Knowledge Transfer Study 2010-2012
Expert workshop

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Knowledge transfer and IP management at universities and public research institutes in Bosnia-Herzegovina

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R&D and inovation activities in BiH: a historical perspective

- During socialist period, S&T and technological progress in general was considered as an essential 'productive force' underpinning successful transformation of economy and industrial progress.
- In the transition period technology related issues have been largely neglected, and economic restructuring relied exclusively on economic forces; industrial restructuring relied mainly on privatisation and institutional reform.
- Restructuring of National System of Innovation (NSI) or R&D Systems was not considered important! S&T as a liability and unnecessary burden.
- Result: 'Erosion of NSI' in the course of transition!

R&D and inovation activities in BiH: a historical perspective

Key facts:

- Gross Expenditures on R&D (1985-1989) in GDP was 1.85 *(EI (1991); Basic, 2004)* compared to en estimated less than 0.1 percent in recent years *(Strategy of science development in BiH 2010-2015)*
- *R&D system consisted of 36 R&D institutes and 22 Scientific Research laboratories (extra mural, independent research institutes) closely linked to industries (Basic, 2004)*- R&D infrastructure as main source of industrial R&D*!*
- *Now a days, R&D system consists of 42 formally registered institutes for science and research activites (mainly within universities) which, however, bearly perform any research activities and have no-weak links with industries (Ministry of Science and Technology of RS and Institues for Scientific Info-ISI*

NSI- R&D System and Institutional Setting

- BiH Srpska (RS) and Federation of BiH and the highly decentralised and complex state structure: Republic of District
- Institutions responsible for R&D policy:

1. *Ministry of foreign trade and economic relations of BiH*
2. *Ministry of civil affairs of BiH*
3. *Ministry of science and technology of RS*
4. *Ministry of industry, energy and mining of RS*
5. *Ministry for education and science of Federation of BiH*
6. *Ministry for development, entrepreneurship, small crafts of FBiH*
7. *Ministry of energy, mining and industry of FBiH*

(Source: Small and Medium sized Enterprise Development Strategy in Bosnia and Herzegovina 2009 – 2011)

- *Institutional overlapping additional weakness, limited financial resources and capacities on gov't side!*

NSI- R&D System and Institutional Setting

- Institutes registered for research activities:
- Independent R&D institutes mainly closed, very few incorporated into Universities in the aftermath of war!
- Currently within RS there are 21 eligible Institutes
- In Federation of BiH: 20 public Institutes, 10 independent
- Major problems of current NSI are:

a. *Low industry related research capabilities inherent in Universities;*

b. *Institutes receive marginal state funding and are basically operating as independent research and consulting organisations,*

c. *No links to industries – Industrial R&D not funded by industry*

NSI- R&D System and Policy Setting

- Industrial and innovation policy in BiH?
- There is no (proper) innovation policy in BiH!
- The strategic documents that do acknowledge the importance of innovation:

-"*Strategy of Science Development in BiH 2010 – 2015"*
- *"Strategy of SME Development in BiH 2009 – 2011"*
- *"Strategy of SME Development in Republic of Srpska 2006 – 2010"*
- *"Development of SME Entrepreneurship in Federation of BiH"*

- however, lack effective policy measures and cohesion between industrial and innovation policy.
- Consequently: R&D funding not linked to industry, R&D policy reflects some-modest state funding of scientific research mostly allocated to Universities (Uni. Institutes eligible for research). These institutes are characterized by limited research capacities (predominantly teaching institutions)
- No funding of industrial R&D, though some specific support measures do exist in RS including support to applied research, human resource development, acquiring production technology, and in FBiH in certain programs that support SME R&D projects but are rather exception!

Knowledge performance: key indicators

- No/limited DATA from official sources

-State funding: GERD are approximated at 0.1 of GDP – reference year 2008 *(Strategy of Science Development BiH 2010-2015); 7.9 EUR million*

- Industrial R&D: no statistical data (some survey data) RS=0.3 % of annual income for small-size and 0.63 of income for medium-size enterprise (RS Pilot survey)

-Human Capital: no statistical data; Employment in MHT&HT estimated at 11%; S&E staff 2.4% (average skills ratio) *(Silajdzic, 2011); Tertiary Edu and S&E graduates N.A.- postgraduates:34 in RS; 130 in FBiH (Statistical yearbook 2010)*

-Patenting activity: 4632 no. of patents applied at EPO per 1 million inhabitants, reference year 2010, source Institute for Intellectual Property Rights BiH)

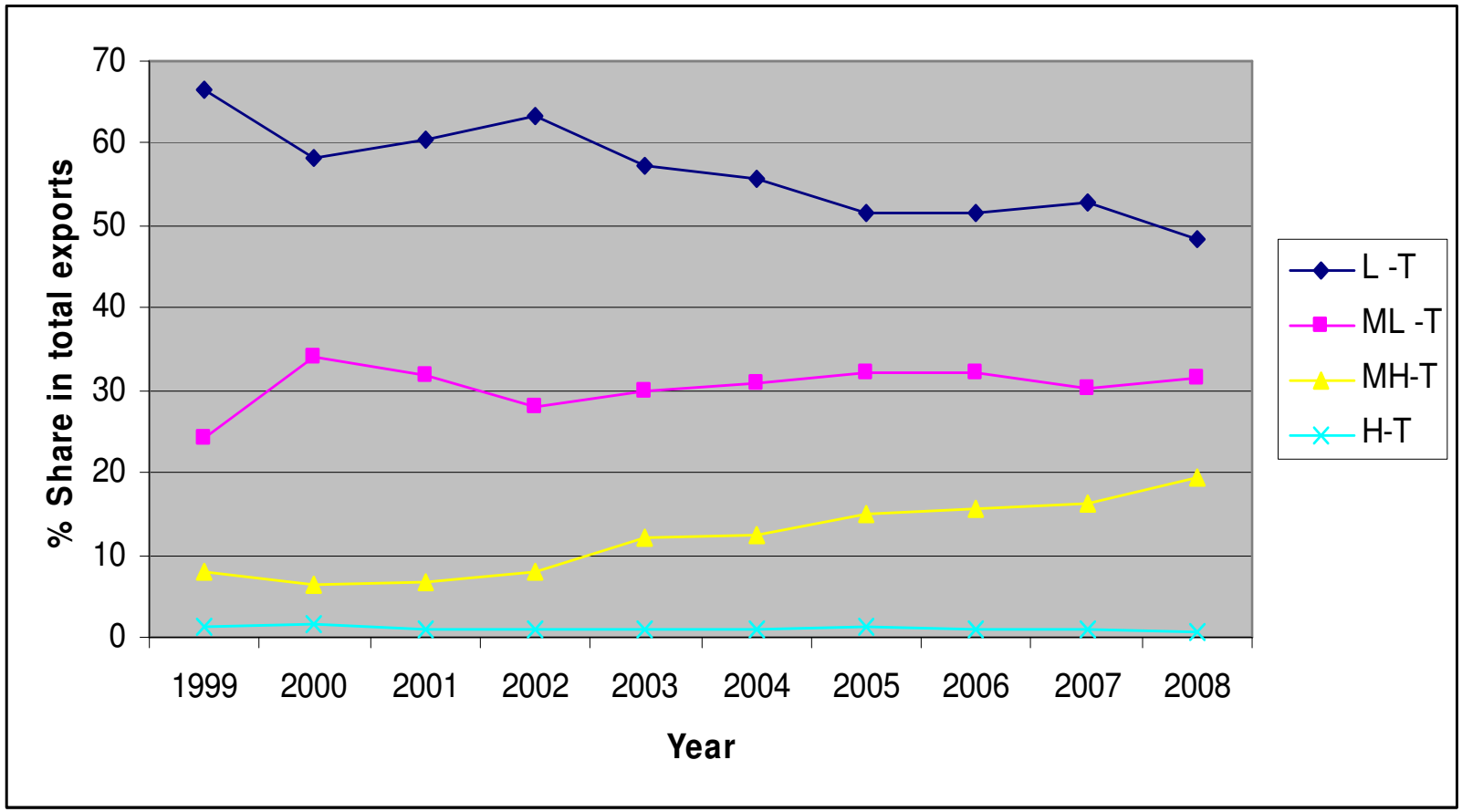
-Science and social science publications: no. of journal articles 103.5 (reference year 2009, source ISI)

Industrial performance and R&D

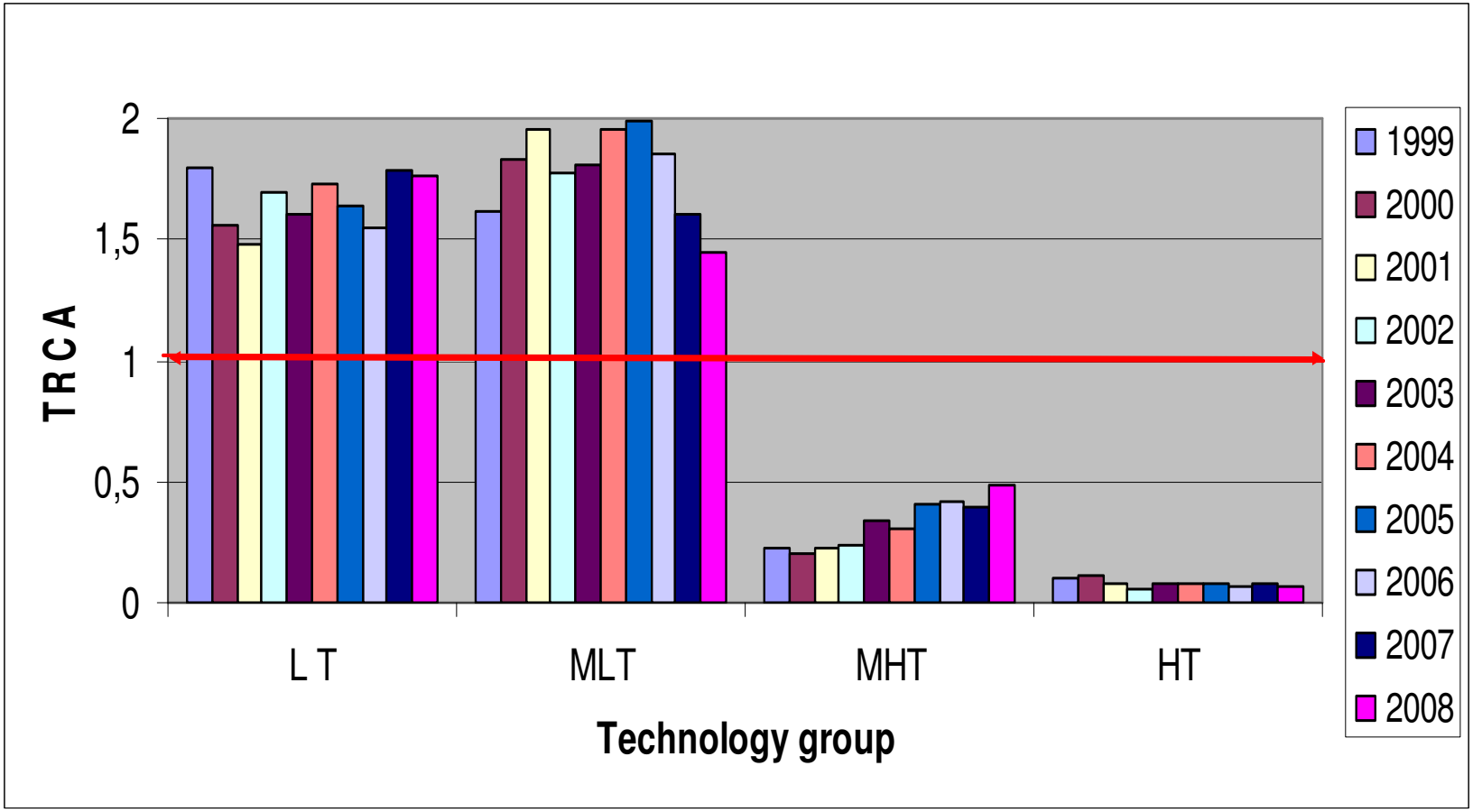
- Limited productive and technological capacity:

a. Manufacturing sector in GDP 13.6%, manufacturing exports in total exports 14.5 %(*BH Statistical Agency, 2010)*
b. Percentage share of SMEs within manufacturing 13.03 (*Small and Medium Sized Enterprise Development Strategy in BiH 2009-2011*)
c. MVA in GDP estimated at 9.3 %, share of MHT and (HT) exports in total exports at 21.3, fairly underrepresented.
d. Limited industrial R&D capabilities: low in-house R&D
e. Technological advancement mainly from external sources, primarily embodied in machinery and equipment!
f. Excessive reliance on external knowledge generation!

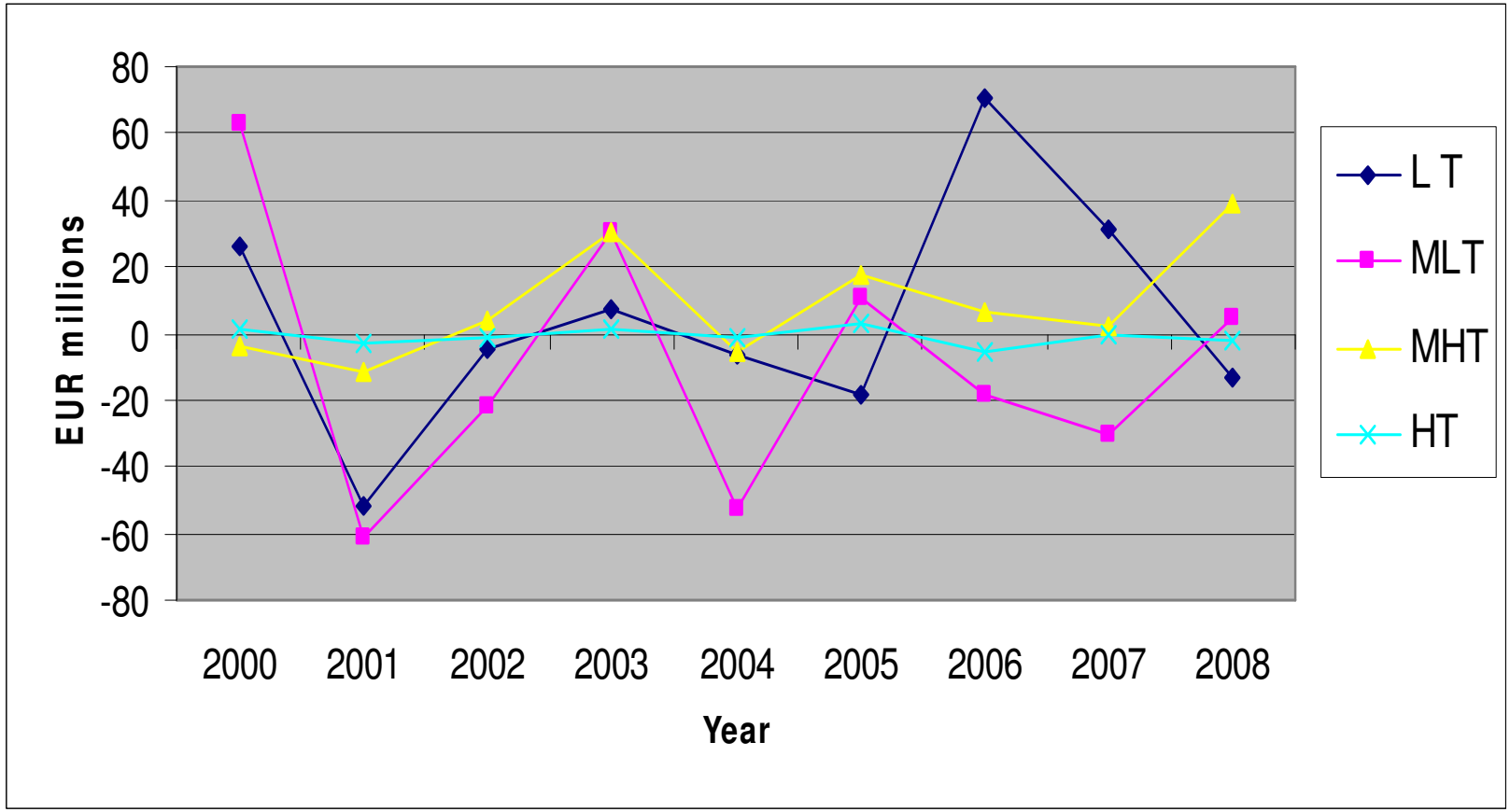
Industrial performance 1999-2009 (Silajdzic, 2011a)



Industrial performance 1999-2009 (Silajdzic, 2011a)



Industrial performance 1999-2009 (Silajdzic, 2011b)



Industrial performance and R&D: survey results (Silajdzic, 2007:2011)

- Study objective: To investigate factors determining competitiveness of manufacturing firms in TE and BiH and the relative importance of technology factors.
- The study *relies on data collected through an extensive firm level survey of 227 firms from manufacturing industry*
- Inovative activity by firms (main discriptive statistics):
- Percentage of firms with formal R&D: 9%; Innovation active firms: 78 %
- Certificated firms (53.7%) ISO, TUW
- Investment in equip. per employee (in BAM) 1041.34 (7357.5)
- R&D/innovation expenditure, per employee (in BAM)1545.7 (3217.5)
- R&D/innovation expenditure, % of sales 1.24 well above RS survey result!
- Patents registered abroad, ratio 0 (only one firm in the sample)
- Patents registered domestically, ratio 0
- New products, % of sales 18.45 (19.31)
- New processes, % of sales 18.40 (24.09)

Industrial performance and R&D: survey results

- Study objective: To investigate factors determining competitiveness of manufacturing firms in TE and BiH and the relative importance of technology factors.
- The study *relies on data collected through an extensive firm level survey of 127 firms from manufacturing industry*
- *TCij = f (Technology, Innovation, Knowledge, Foreign partnership & FDI, Externalities, External environment)*

Accordingly, we specify the following model:

$$\left(Exp/Sales\right)_{ij} = \alpha_0 + \beta_1 Tech_{ik} + \beta_2 Certif_{ij} + \beta_3 Patent + \beta_4 Newp + \beta_5 NewT + \beta_6 invRD_{ij} + \beta_7 \ln HSR_{ij} + \beta_8 RDDep_{ij} + \beta_9 Frgn_{ij} +$$

$$\beta_{10} FrgnP_{jk} + \beta_{11} Spillover_{jk} + \beta_{12} Geoprox + \beta_{13} Gov\sup_{ij} + \beta_{14} Inst\sup + \varepsilon_{ij}$$

Industrial performance and R&D: survey results (Silajdzic, 2007:2011)

- **The assesment of institutional importance:**
- **Obstacles to innovation: factors of high importance discriptive statistics (percentage)**

- **Collaboration and networking** (60%) of which:

a. Lack of collaboration with R&D institutions (48.1)
b. Lack of inter-firm innovation collaboration 34 (32.01)

- **Technology and Innovation Policy** (76.4) of which**:**81

a. Lack of (access to) R&D subsidies (50.03)
b. Lack of (access to) qualified personnel (13.2)
c. Lack of access to information about new technology(8.4)
d. Lack of support in product/process standardisation (20.7)

Industrial performance and R&D: survey results (Silajdzic, 2007:2011)

- **The assesment of institutional importance:**
- Investigating the impact of eroded NSI in the course of transition (results of econometric analysis- OLS)
- Key findings:

1. Overall firms seem to have benefited from inv. in new technologies, greater integration with foreign partners and the related externalities.
2. Weak NSI: results suggest devastating impact on firms competitive performance and technological upgrading.

Industrial performance and R&D: survey results (Silajdzic, 2007:2011)

Regressor	Coefficient *t* stat	Regressor	Coefficient *t* stat
Const	-	Prod_S	-.126 *(-1.06)*
MHT	**.556 *(3.80)******	Proc_S	**.295 *(2.33)*****
HT	.401 *(1.86)**	Geoprox	.393 *(1.47)*
Certif	.207 *(1.25)*	Frgn	**.403 (3.53)*****
Patents	----	Size	.415 (1.36)
N_prod	.0007 *(0.55)*	R&D Inst	**-.115(-3.23)*****
N_proc	**.004 *(2.70)*****	R&D Coll	**-.224(-2.71)*****
R&D	*-.0000 (-0.93)*	R&D Sub	**-.108 (-2.50)****

Concluding Remarks

- The Weak NSI likely to continue to have devastating effects:
- *"firms are not isolated in their innovation activities but rather perform them in networks ..."*
- Overall, the design of an effective policy requires capabilities and resources on the government part
- Innovation policy is non-existent in BIH.
- The current features of the BiH political system and political culture do not render much optimism with respect to the overall capabilities and political will of BiH authorities to develop comprehensive and complementary policy mix to effectively build local capabilities.
- This is particularly worring considering the following:
- The growing importance of "technology" in understanding competitiveness and specialisation patterns amongst countries.
- The current milieu of accelerated technological development and increasing globalisation of TEs including BiH
- The benefits a country can derive from opening up to foreign markets, would depend largely on their technological prowess