HIGHER SCHOOL OF ECONOMICS
NATIONAL RESEARCH UNIVERSITY

ISSEK Institute for Statistical Studies and Economics of Knowledge

Research Laboratory for Economics of Innovation
Research Laboratory for Science and Technology Studies

Studying the Role of Public Research Organisations

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Linkages between actors in the innovation system

Extended Workshop

Moscow, 13.06.2012

Contents

- **The context: corresponding international studies, role of RTOs in Russia, pilot studies**
- **Defining RTO technology transfer strategies**
- **Regional issues**
- **Prospects and challenges**

The subject

- **Main concept**

  RTOs are understood as "…organisations with significant core government funding (25% or greater) which supply services to firms individually or collectively in support of scientific and technological innovation and which devote much of their capability (50% or more of their labour) to remaining integrated with the science base…" (Hales 2001).

- **Russian context**

  The contemporary Russian S&T system is still characterized by a large number of research organizations (over 3.500 in total) considerably separated both from the higher education sector and industrial enterprises, as a heritage of the former Soviet R&D institutions (state-owned and state-governed). Nowadays 84% of them remain completely or partially state-owned and the share of public sources in their total R&D expenditure (67%) is relatively high (Science Indicators, 2011).

Concept background: model studies

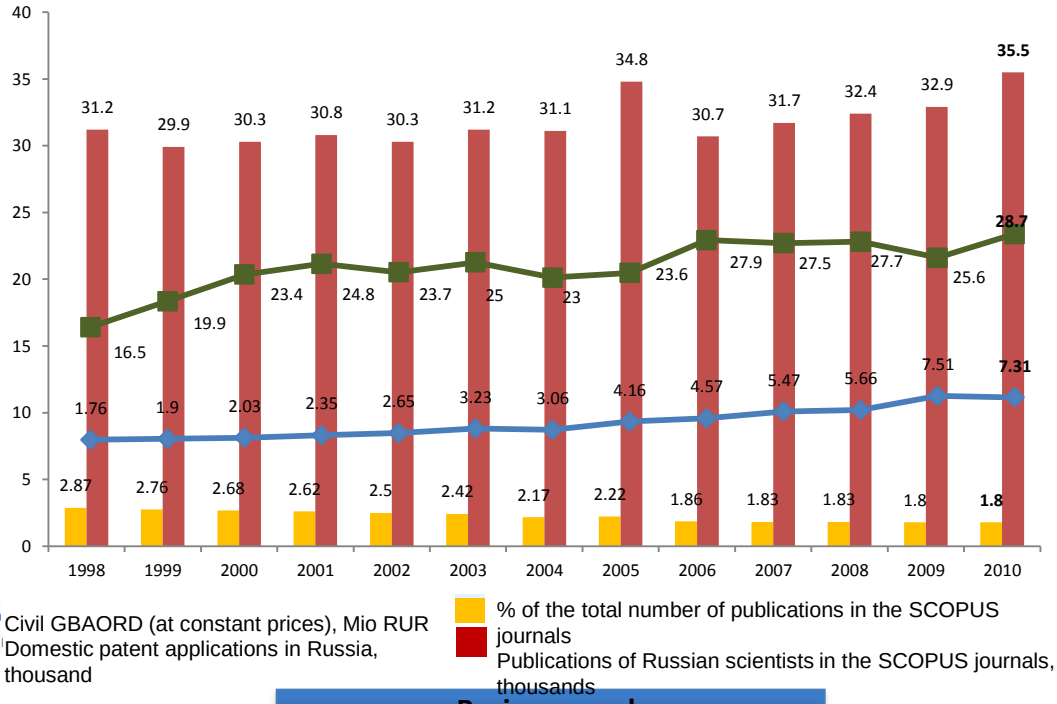
- National Survey of Research Commercialisation (Australia, since 2000)
- Higher Education – Business and Community Interaction Survey (UK, since 1999)
- Research Institutes in the Service Economy (RISE) project (UK, 1998-2001)
- Targeted Socio-Economic Research (TSER) studies (EU, 1999)
- Others…

Rusian context

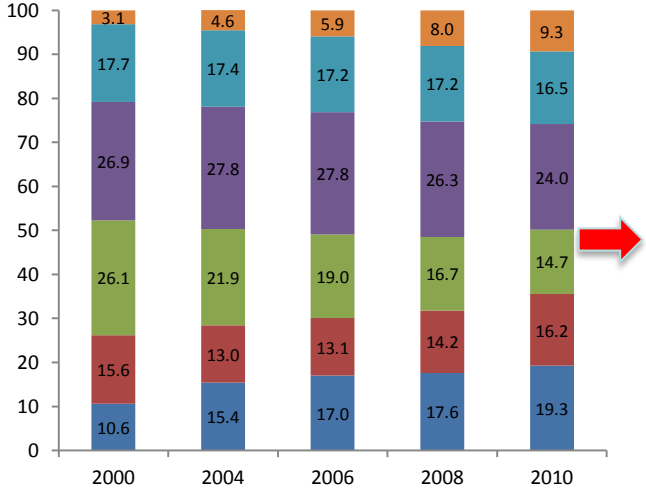
- **Growing direct public support vs. conservation of low S&T productivity**
- **Accumulated gap in financing :**

  GERD in 2010 = 53,9% 1990
- **Archaic institutions**

  Preservation of the «Soviet» model:
  - **R&D institutes - 79,3% GERD (2010)**
  - **Industrial enterprises - 6,3% GERD (2010)**
  - **Universities - 7,4% GERD (2010)**
- **Loosing competitive positions**
- **Weak integration into global S&T and innovation networks**



Distribution of researchers by age (%)



Ageing and outflow of experienced qualified researchers from the R&D sector

Basic research

Publications in Scopus journals ranking (2010)
Russia – **16** (1996 – **8**)
China – **2** (1996- **9**)

Citations ranking (Scopus, 2010)
Russia – 27
Brazil – 18
India - 15
China - 4

Applied Science and Technology

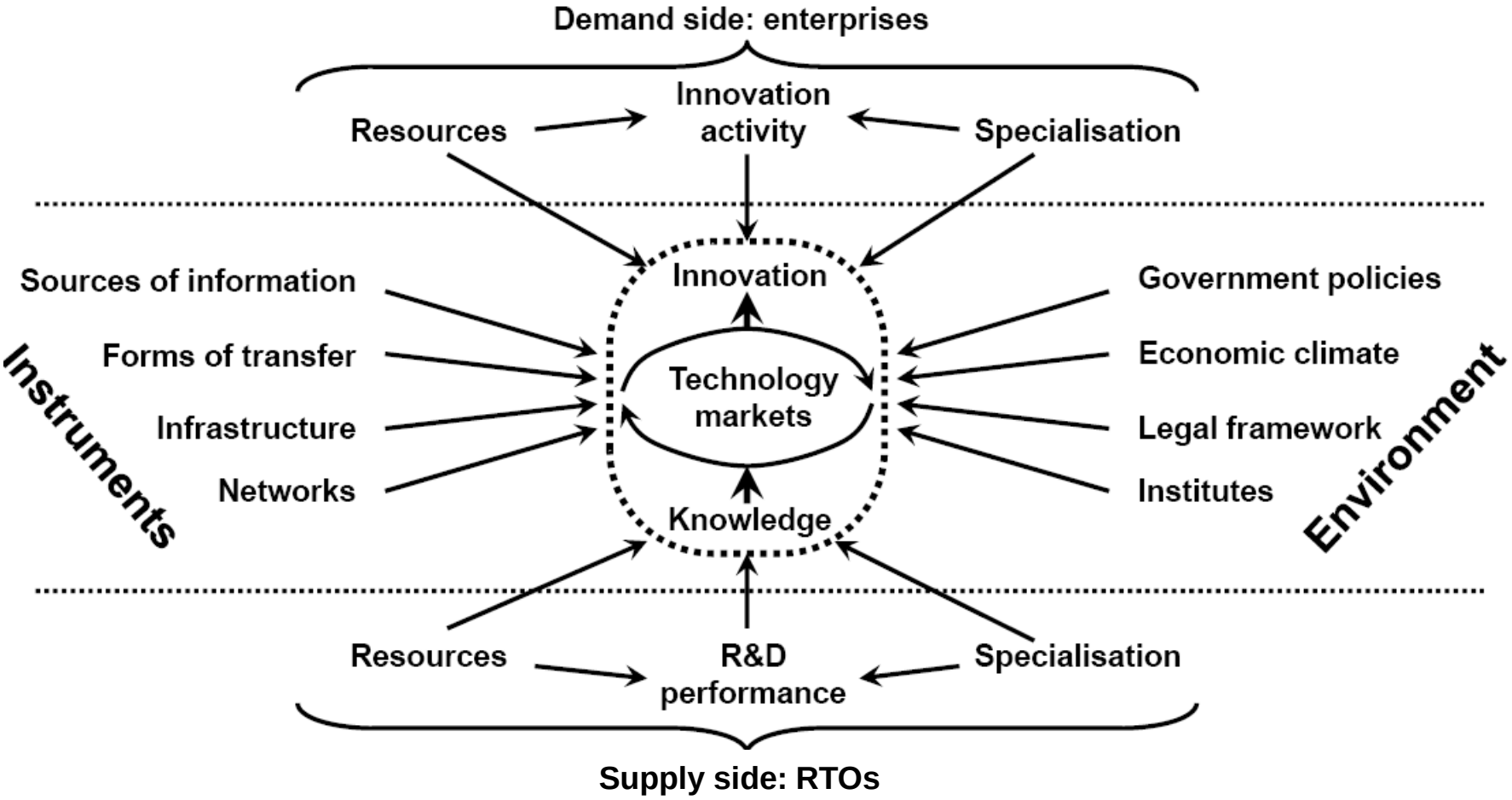
Triadic patent families (2009)
Russia – 63 (1995 – 63)
US –13715 (1995 - 12361)
China – 667 (1995 – 21)
Israel – 339 (1995 – 161)

Export of technology
Russia – 0,6 US $ bn (2010)
Hungary – 2,7 US $ bn (2009)
Finland – 9,1 US $ bn (2009)
US – 89,1 US $ bn (2009)

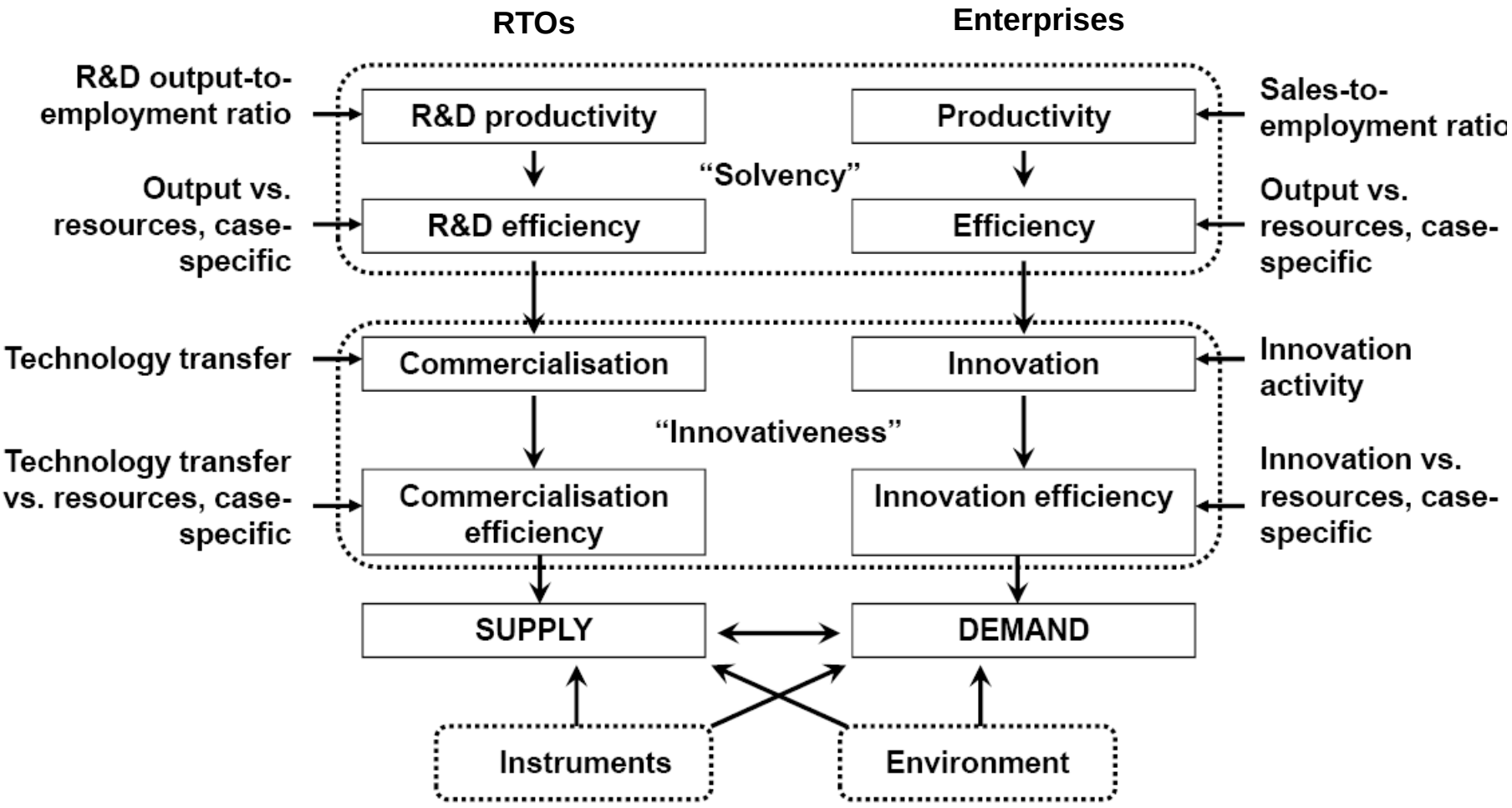
Innovation activity in industry (2010)
Russia – 9,3% (1992 – 16,3%)
EU: 21,7% (Romania) – 71,8 % (Germany)

Share in global high-tech exports (2009)
Russia – 0,20%
Hong Kong – 8,.94%
Singapore – 6,61%
Korea – 5,27%

Knowledge transfer from RTOs: how to measure at the micro-level?



Knowledge transfer from RTOs: pieces of the puzzle



First complex survey of R&D institutions, 2007

> Coverage – 119 public R&D institutions (state research centers, state academies for architecture and education, etc)

> Contents:

Performance

R&D output (local & international)
- publications
- patents, other IPR
- contracts / grants
- Commercialization of technology
- Innovation partnerships
- Links with universities
- PhD programmes

Resources

Personnel
- stock
- flows
- training

Fixed assets
- land
- buildings/premises
- equipment (age, quality)
- unique research facilities

Financial sustainability
- revenues (by type of activity)
- expenditure
- debts
- profits
- staff remuneration

Organisation

- Organisational structure
- Experimental base
- Innovation infrastructure
- Training departments
- Spin-offs

2007 survey: effects of technology transfer

- **R&D results:**

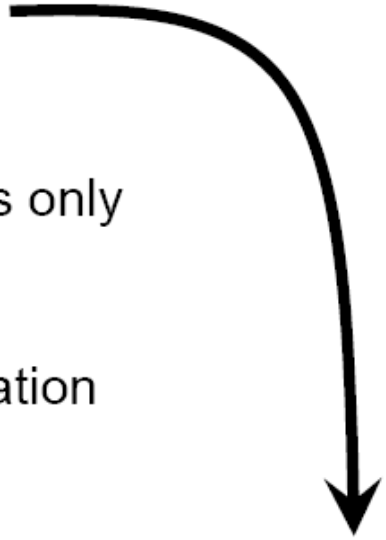
  NO SUBSTANTIAL EFFECT

- **Financial results:**

  Effect on structure of activities only

- **Organisational mechanisms**

  Effect on structure of organisation

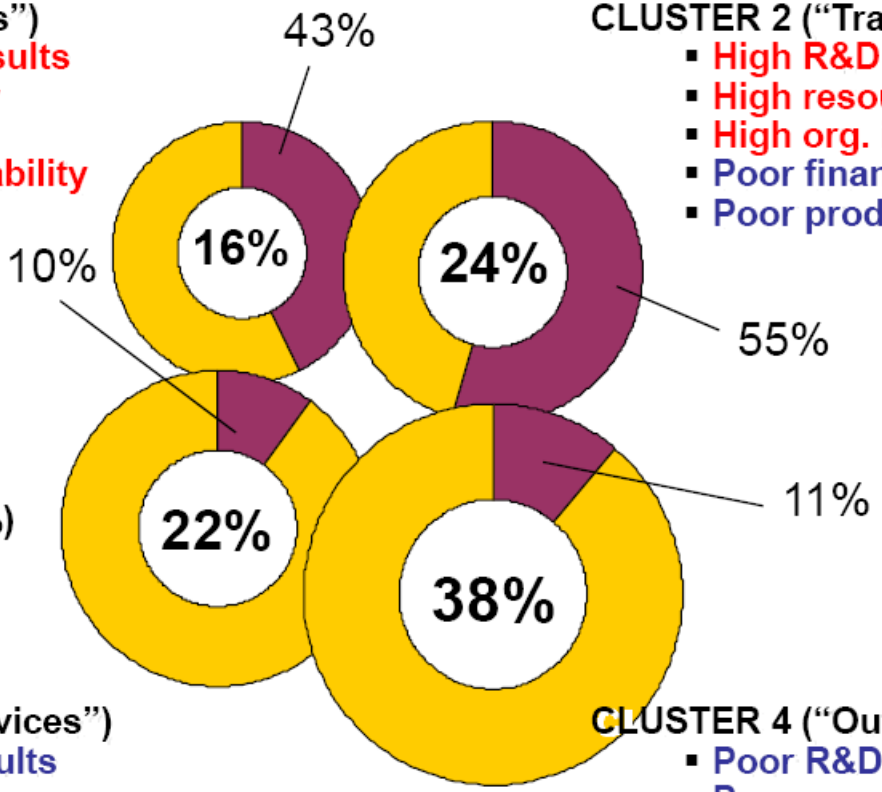


- Technology transfer activities do not provide a definite competitive advantage
- No direct motivation for technology transfer

2007 survey: ‘proto-strategies’

CLUSTER 1 (“National leaders”)
- High R&D quality & results
- High resources supply
- High org. innovation
- High financial sustainability
- High productivity

CLUSTER 2 (“Transitional”)
- High R&D quality & results
- High resources supply
- High org. innovation
- Poor financial sustainability
- Poor productivity



RTOs:

Engaged in TT (26%)

Not engaged in TT (74%)

CLUSTER 3 (“Government services”)
- Poor R&D quality & results
- High resources supply
- Poor org. innovation
- Poor financial sustainability
- High productivity

CLUSTER 4 (“Outsiders”)
- Poor R&D quality & results
- Poor resources supply
- Poor org. innovation
- Poor financial sustainability
- Poor productivity

Source: ISSEK calculations based on the Rosstat data

Survey on innovation behavior of RTOs, 2010-2011

Sample 2010: 305 cases; 196 RTOs perform technology transfer

Sample 2011: 1001 cases; 627 RTOs perform technology transfer

Contents: 56 questions; 160 variables

1. **Performance**

   R&D performance; RDR trasfer - intensity, forms, level of novelty, etc.

2. **Resources**

   Financial, human, organisational, intellectual, etc.

3. **Transfer management and process**

   Goal-setting, market monitoring, quality control, transaction process etc.

4. **Environment**

   Networks, benchmarks, customers, mediators

5. **Transfer factors**

   Obstacles, sources of information, economic climate, government support, etc

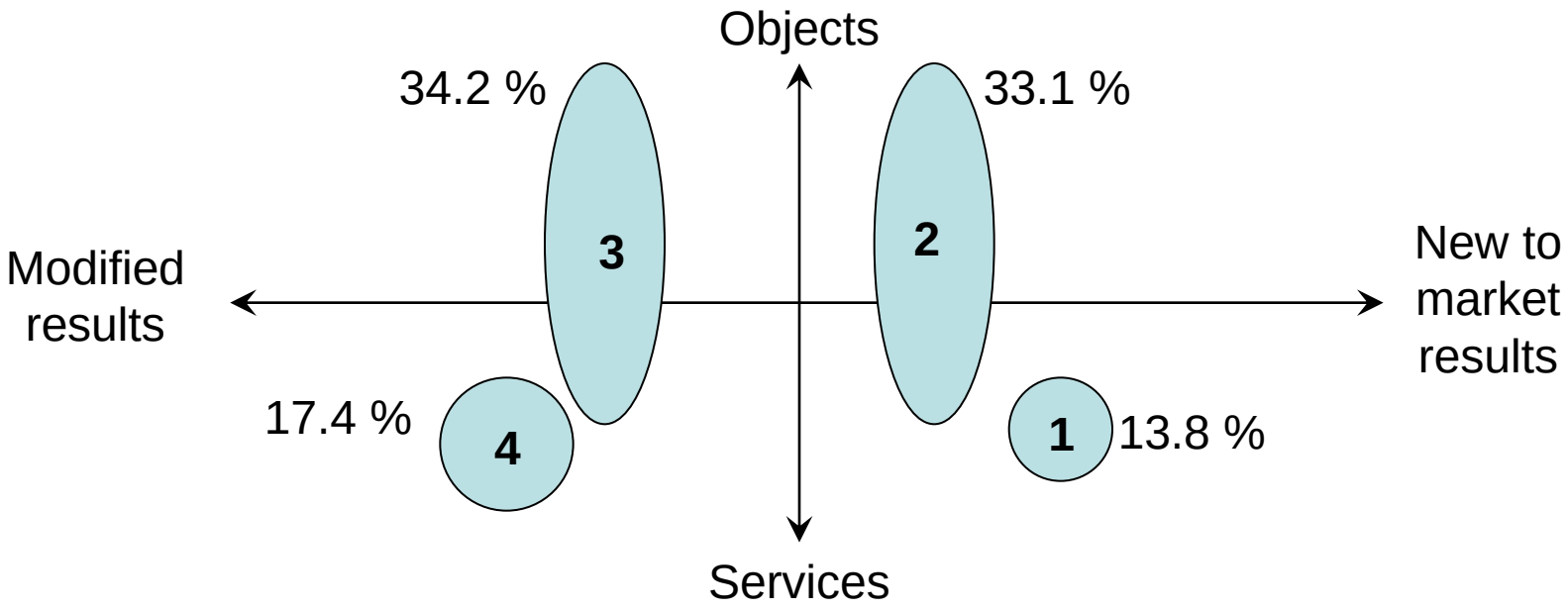
Strategy building blocks

- **What knowledge to transfer?**
  - Level of novelty
  - Forms of transfer (services, objects, formal/informal ways)

- **Who is the customer / user?**
  - Communication with the customer
  - Target market – product, location…

- **How to transfer the R&D results?**
  - Quality control procedures
  - Transfer as a strategy priority
  - Intensity / depth of marketing and S&T monitoring activities

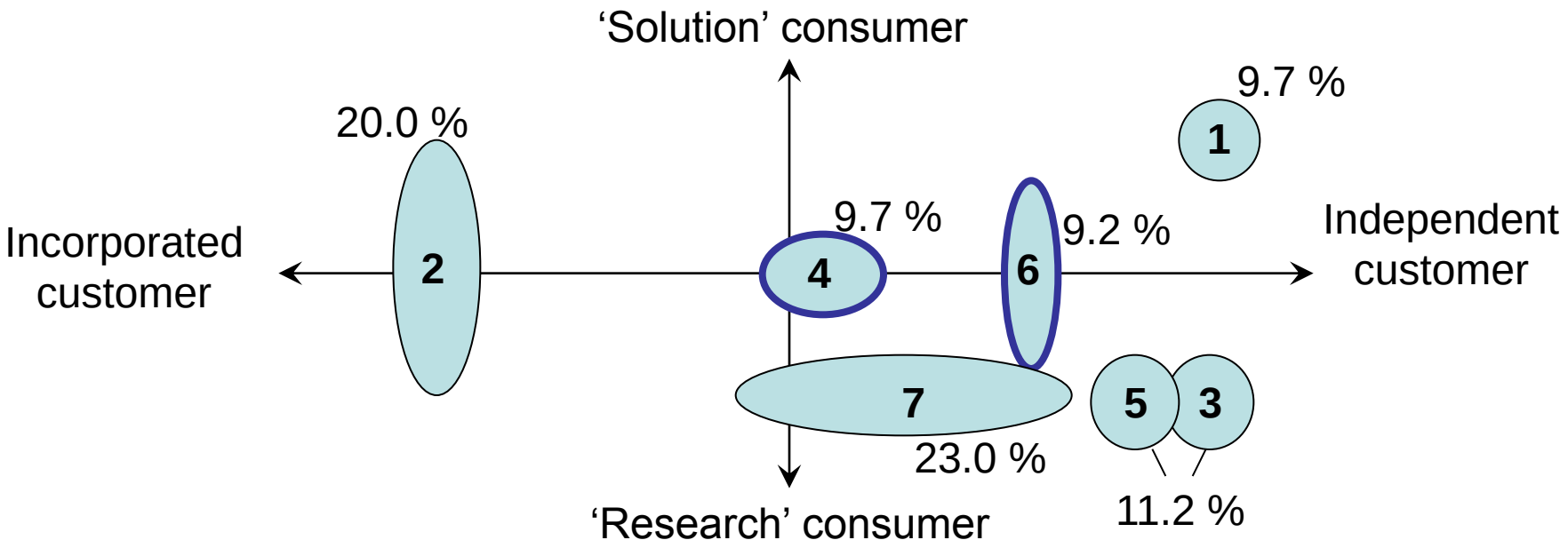
What to transfer?



1. New to market / R&D projects, R&D cooperation
2. New to market / R&D projects, know-how, patents, etc.
3. Modified / R&D projects
4. Modified / R&D projects, complete products, etc.
5. Undefined (1.5%)

Source: ISSEK calculations

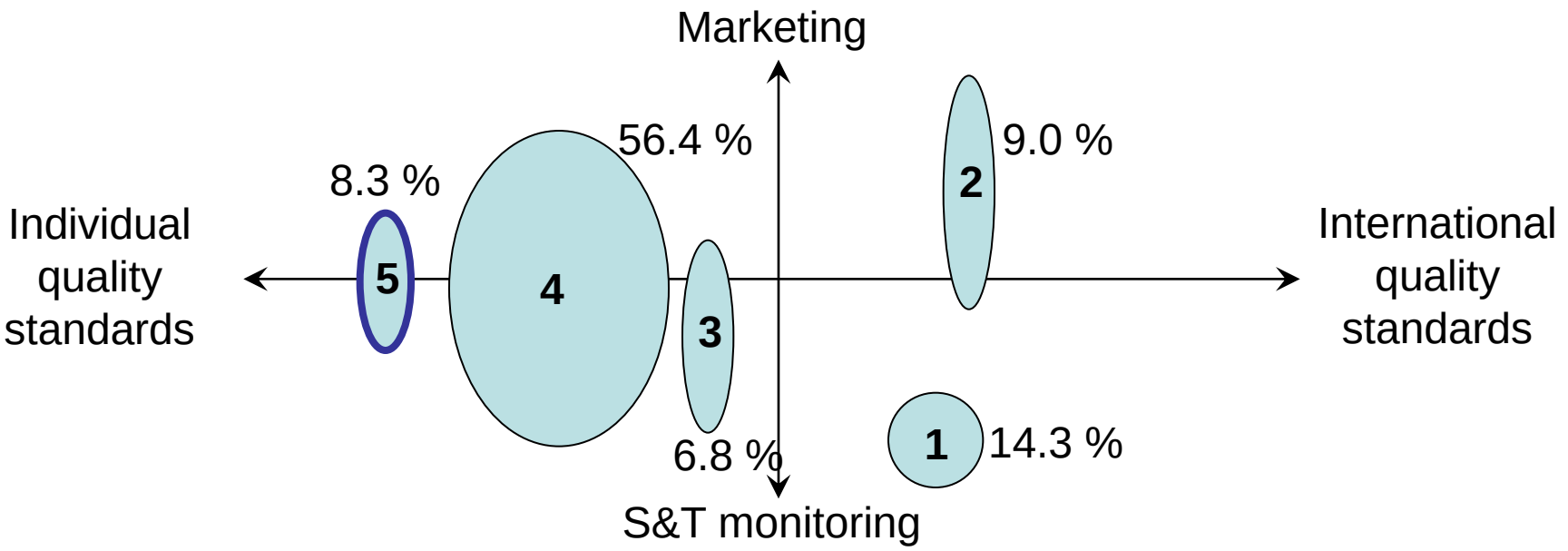
Who is the customer?



1. Independent customer / domestic engineering markets
2. Incorporated customer / domestic markets including both R&D and technology
3. Independent customer / domestic technology markets
4. Independent or associated customer / **domestic & international** markets including R&D and technology
5. Independent customer / domestic R&D and education markets
6. Independent customer / **international markets** of R&D and technology
7. Independent or associated customer / domestic R&D markets
8. Undefined (6.0%)

Source: ISSEK calculations

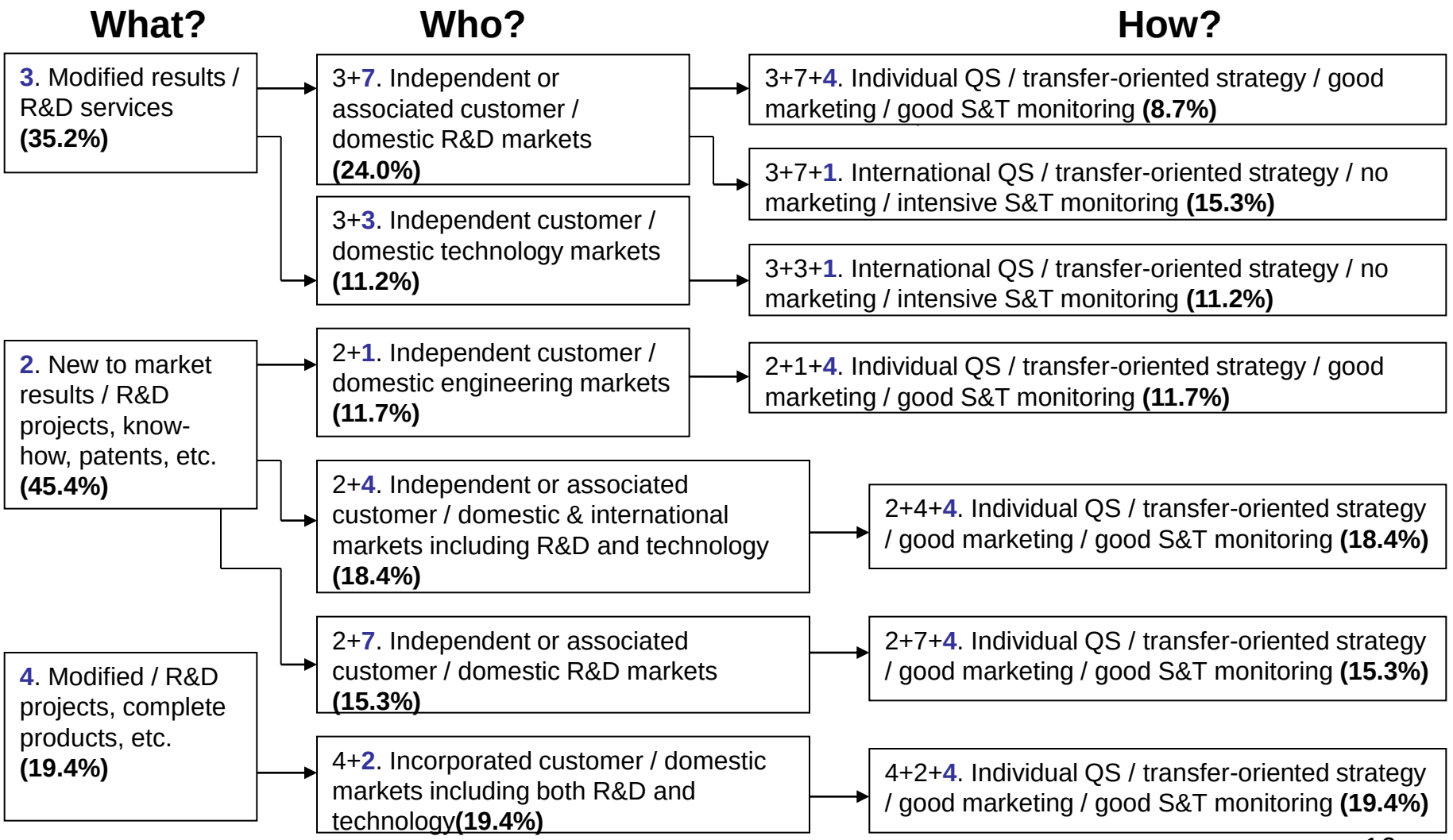
How to transfer?



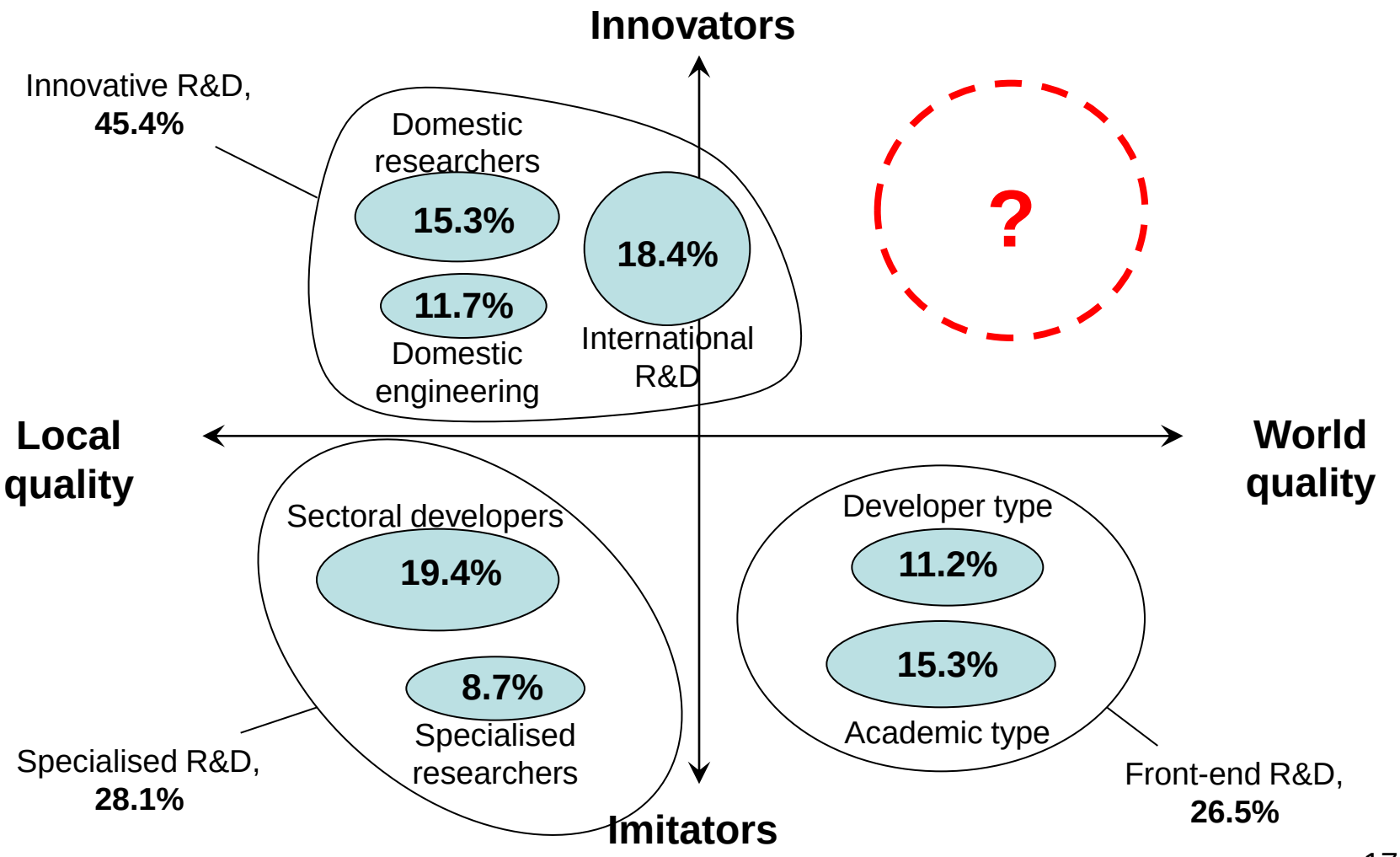
1. International QS / transfer-oriented strategy / no marketing / intensive S&T monitoring
2. International QS / transfer-oriented strategy / intensive marketing / poor S&T monitoring
3. Individual QS / transfer-oriented strategy / poor marketing / good S&T monitoring
4. Individual QS / transfer-oriented strategy / good marketing / good S&T monitoring
5. Individual QS / **no transfer benchmarks** / moderate marketing / moderate S&T monitoring
6. Undefined (5.3%)

Source: ISSEK calculations

Strategies composition

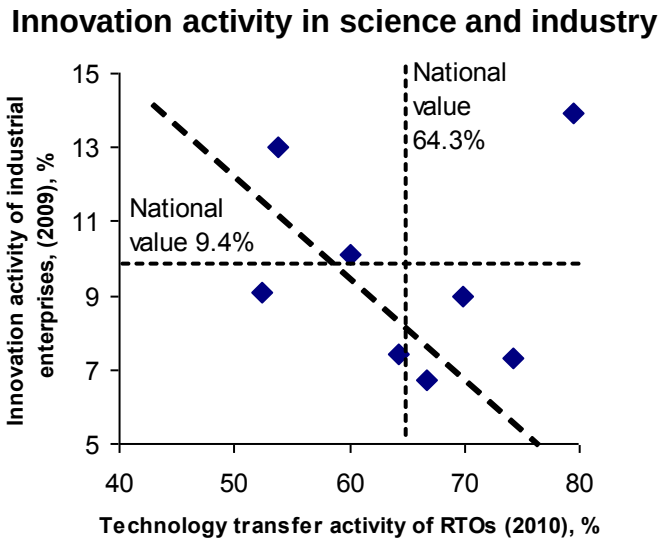


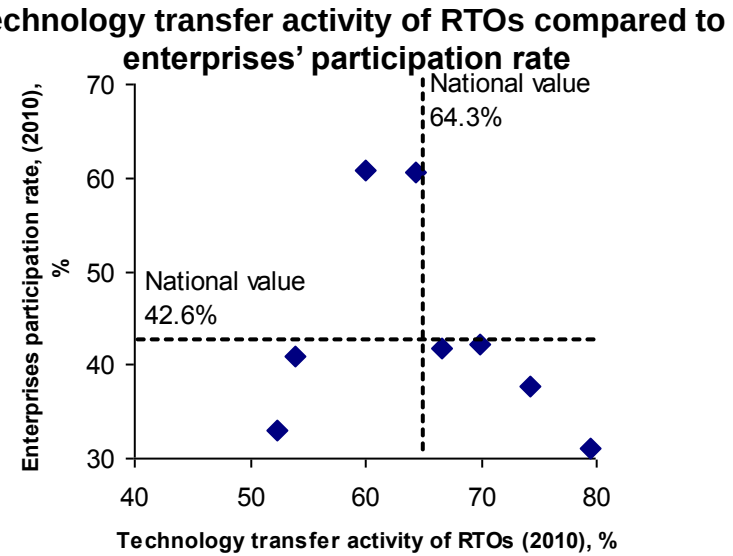
Mapping the strategies



Source: ISSEK calculations

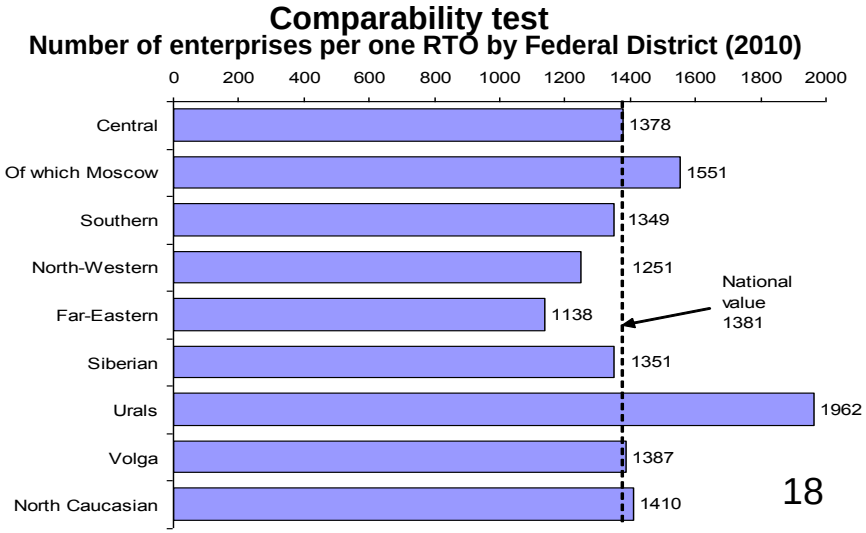
Regional Aspects





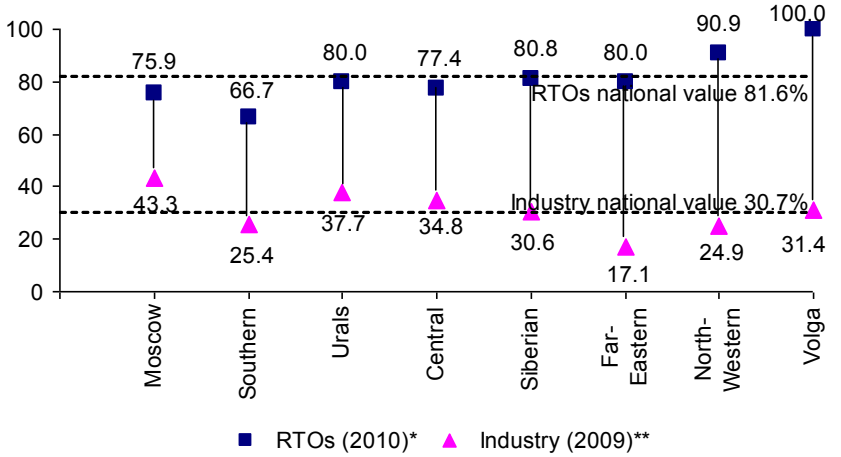
Main topics:

- **Cross-regional differences in effects of RTO technology transfer on innovation**
- **Transfer performance: channels, factors (barriers/support), patterns**

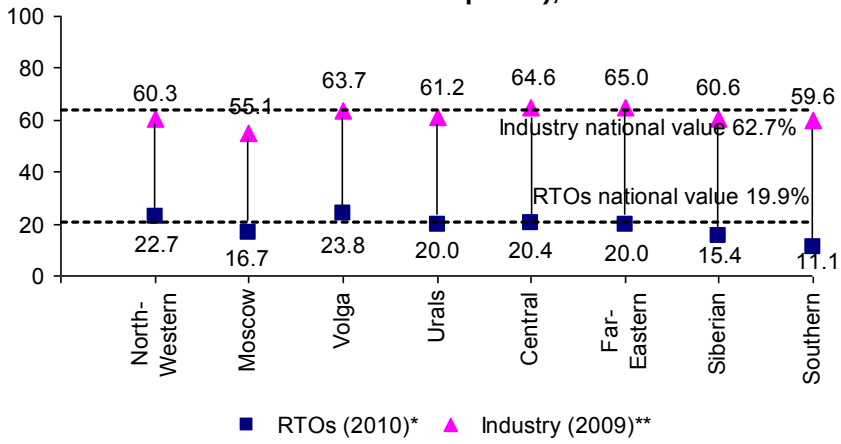


Channels for technology transfer

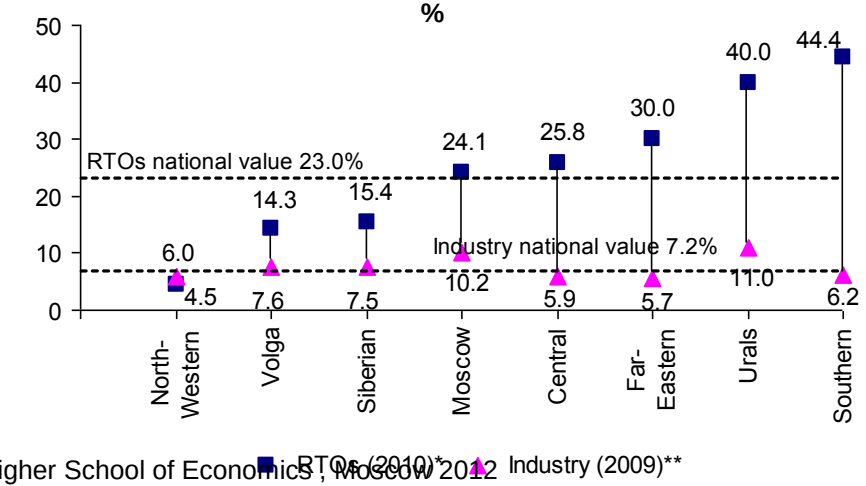
R&D projects as forms of RTOs technology transfer and industrial innovation (frequencies inside subsamples of technology transferring RTOs and innovative industrial enterprises), %



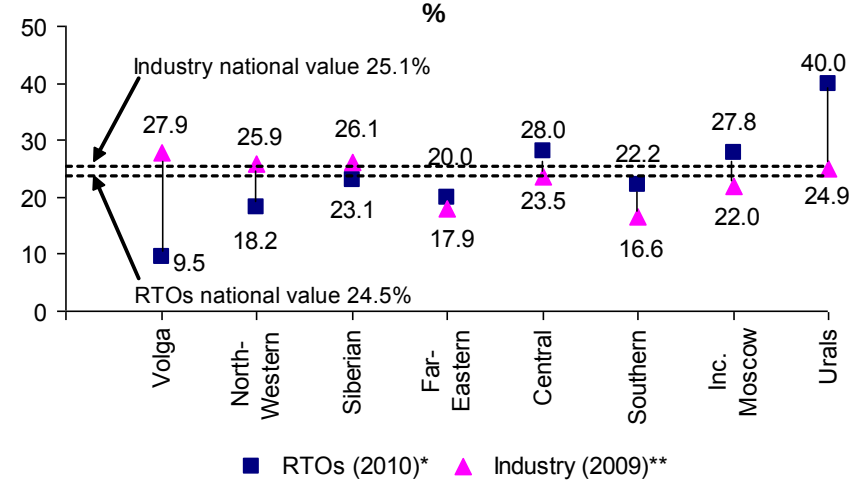
Ready-to-use products (equipment, software) as forms of RTOs technology transfer and industrial innovation (frequencies inside subsamples of technology transferring RTOs and innovative industrial enterprises), %



Patents and patent licenses as forms of RTOs technology transfer and industrial innovation (frequencies inside subsamples of technology transferring RTOs and innovative industrial enterprises), %



Industrial design and engineering as forms of RTOs technology transfer and industrial innovation (frequencies inside subsamples of technology transferring RTOs and innovative industrial enterprises), %



Factors hampering creation of knowledge and technology transfer

Overall hampering intensity*	Federal district	Factors		
		Lack of researchers at RTO	S&T infrastructure shortcomings	Administrative and legal barriers for transfer and adaptation
	Urals		+	
	Far-Eastern	+	+	+
+	Central	+	+	+
	Of which Moscow	+	+	+
++	Siberian	+		++
	Volga	++	++	+
	North-Western	++	++	++
	Southern	+	++	
National frequency, %		37.4	11.1	26.6

Hampering intensity estimations:

	Low
+	Moderate
++	High

* To convert quantitative indicators into simplified intensity estimation with “low”-“moderate”-“high” values we used regional ratings (by membership in one of three equal sections of the frequency distribution among the regions) based on proximity to the aggregate national level of the initial indicators. In other words “low” means “below the national value”, “moderate” is “close to the national value”, and “high” is translated as “higher than the national value”.

Policy mechanisms application

Support intensity	Federal district	Policy mechanisms		
		Direct support	Indirect incentive	Other
Low	Southern	Direct budgetary funding; Federal Targeted Programmes; regional programes	-	-
	Far-Eastern	Regional programes	-	State corporation support
Moderate	North-Western	Direct budgetary funding; Federal Targeted Programmes; regional programes	Profit tax allowances; custom discounts; accelerated depreciation of tangible assets	State science foundations' grants; state corporation support; support from other forms of PPP
	Siberian	Direct budgetary funding; Federal Targeted Programmes; regional programes	Preferential credits	Non-budgetary foundations' grants
	Urals	Direct budgetary funding; Federal Targeted Programmes; regional programes	Land / assets tax allowances; profit tax allowances; accelerated depreciation of intangible assets; preferential credits	State corporation support
	Volga	Direct budgetary funding; Federal Targeted Programmes; regional programes	Land / assets tax allowances; profit tax allowances	State corporation support
High	Central	Direct budgetary funding; Federal Targeted Programmes; regional programes	Land / assets tax allowances; profit tax allowances; custom discounts; accelerated depreciation of tangible / intangible assets; preferential credits	State science foundations' grants; non-budgetary foundations' grants; venture foundations' grants; state corporation support; support from other forms of PPP
	Of which Moscow			

Main competitors for RTO at stage of knowledge creation

Federal District	Domestic RTOs		Foreign RTOs and universities		Domestic real sector companies		Foreign real sector companies		Domestic engineering companies		Foreign engineering companies		Domestic universities	
Central	+				+								+	
Of which Moscow	++													
Southern	++		++		+									
North-Western	++				++				+					
Far-Eastern	++				+				+					
Siberian	++				+				+				+	
Urals	++		++		+		+		++		++			
Volga	++				+									
National frequencies, %		22.6		55.8		39.7		57.4		57.0		65.0		61.3
	+	25.9	+	21.6	+	44.6	+	23.6	+	33.2	+	21.6	+	32.8
	++	51.5	++	22.6	++	15.7	++	19.0	++	9.8	++	13.4	++	5.9

Modal estimations (made by respondents according to the questionnaire Likert scales):

	No competition
+	Low competition
++	Moderate competition

Main competitors for RTO at stage of technology transfer

Federal District	Domestic RTOs		Foreign RTOs and universities		Domestic real sector companies		Foreign real sector companies		Domestic engineering companies		Foreign engineering companies		Domestic universities	
Central	++				+									
Of which Moscow	+				+									
Southern	++													
North-Western	++				++		+							
Far-Eastern	++				++				+					
Siberian	+				+									
Urals	+		++		++		++		++		+		+	
Volga	+		+		+									
National frequencies, %		14.4		56.7		17.0		50.5		57.7		62.3		69.2
	+	47.2	+	22.3	+	43.6	+	23.6	+	31.1	+	19.3	+	25.9
	++	38.4	++	21.0	++	39.3	++	25.9	++	11.2	++	18.4	++	4.9

Modal estimations (made by respondents according to the questionnaire Likert scales):

	No competition
+	Low competition
++	Moderate competition

Outcomes

Strategy	Federal District	Description (by strategy indicators compared to national values)
"Innovation"	Southern	Higher novelty level of technology, international quality standards, international competition
	North-Western	
	Urals	
"Combination"	Central	Mixed profiles addressing both to "innovation" and "initation" strategies
	Of which Moscow	
	Far-Eastern	
"Imitation"	Siberian	Lower novelty level of technology, local quality standards, local competition
	Volga	

Cluster	Federal District	Enterprise innovation activity	RTO technology transfer intensity	Intensity of factors hampering technology creation/transfer from RTOs	Intensity of support mechanisms implementation by RTOs	Regional RTO technology transfer strategy
"Stakeholders"	Central	Moderate	Moderate	Moderate	High	Combination
	Of which Moscow	High	High	Moderate	High	Combination
"Innovators"	Southern	Low	Moderate	High	Low	Innovation
	North-Western	Moderate	Moderate	High	Moderate	Innovation
	Urals	Moderate	Moderate	Low	Moderate	Innovation
"Insulated"	Far-Eastern	Low	Moderate	Low	Low	Combination
	Siberian	Low	High	High	Moderate	Imitation
"Uncompetitive"	Volga	High	Low	High	Moderate	Imitation

Further research

Sector-specific analysis:

1. **RTOs transferring to the Primary sector enterprises:**
   - **Agriculture and forestry + Mining and quarrying.**
   - **Agriculture and forestry + Mining and quarrying for fuels and energy + Other mining and quarrying. Extended set of independent variables*.**
2. **RTOs transferring to the manufacturing:**
   - **High-tech + Medium-high-tech + Medium-low-tech + Low-tech. Extended set of independent variables*. Analyzing implications of knowledge intensity in manufacturing TT.**
3. **RTOs transferring to the service sector:**
   - **KIS + High-tech KIS + Market KIS + Other services. Extended set of independent variables. Analyzing implications of knowledge intensity in service TT.**
4. **Summary analysis for #1-3: Sector-specific modes of TT**

Activity-specific analysis:

1. **RTOs performing continuous knowledge transfer (using #4 but with subsamples of RTOs transferring technologies to other RTOs in each sector).**
2. **TT transaction modes (using #4 but instead of Extended set of independent variables, transaction variables are to analyze, but more detailed).**

Challenges

Correspondence with international studies:

- **By problem topic**
- **By methods/data**

Bridge to the NIS context:

- **Positioning of RTOs in the NIS processes**
- **Links to innovative enterprises behavior analysis**

Positive application:

- **RTO TT strategies, TT channels and factors… How to link with macro-evidence-based policies?**
- **Moving towards operational policy tool: development of evaluation/assessment instruments**

Thank you!

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