



The Potential of ICT for Development in Transition Economies – Technological Leapfrogging or a Growing Digital Divide?

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Agenda and summary

- Motivation for research

- Main points:

- ICT investment led an accelerated convergence of five leading CEE countries with the EU-15 during 1995-2001 (the case of technological leapfrogging). Romania, Russia and – to a lesser extent – Bulgaria lagged behind (the case of digital divide).
- ICT production sector is too small to drive convergence. Hence, the catching-up will have to rely on the productive use of ICT in non-ICT producing sectors.
- Intensive use of ICT contributes to a faster productivity growth at the industry level in CEE countries: ICT-using industries reported much higher labor productivity growth rates than non-ICT using sector.
- Convergence of CEE countries can be described as a “two phase” process: the first phase is driven by ICT production and ICT use in manufacturing. In the second phase, the convergence has to rely on productivity growth in services and non-ICT using industries.
- More intensive use of ICT could bring sizable increase in aggregate productivity. This is however dependent on implementation of “second phase” structural reforms, business re-organization and investment in human capital and ICT skills.

- Policy recommendations.



Motivation for research

- Lack of quantitative estimates of the impact of ICT on growth and productivity in transition economies
- Lack of analyses of the potential of ICT for faster convergence with developed countries
- Insufficient understanding of the economic, institutional and regulatory determinants of diffusion and productive use of ICT



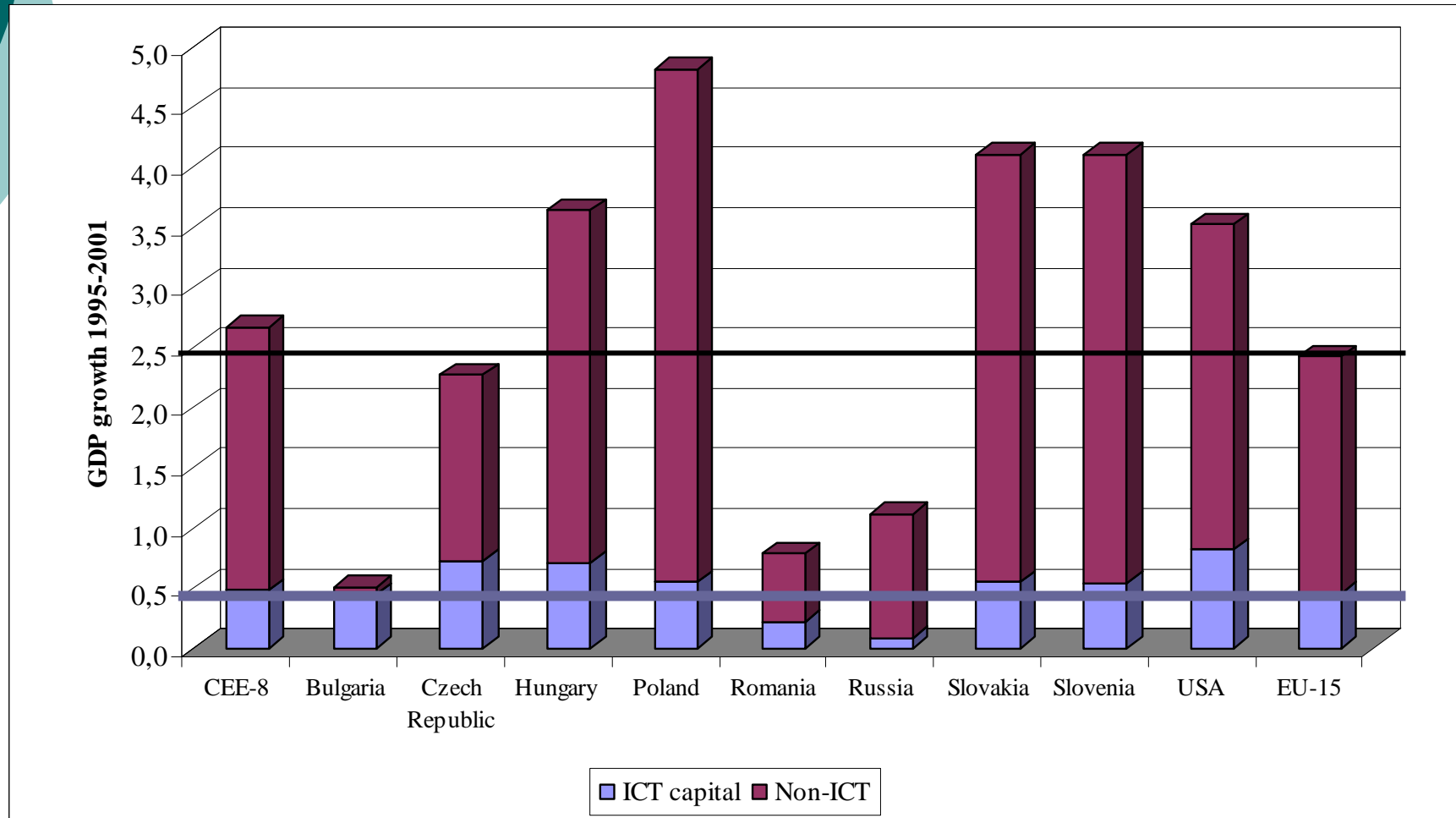
Multi-channel impact of ICT on growth

ICT production, which directly contributes to an increase in the aggregate valued added generated in an economy;

- Use of ICT capital as an input in the production of other goods and services;
- Increase in total factor productivity (TFP) of production in ICT sector, which contributes to aggregate TFP growth in an economy;
- Contribution to economy-wide TFP from increase in productivity in non-ICT producing sectors induced by production and use of ICT (spillover effects);

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

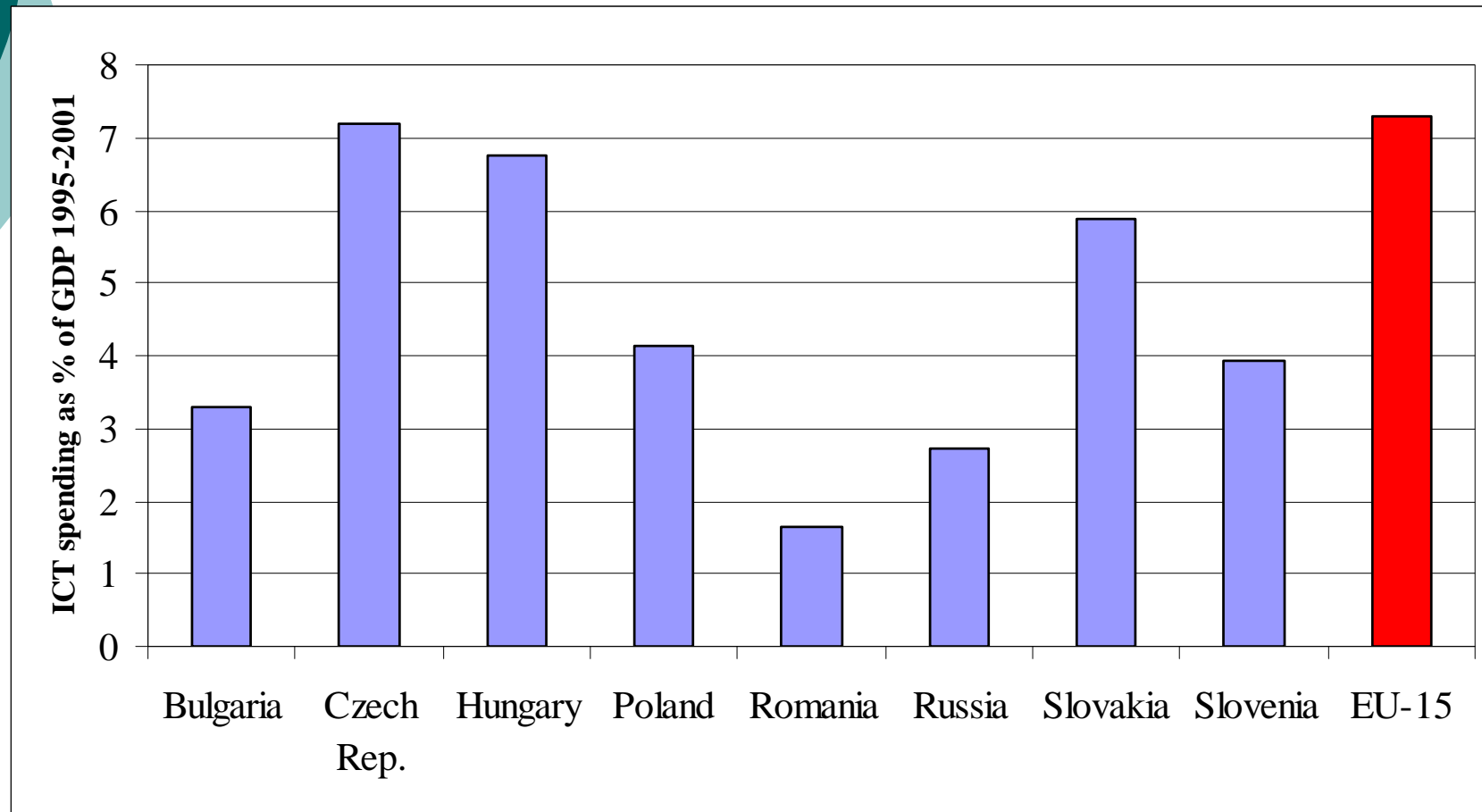
Figure 1. The contribution of ICT investment to GDP growth in CEE countries, EU-15 and the US, 1995-2001



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 differences in the quality of economic and institutional environment as shown by the „New Economy Indicator” based on...

Table 1: Variables and data sources for the New Economy Indicator

Factor	Variable	Source
1. Quality of regulations and contract enforcement	Sum of World Bank Regulatory Quality and Rule of Law Indicator*	Kaufmann et al. (2003)
2. Infrastructure	Sum of total number of telephone lines (main and cellular) and PCs per 1000 persons	WDI 2003
3. Trade openness	Share of trade in GDP (in %)	WDI 2003
4. Development of financial markets	Domestic credit to private sector (% of GDP)	WDI 2003
5. R&D spending	Annual R&D spending (% of GDP)	Eurostat 2003
6. Quality of human capital	Public spending on education (% of GDP)	Eurostat 2003
7. Labour market flexibility	Unemployment rate (in %)	WDI 2003
8. Product market flexibility	Product market regulation indicator (Nicoletti et al. 2000)**	EBRD 2003
9. Openness to foreign investment	FDI (% of GDP)	WDI 2003
10. Macroeconomic stability	Inflation (CPI) (in %)	WDI 2003

Source: Van Ark and Piatkowski (2004)

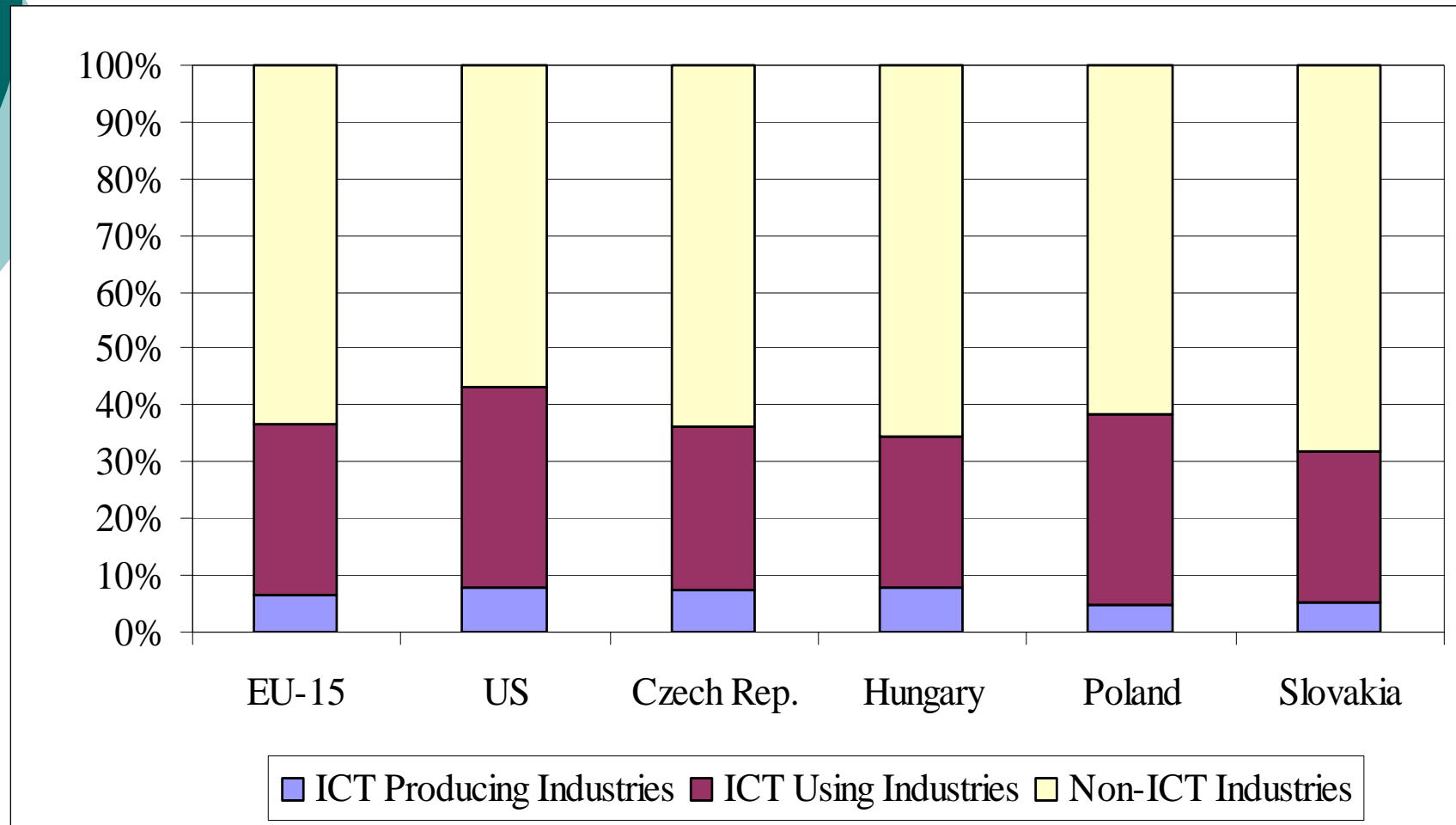


...where Bulgaria, Romania and Russia lag behind the leading CEE countries...

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
Slovenia	13	-0.180
Czech Rep.	14	-1.060
Hungary	15	-2.163
Italy	17	-3.141
Spain	16	-3.102
Greece	18	-5.399
Slovakia	19	-5.670
Poland	20	-7.042
Bulgaria	21	-10.372
Romania	22	-12.063
Russia	23	- 13,375

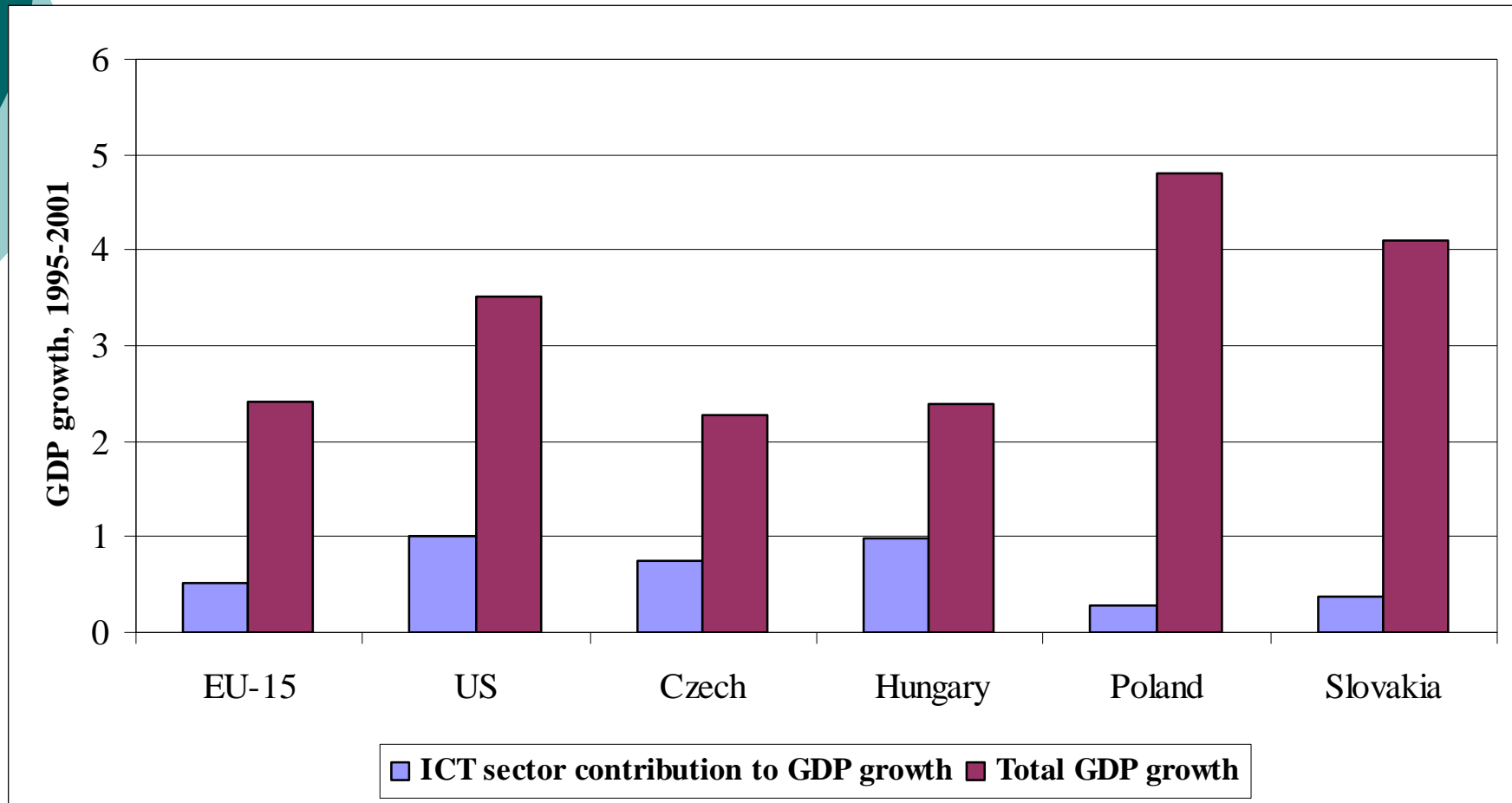
ICT production is still too small to be a driver of growth in CEE economies. ICT use has a much larger potential...

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



Nonetheless, ICT sector can contribute to catching-up thanks to its high productivity growth...

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



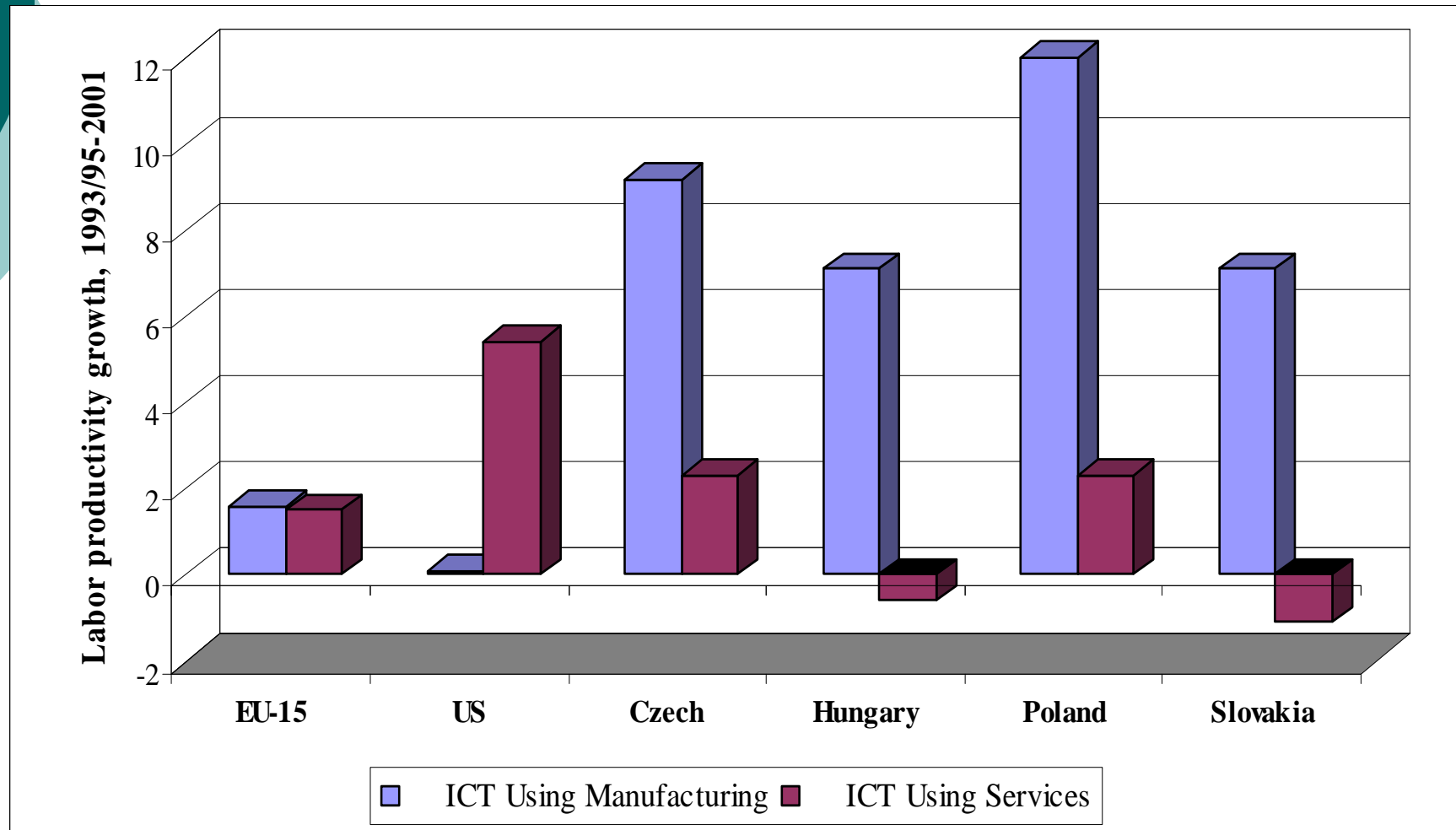
ICT production and use contributed to faster productivity growth in CEE countries...

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 was much lower in all countries, with the exception of the US...

Figure 6. Labor productivity growth in ICT-using manufacturing and ICT-using services, 1995-2001 average



Source: based on Van Ark and Piatkowski (2004)



This may suggest that ICT-led growth and convergence is a “two-phase” process...

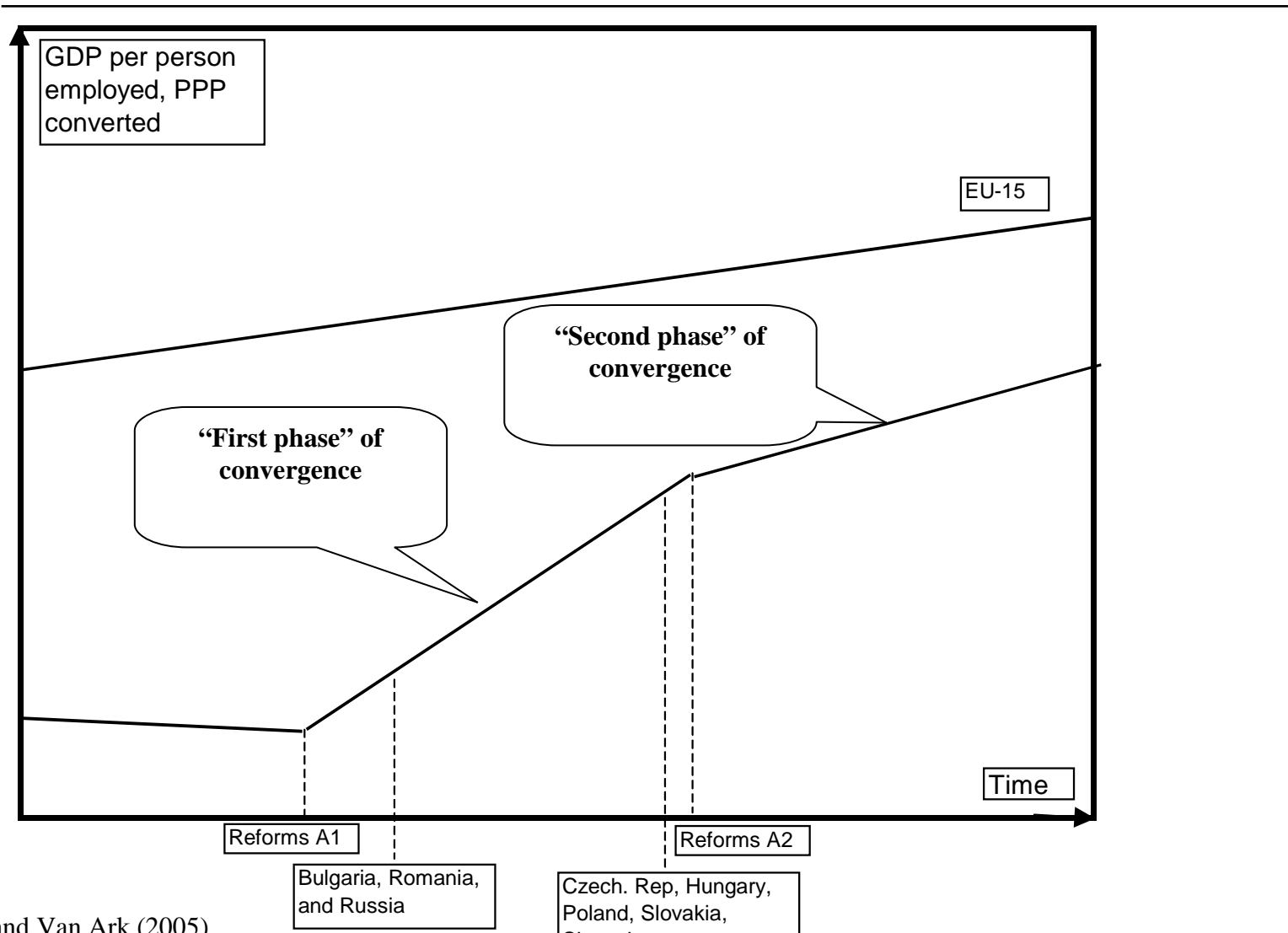
- In the first “restructuring” phase, convergence is driven by productivity growth in ICT-using manufacturing and a rise in ICT production (mainly through FDI);
- Later however, productivity growth slows down as the restructuring process in ICT-using manufacturing nears completion as well as simple post-transition growth reserves become exhausted (largely completed institution-building and privatization, achieved macroeconomic stability, elimination of most the loss-making SOEs etc.).



Hence, in the second “expansionary” phase...

- Faster productivity growth must be dependent on productivity increase in services and non-ICT using industries...
- ... which however requires that ICT investment, especially in the case of services, is complemented with managerial skills, human capital, business re-organization as well as a more conducive business environment (flexible product and labor markets). These are much harder to achieve.

The “two-phase” convergence can be shown as the following...



Source: Piatkowski and Van Ark (2005)

Only the U.S. has so far succeeded in moving to the “second phase” thanks to better business environment ...

Table 4. Indicators of business environment for ICT use in CEER countries, EU-15 and the US, 1993/94-2001 average

	<u>Reforms related to ICT use in Services in Second Convergence Phase</u>							Ranking
	%-point contribution of ICT-use in services	Product market regulation	Employment protection	R&D investments (1)	Development of financial markets (2)	Quality of human capital (3)	Composite Indicator for (1-3)	
Bulgaria	n.a.	n.a.	n.a.	0.59	15.2	3.3	(3.1)	10
Czech Republic	0.89	2.9	1.7	1.19	64.4	4.6	0.7	4
Hungary	0.07	1.6	1.4	0.75	26.5	4.6	(0.92)	7
Poland	0.92	3.3	1.9	0.70	19.2	5.2	(0.42)	5
Romania	n.a.	n.a.	n.a.	0.53	9.4	3.5	(3.08)	9
Russia	n.a.	n.a.	n.a.	0.94	10.9	3.8	(2.05)	8
Slovakia	-0.58	n.a.	n.a.	0.81	32.9	4.6	(0.67)	6
Slovenia	n.a.	n.a.	n.a.	1.46	33.1	5.8	1.83	3
EU-15*	0.47	1.5	2.4	1.91	87.4	5.1	2.99	2
USA	1.29	1.0	0.2	2.62	129.6	4.8	4.74	1

.. and probably also the quality of management practices which seem to be particularly important for the productive use of ICT ...

Table 5. Changes in firm-level productivity based on a survey by LSE and McKinsey on 100 manufacturing companies in France, Germany, UK and USA



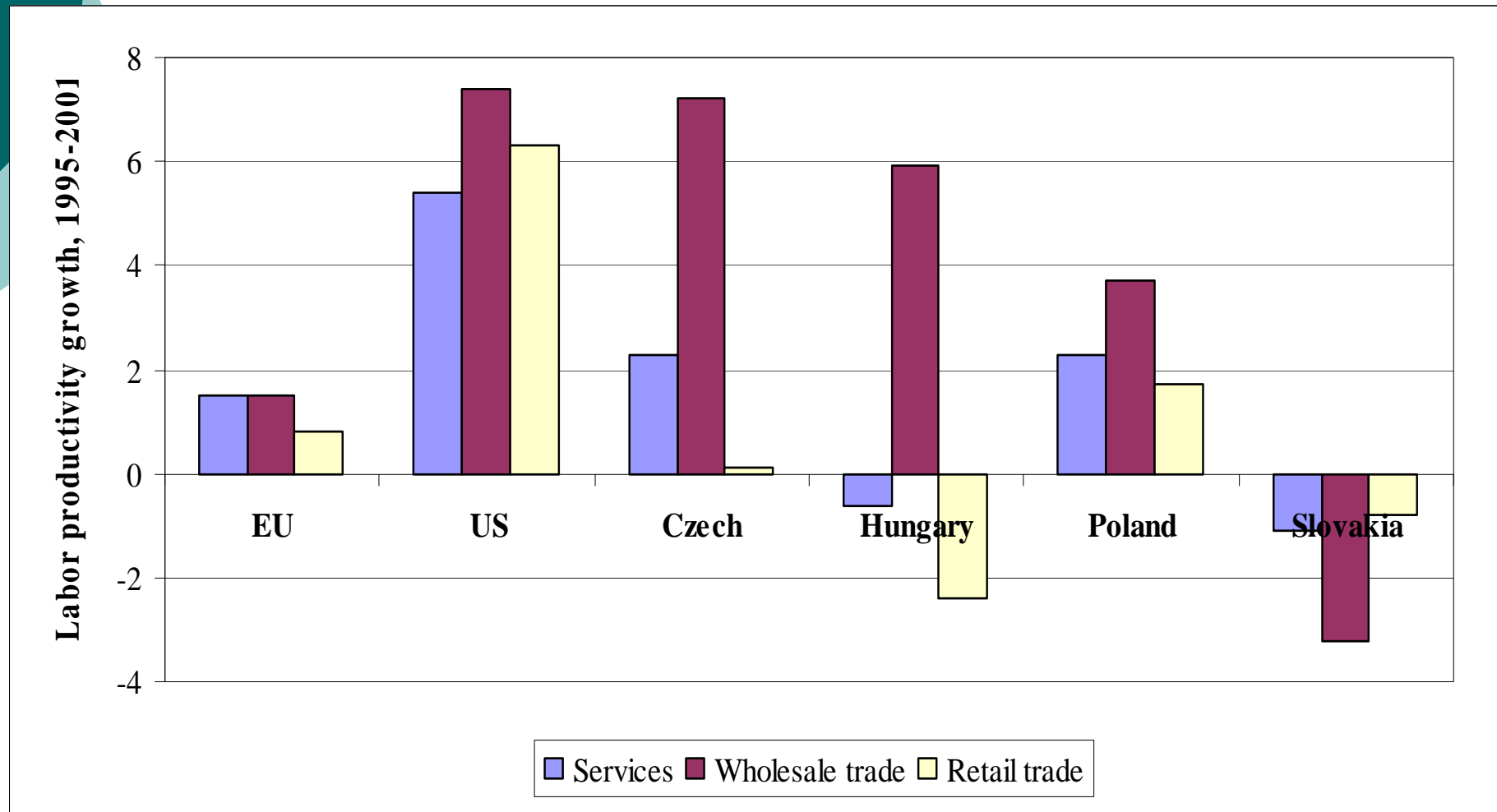
MANAGEMENT PRACTICE	HIGH (top 25%)	+8%	+20%
	LOW (bottom 25%)	0	+2%
		LOW (bottom 25%)	HIGH (top 25%)
		IT USE	

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

Source: Dorgan and Dowdy (2004)

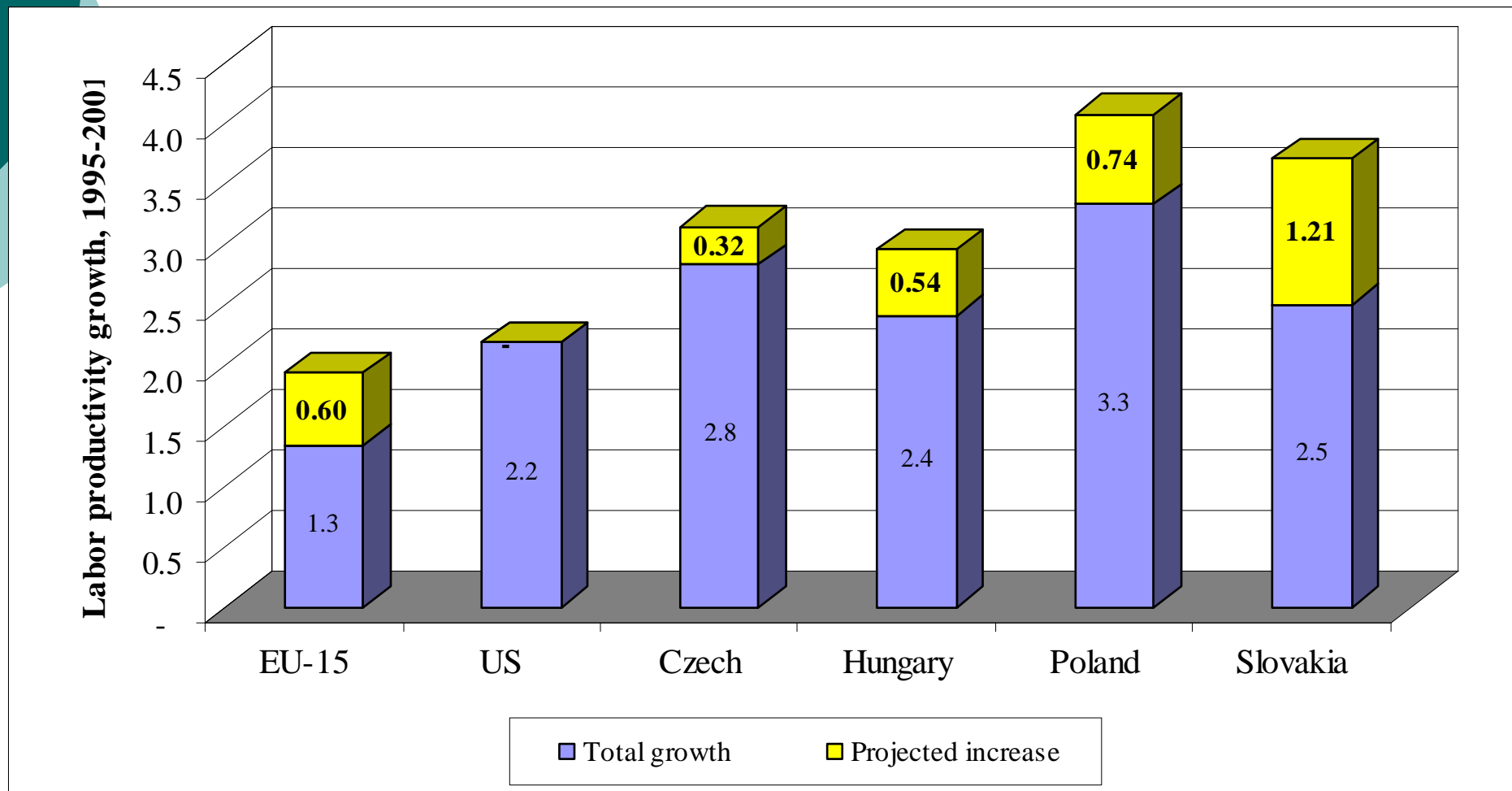
What would happen if productivity growth in retail and wholesale trade in CEE countries caught-up with the US productivity growth?...

Figure 7. Labor productivity growth in retail and wholesale sector, 1993/95-2001



Source: based on Van Ark and Piatkowski (2004)

It would have a sizable contribution to the aggregate labor productivity growth and thus to the speed of convergence...





Policy recommendations

- Stimulate conducive overall business environment – macroeconomic stability, low administrative barriers, flexible labor markets, transparent and effective regulations
- Competition, competition, competition!
- Develop public e-services (push strategy)
- Implement public e-procurement systems (spillover and network effects).
- Promote benefits of ICT use, particularly in the non-ICT using sector, through public productivity rankings, educational programs, public grants and co-financing.