <b>Metal products (except machinery and equipment) (28)</b>
<b>Medium skill white Collar</b>	1. Radio, TV and communications equipment (32)	1. <b>Medical precision and optical instruments, watches and clocks (33-331),</b> 2. <b>Publishing and printing (22)</b> 3. <b>Electrical machinery and apparatus (31-313)</b>	1. <b>Coke, refined petroleum products and derivatives (23)</b> 2. <b>Pulp and paper (21)</b> 3. <b>Chemicals and chemical products (24)</b>
<b>High skill</b>	1. Manufacture of office machinery and computers (30)	1. Machinery and equipment (29)	

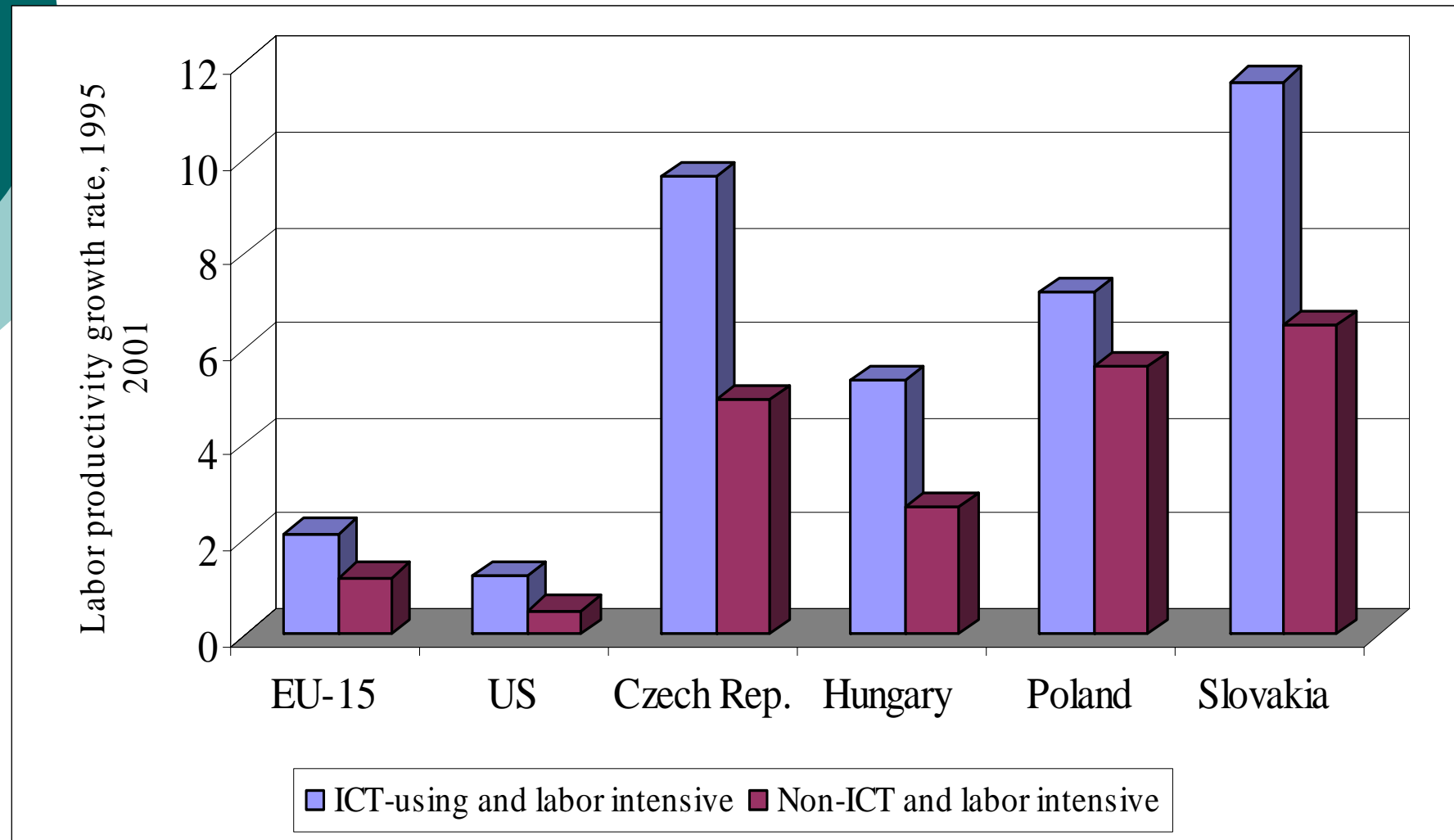


ICT-using industries in mainstream manufacturing recorded much higher productivity growth than non-ICT using industries...



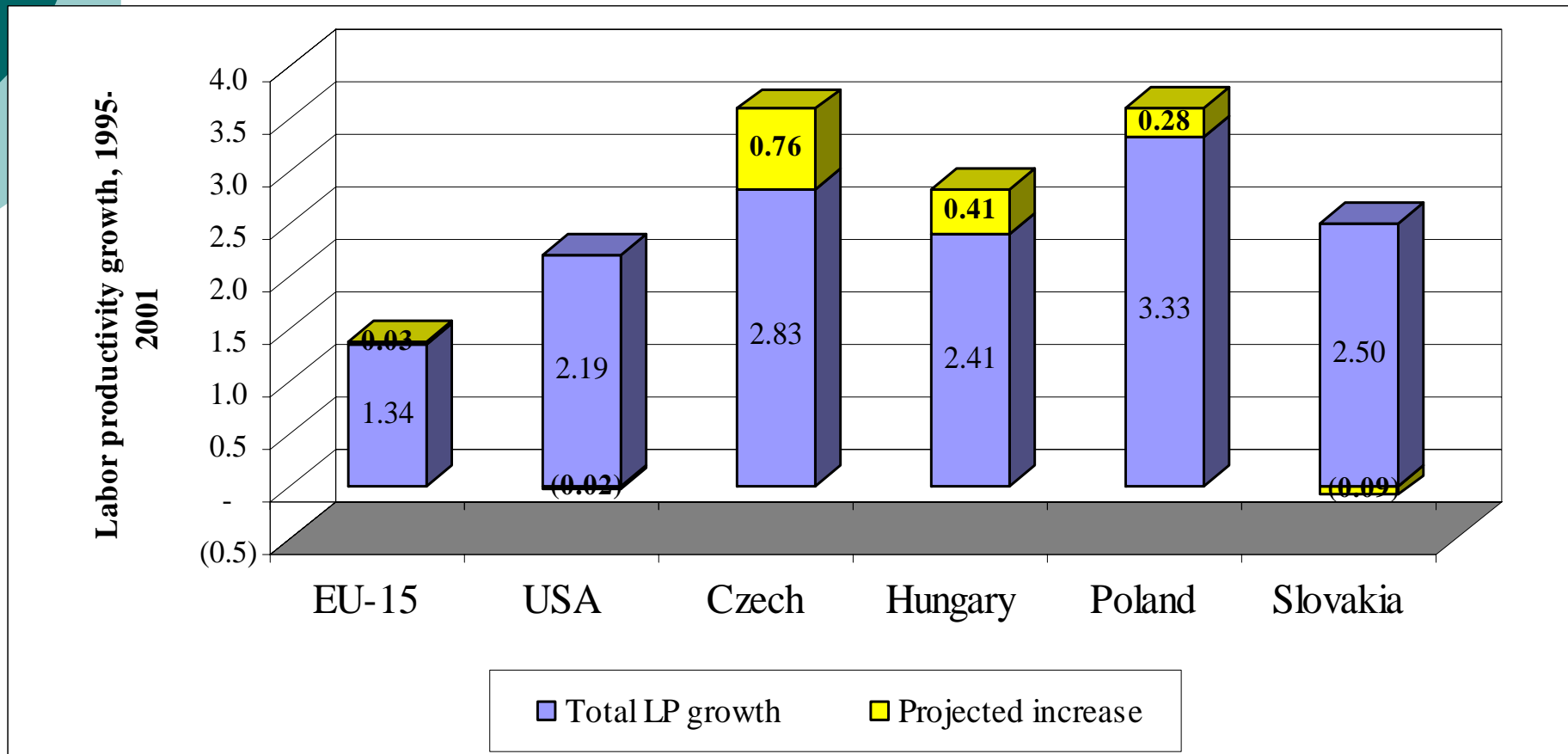
Source: based on Piatkowski (2004b)

.. Similarly as in labor intensive industries...



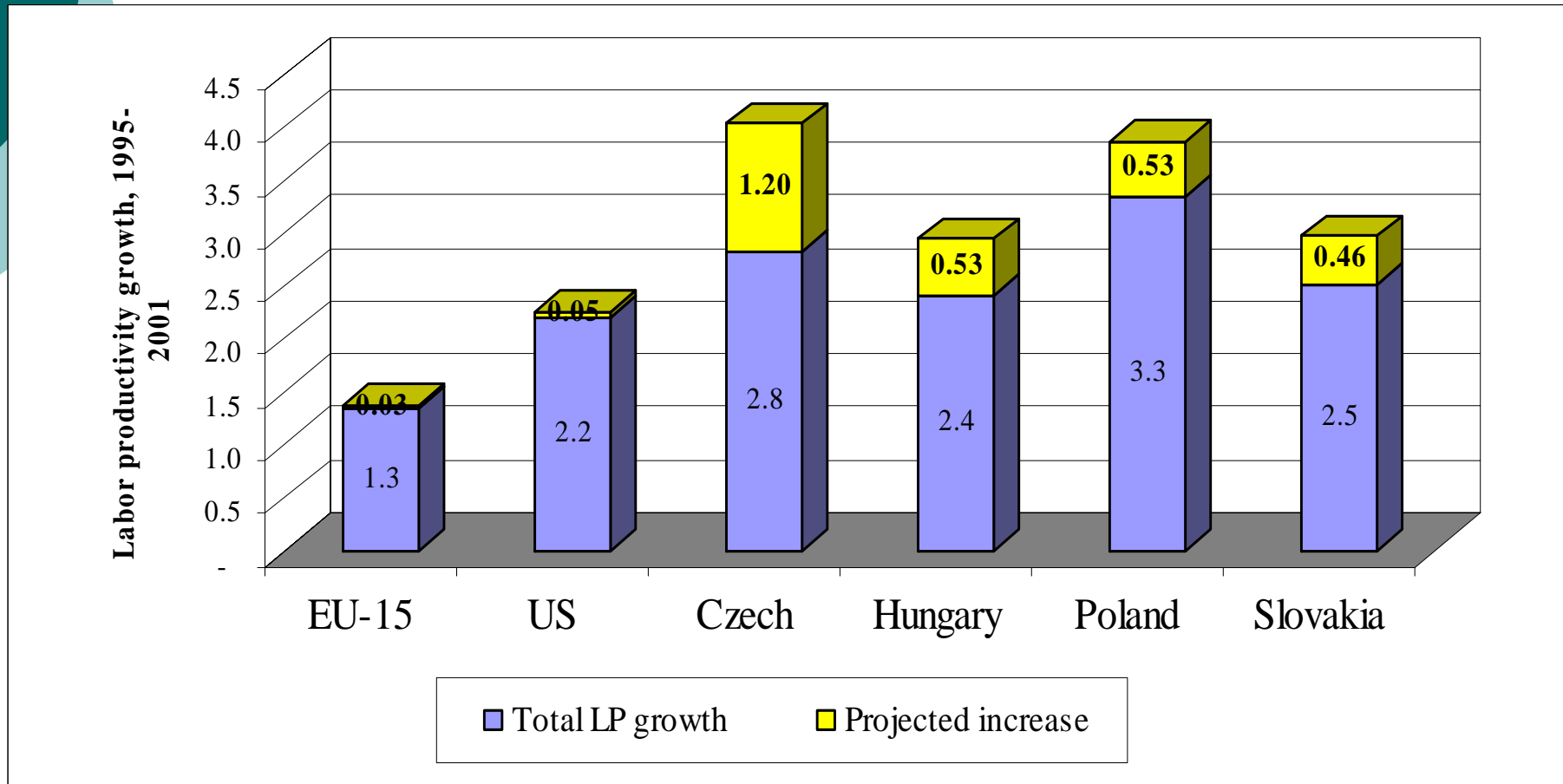
## What if non-ICT industries used ICT more intensively and caught-up with productivity growth rates in ICT-using sectors? It would have significant effects on total productivity growth...

Figure 8. Contribution to total labour productivity (LP) growth due to increase in LP in non-ICT mainstream manufacturing and labor intensive industries, annual average, 1993/5-2001



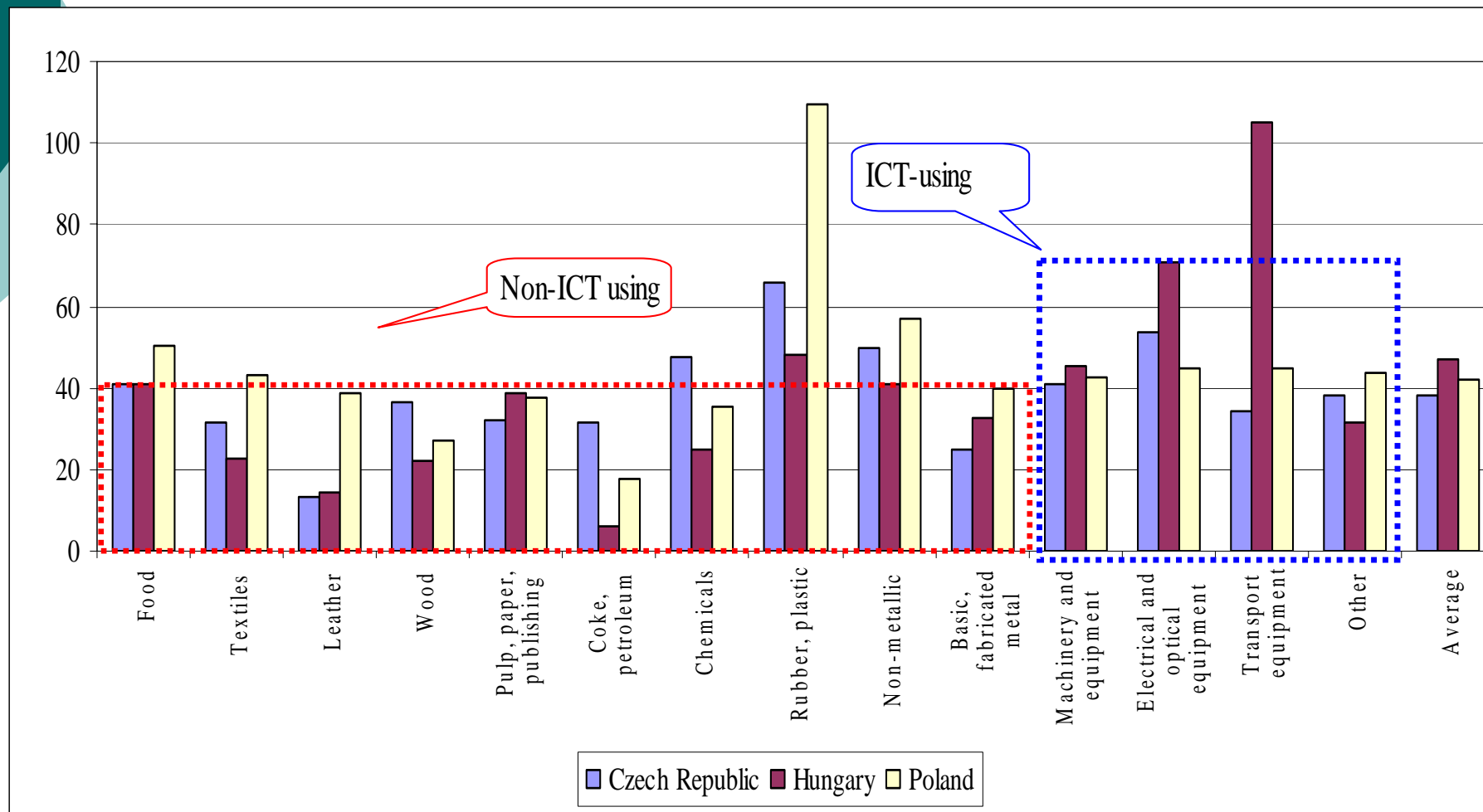
## Even more robust results for projections based on the educational input vs. ICT matrix...

Figure 9. Contribution to total labour productivity (LP) growth due to increase in LP in non-ICT medium-skill blue collar and white collar industries, annual average, 1993/5-2001

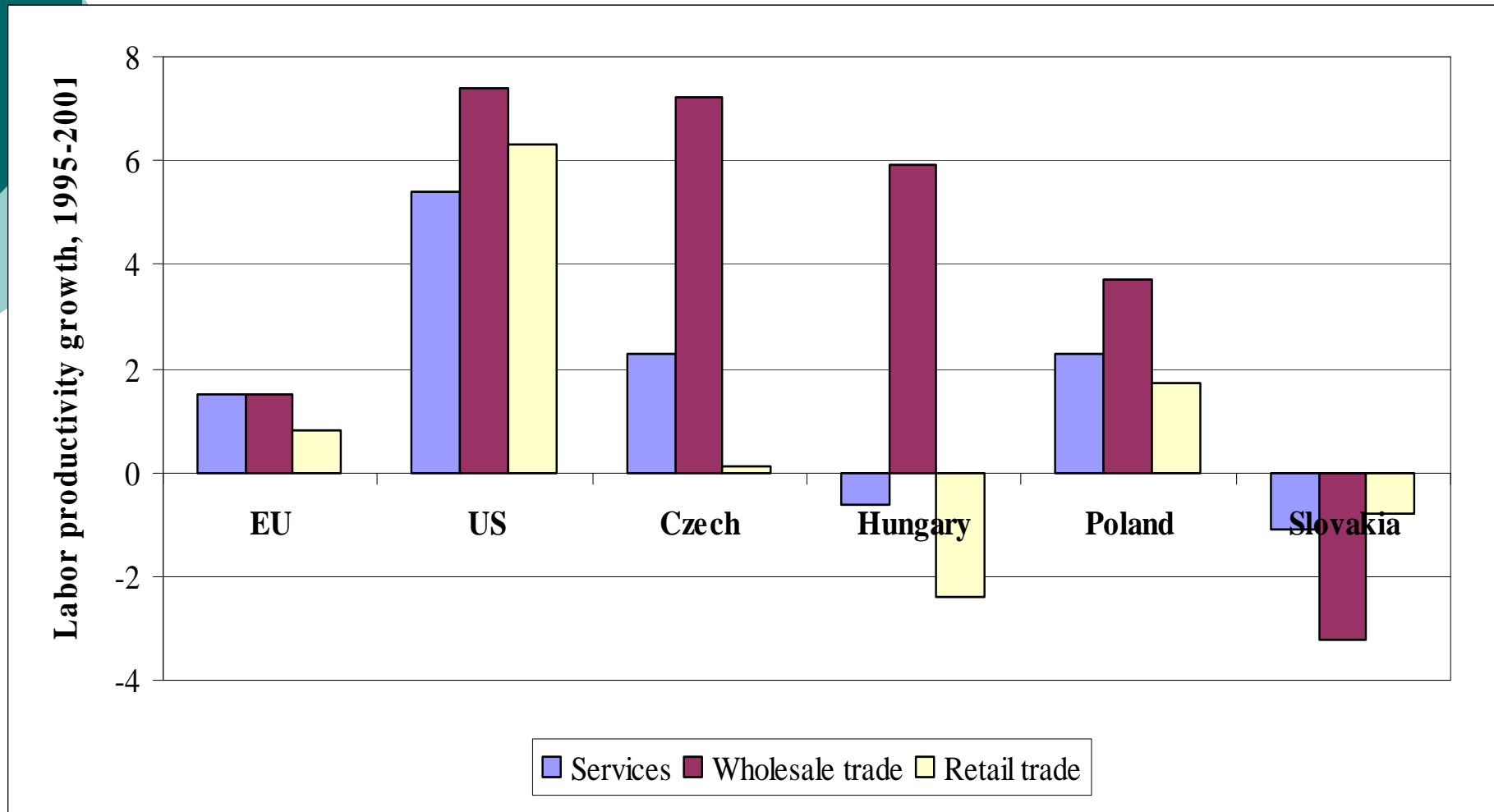


## Faster productivity growth in non-ICT using sector is realistic given its low productivity levels and thus large catching-up potential...

Figure 10. Labour productivity levels in manufacturing industry in CEE countries, 2002, Austria=100

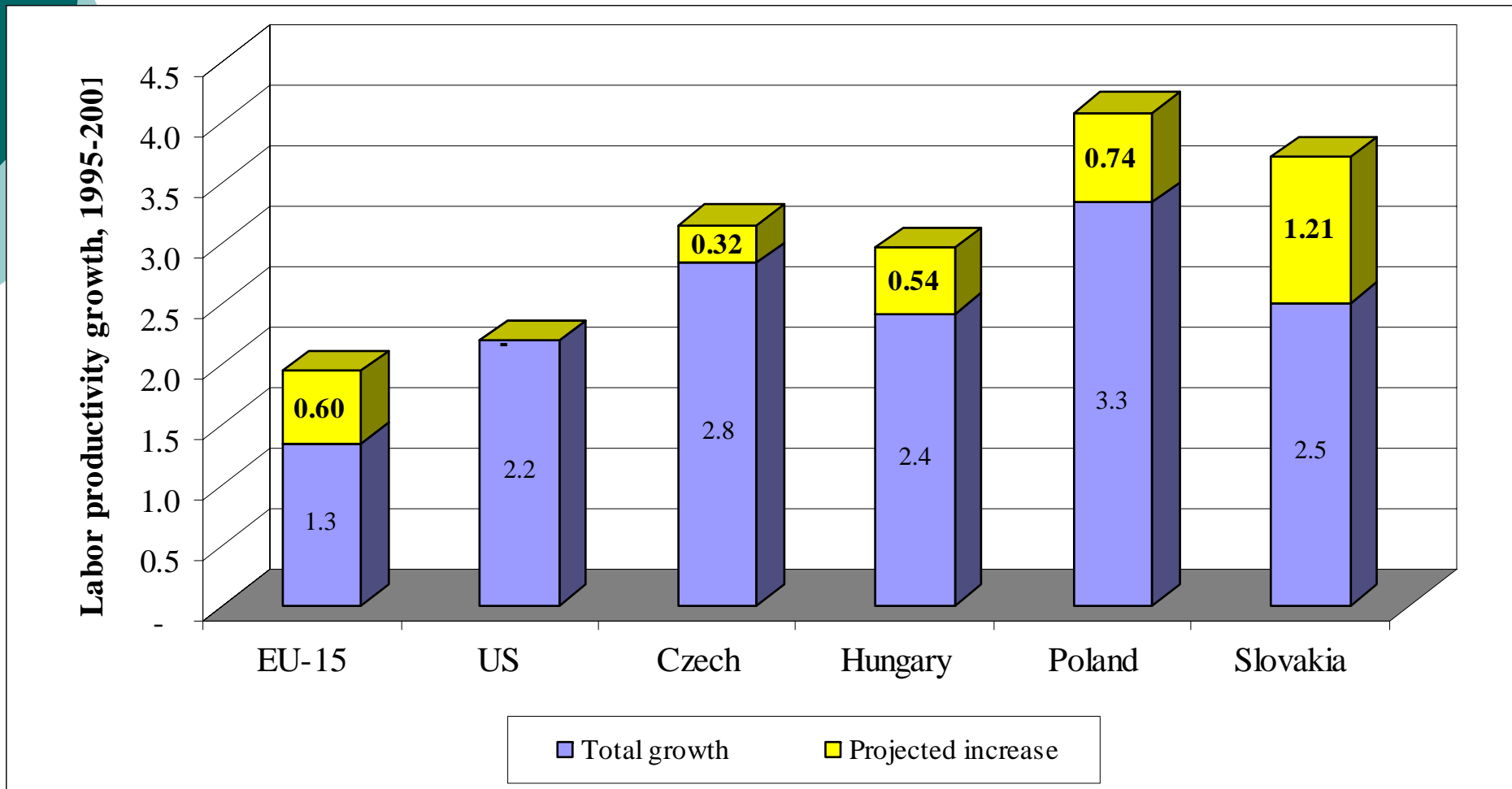


There is also untapped potential in the ICT-using service sector: ICT-driven productivity growth in wholesale and retail trade in the US was much higher than in CEE countries ...



Source: based on Van Ark and Piatkowski (2004)

If these sectors in CEE countries caught-up with the US productivity increase, benefit to the overall productivity growth would be substantial...





## Expert assessment of industry-level ICT potential in the US

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Table 2. Estimates of the potential savings due to the use of Internet in USA during 2000-05, by sub-sectors

Sub-sector	Estimated savings until 2005 (in billion \$)	As share of GDP in 2003
Education	Hard to estimate	-
Financial services	19	0,2%
Public administration	At least 12	0,1%
Health	41	0,4%
Manufacturing	50-100	0,5% - 1,0%
Retail trade	Hard to estimate	-
Transport	3-79	0%-0,7%
Total	125-251	1,2%-2,4%





## Summary

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1. ICT investment has a large potential to accelerate productivity and economic growth as evidenced by its substantial contribution to growth during 1995-2001 in some CEE countries.
2. The size of ICT investment is dependent on the quality of economic and institutional environment (not simply because of GDP levels).
3. Use of ICT increased productivity growth in ICT-using industries. Yet, it is not enough to invest in ICT: its productive use depends on managerial skills.
4. There is a „two-stage” ICT-led pattern of development: in the second stage, the continued productivity growth must be dependent on faster growth in non-ICT using industry and in the whole service sector.
5. ICT producing sector is too small to be a main driver of growth (perhaps with an exception of Hungary and the Czech Republic). Yet, in spite of its small size, it can still have a large contribution to growth thanks to its high productivity growth rates.
6. For some non-ICT industries ICT use may have higher economic potential than for others.



## Preliminary policy recommendations

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1. Stimulate conducive business environment to increase ICT investment: macroeconomic stability, developed financial markets (VC), labor markets flexibility, low administrative barriers, transparent and effective regulations, high level of competition, FDI.
2. Promote ICT investment in industries, particularly in some non-ICT using sectors: public rankings of industrial productivity, peer pressure, educational programs, public grants and co-financing, and development of public e-services and public e-procurement (push strategy)
3. Promote ICT production: stimulate emergence of clusters around academic centers, increase public spending on ICT procured by domestic companies.