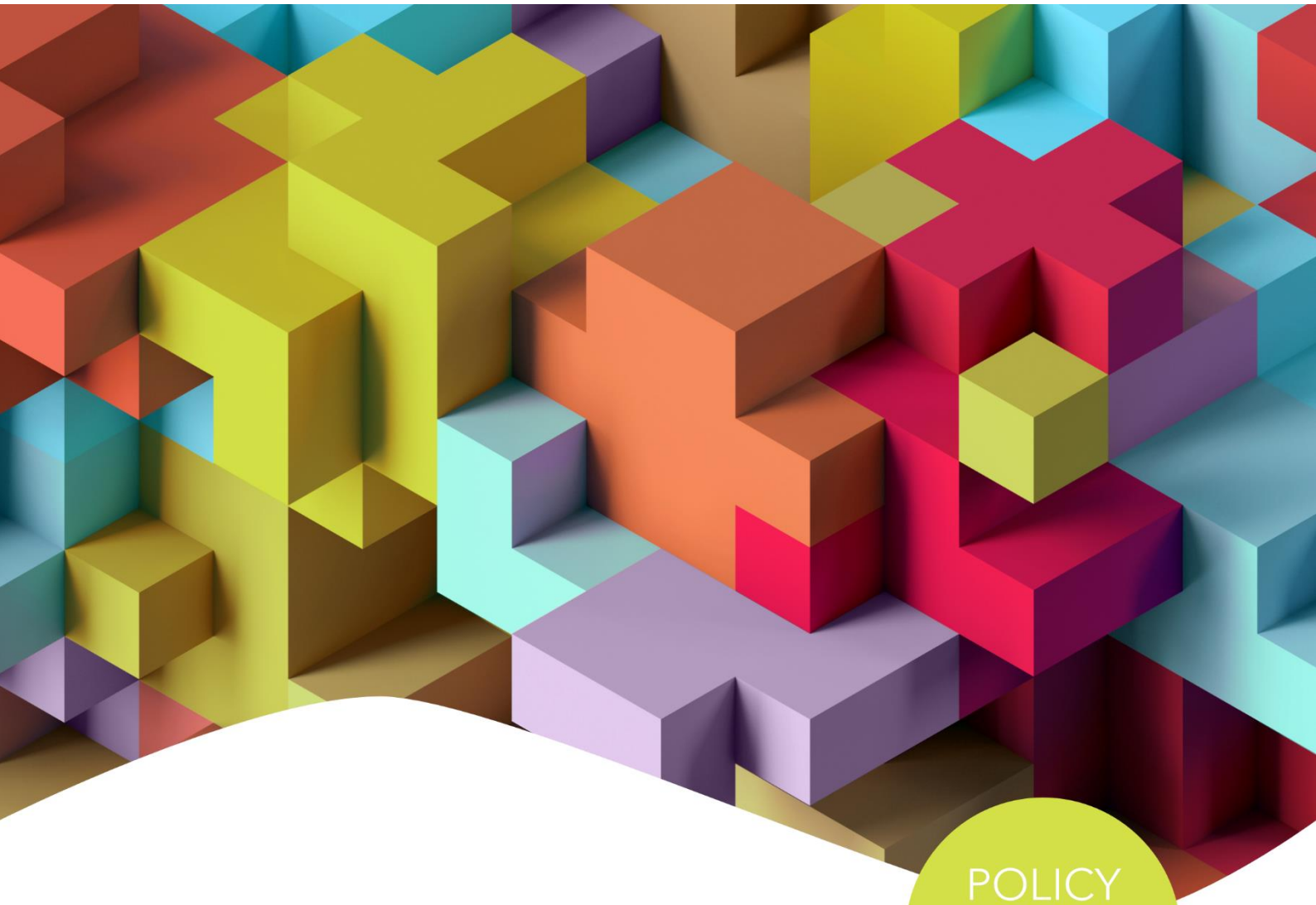

POLICY CASE STUDY

Centres for Higher Education and Industrial Cooperation, Hungary

Case study contribution to the OECD TIP Knowledge Transfer and Policies project

National Research, Development and Innovation Office

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Centres for Higher Education and Industrial Cooperation, Hungary: Case study contribution to the OECD TIP Knowledge Transfer and Policies project

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Abstract

This case study describes the Centres for Higher Education and Industrial Cooperation (HEICC, in Hungarian FIEK) scheme, which is primarily a financial instrument to foster science-industry knowledge transfer. In section 1, we describe the policy background of the FIEK: What factors led to the introduction of this new policy instrument, which are the direct external conditions that influenced the design of FIEK cooperation centres (Research system, Regulatory, organizational and policy context, Industrial context). In section 2, we outline the main characteristics of the selected policy instrument: Which are the key features of the FIEK? What does the institutionalised cooperation (main element of the FIEK) mean in practice? In addition, we analyse where knowledge transfer actually takes place in the FIEK and discuss the different knowledge transfer channels. In section 3, we assess the overall policy mix for knowledge transfer and describe the potential interactions of FIEK with other elements of the policy mix. Finally, we summarize the impacts and conclusions of the case study.

Executive summary

FIEK in the knowledge transfer policy mix

Direct financial support has a significant role in domestic Research, development and innovation (RDI) policy. After its establishment in 2015, the National Research, Development and Innovation Office (NRDI Office) – the managing authority of the Higher Education and Industrial Cooperation (HEICC, in Hungarian FIEK) scheme - developed a coherent portfolio of competitive calls. In particular, there are two main types of programmes to support knowledge transfer:

- joint R&D activity and knowledge creation involving both the university and the business side, where knowledge building and sharing activities are integral parts of the project;
- R&D activity performed (on demand) by the university according to the needs of a business entity as a customer, where the university itself is not necessarily directly involved in the knowledge creation, the production of outstanding R&D results or knowledge sharing. Instead, the company implements an intra-firm innovation process to which the university's overall contribution is usually low.

Main characteristics of the FIEK scheme

- FIEK is basically a grant-type policy instrument but in practice it is much more than a traditional financial instrument **due to its institutional element**.
- A FIEK project must be implemented in **consortium between universities and businesses** with the **university as the consortium leader.** The consortium must comprise at least one university and one firm, with a maximum of five different partners.
- All FIEK projects must involve **the establishment of a FIEK Centre (institutional element) within the university,** which guarantees long-term cooperation instead of an ad-hoc partnership.
- Within the university, the FIEK Centre must operate **independently from the faculties, as an autonomous organisational unit** under the direct control of the rector.
- The **overall goal** of the FIEK is creating research infrastructure capacities at HEIs, for which a real market demand is expected. Such market demand may enable the university to operate the infrastructure in the long run (after the project closure) as own revenues will be generated and new business relationships will be built.
- Effective service development at the university is a key component in the FIEK scheme. The aim is to create a **competence centre** within the university, which functions as a "one-stop service centre", that connects companies having actual needs with university research groups providing actual answers to such needs.
- **Cooperation under the FIEK project is based on already existing professional relationships.** FIEK Centres are responsible for reinforcing and maintaining this network of relationships.
- The **institutionalised cooperation** operates not only outward, towards businesses, but also **among the organisational units of the university**. Within

the universities, FIEK Centres are open to involve any department and institute in the collaboration, if they can contribute relevant added value.

- FIEK Centres enable the university to engage in **multidisciplinary research addressing socio-economic challenges**, which require collaboration among departments and faculties from various scientific fields.
- FIEK Centres are responsible for **connecting projects**. The Centres enable the professional coordination of basic research projects as well as targeted industrial research projects within the university, thus ensuring the efficient use of capacities, knowledge transfer and synergies between the projects.

Channels of knowledge transfer in the FIEK programme

- **Collaborative research** forms an integral part of FIEK projects.
- One of the declared aims of the FIEK scheme is to increase the number of **research assignments from businesses** after the project.
- FIEK aims to improve the readiness of universities to operate as **service providers**.
- **Academic consultancy** provides excellent opportunities for identifying new technological challenges and problems to be addressed.
- **Publication of public research results in scientific journals** reflects the conflicting interests between universities and companies: if a research project is purely commercial, publication is not the primary objective.

The main difference from other policy instruments is **the FIEK Centre itself and the service centre built around it**. This essentially means a paradigm shift in networking in relation to RDI activities. The FIEK Centre and the resulting research network makes it easier for partners to keep in contact and build external collaborative relations, and makes it a routine task to launch new projects. Competition between research groups and projects is replaced with cooperation.

1. Background and development of the Centres for Higher Education and Industrial Cooperation (FIEKs)

1.1. Policy background

The idea of establishing Centres for Higher Education and Industrial Cooperation (FIEKs) in Hungary first began to take shape in 2015. The actual implementation of the programme started in 2016. The design of FIEK as a policy instrument took place in the National Research, Development and Innovation Office (hereinafter NRDI Office).

Direct external conditions influencing the design of FIEKs:

- the need to build on the lessons learned from introducing the former transfer-type instruments;
- the need for a long-term sustainable model capable of generating revenue even after closing the project;
- strong demand on business side (large enterprises) for cooperation with universities;
- many international (American, German, Israeli) examples, that could be potentially followed, were considered for the design process. However, due to the different academic and business innovation culture, these examples were not directly applicable in Hungary, only certain elements could be used. The specificities of the Hungarian context are discussed further in the following section.

1.2. The role of external factors in the operation of FIEKs

1.2.1. Research system

- In Hungary, universities have traditionally been very strong in basic research.
- Universities are weakly embedded in corporate R&D processes.
- Knowledge transfer between universities and businesses can take place in any field of science. FIEK-type cooperation is primarily conditional on whether the universities involved have advanced research infrastructures, rather than on the given thematic field. This is why FIEK projects heavily focus on the development of research infrastructures to ensure the creation of research capacities for which there is actual business demand.
- The quality and quantity of next-generation researchers are highly important for the successful implementation of the project. For this reason, it is essential to reverse the brain drain of researchers, which can be achieved by coordinated policy instruments.

1.2.2. Regulatory, organizational and policy context

The success of the FIEK project fundamentally depends on the local university's regulatory frameworks and organisational culture, including:

- the flexibility of the university's regulatory environment, and the organisation's ability to cooperate with actors within and outside the organisation and with businesses;
- the openness and supportiveness of the university environment, and the opportunities for changing the standard internal processes;

- the level of bureaucracy within the university;
- the extent to which creation and managing of cooperation with businesses has become part of the academic life;
- the ease of organising and implementing joint projects in view of the university's internal administration and level of competence;
- whether there is any change in the organisational culture as a result of the above.
- The low level of funding provided for universities is a competitive disadvantage. Although the scarcity of funds forces universities to cooperate with businesses, it can also make them too exposed to business needs. This, in turn, can obscure former strengths such as basic research and professional excellence.

1.2.3. Industrial context

- **Corporate demand for R&D is a basic element** in a FIEK project. Accordingly, market analysis, target group analysis and the presentation of the market potential were all key components in FIEK project proposals. Funded FIEK projects focus on developments, which are internationally marketable.
- Project participants include the local subsidiaries of large international enterprises as well as domestic-owned companies. It is important to note that **large enterprises with appropriate R&D capacity** are crucial for FIEKs.
- In Hungary, **the volume of foreign direct investment** and the role of foreign companies are very significant in certain areas. These companies intend to strengthen applied research and experimental developments relying on the research base of universities.
- FIEK as a policy instrument can be implemented in all industries and disciplines. The intention of the participants (universities, companies) to cooperate is key to successful projects regardless of their scope of activities.
- FIEK projects are primarily based on existing – in certain cases decades-long – professional cooperation. The emphasis is not on creating new relationships but on institutionalising cooperation. This requires participants who have a long-established trust-based relationship, and thus know each other's technological capabilities and intellectual capital.

1.3. Direct needs underlying the establishment of FIEKs

In Hungary, **university and business RDI activities tend to be sharply separated**. Stakeholders often fail to see the common interests because businesses are not familiar with the operation of the academic sector, while public employee researchers have no experience in the private sector. The main goal is to get the two sides closer together. It should also be noted that routine tasks performed for businesses under a service agreement are not sufficiently motivating for researchers in professional terms. However, for larger scale cooperation that results in knowledge transfer sufficiently advanced research infrastructure is indispensable.

Businesses and universities have long been cooperating in Hungary and such partnerships are nearly always **based on personal relationships**. However, universities must be empowered to engage businesses in research not only at individual but also **at institutional level.** This calls for the establishment of competence centres at universities which ensure a solid foundation for successful cooperation with businesses.

If universities have their own resources, they become much more competitive. Part of this should be based on revenue from the business sector. The renewed higher

education strategy[1] also sets it as an objective to increase universities' industrial revenue. This, however, requires a paradigm shift in universities, which is a long process but can be significantly facilitated by the FIEK programme. Further potential external sources can be the funds available under the Horizon 2020 framework programme. FIEK may improve the success rate of universities in H2020 projects.

[1] http://www.kormany.hu/download/c/9c/e0000/Fokozatvaltas_Felsooktatasban_HONLAPRA.PDF

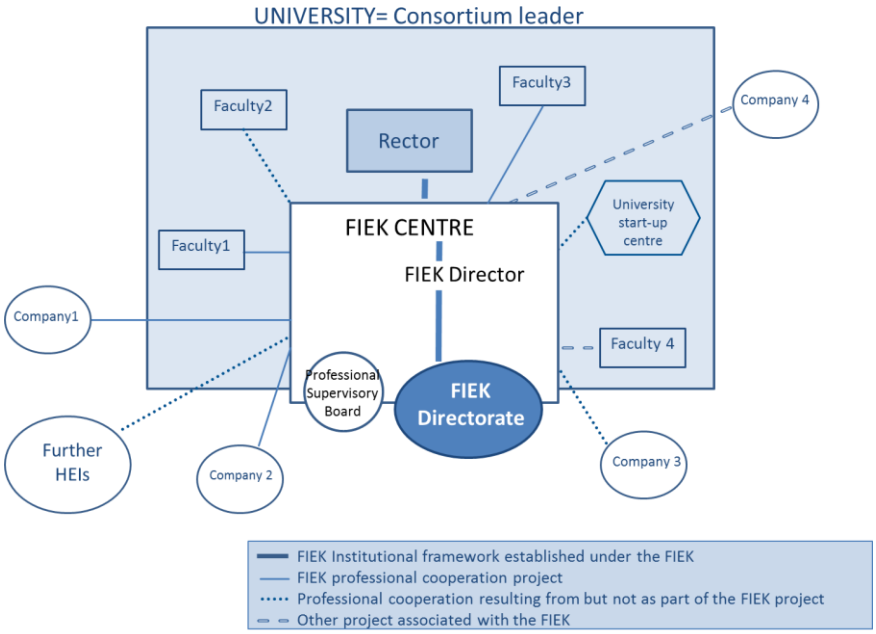
2. Main characteristics of the FIEK programme

2.1. Key features of the FIEK scheme[2]

The FIEK scheme is primarily a grant-type policy instrument, but in practice, **due to its institutional element**, it is **much more than a traditional state subsidy.** The most important features of the FIEK scheme:

- A FIEK project must be implemented in **consortium between universities and businesses** (with additional knowledge-dissemination organisations, such as research institutions, as the case may be) with the **university as the consortium leader.** What's more, universities and knowledge-dissemination organisations must represent at least 35% of the total eligible costs. There are 4 or 5 different partners in each ongoing FIEK projects, one of them (the consortium leader) being a university.
- All FIEK projects must involve **the establishment of a FIEK Centre within the university,** which guarantees long-term cooperation instead of an ad-hoc partnership. This way the project **ensures institutionalised cooperation** which is key to sustainability.
- Within the university, the FIEK Centre must operate **independently from the faculties, as an autonomous organisational unit** under the control of the rector.
- The FIEK project must also establish a FIEK Directorate, which serves as the decision-making body of the investors. It comprises the representatives of the consortium members whose voting rights are proportional to their financial share in the project. It is the supreme decision-making body of the FIEK. This element of the FIEK ensures that stakeholders get to know and take into account each others' views.

Figure 1. The operational model of FIEKs



[2] For a detailed summary of the technical parameters of the FIEK funding scheme see Annex 1.

- The university must guarantee in its internal regulations that the FIEK Centre operates under the supervision of a so-called Professional Supervisory Body (PSB). The NRDI Office, as the office managing the implementation of the FIEK funding scheme, may also delegate a member to the PSB. The NRDI Office is responsible for ensuring and monitoring that the scheme goals are met at most until the end of the monitoring period.

2.1.1. The tasks of the FIEK Centre. What is institutionalised cooperation?

- It ensures an active relationship between the university and the company making it possible to **go beyond the implementation of specific industrial assignments** or a single project, and to engage in more challenging and riskier long-term research.
- Effective service development at the university is a key component in FIEKs. The aim is to create a **competence centre** within the university, which functions as a "one-stop service centre", that is, it connects companies having actual needs with university research groups providing actual answers to such needs. Competence centres are made up of the following elements:
  1) **Research capacity** (knowledge, motivation, staff)
  2) **Established research infrastructure**, laboratories and equipment
  3) **Management capacity:**
  - *Professional responsibilities*: Coordinates basic research projects financed from various resources and research projects performed together with businesses; develops a project portfolio for the coordination of infrastructural and research capacities so that the universities can harmonise their routine business assignments and challenging research tasks;
  - *Legal and financial responsibilities*: secures operational stability, sustainability and continuity; manages contracts;
  - *Project management and business development responsibilities*: carries out market analysis and develops business plan to ensure the operation of the FIEK model after project closure, manages information (collects and effectively handles internal information for business development purposes).
- Each FIEK project tries to find **scientific and marketable answers to specific problems.** University research groups focusing on different research topics work together with the staff of various industrial actors to solve the problems. This work is coordinated by the FIEK Centre.
- **Cooperation under the FIEK project is based on already existing professional relationships.** The core of the competence centre, the relationship between the consortium members was not generated by the project. The FIEK Centre is responsible for reinforcing and maintaining this system of relationships.
- It follows that the FIEK Centre is **not a general institutional element that has transfer functions.** Due to the technical specification, it is expected to provide something different than a technology transfer office.
- Though the above description suggests that the FIEK project targets individual faculties or institutions rather than the whole university, it must be pointed out that the project implements **institutionalised cooperation** not only outwardly, towards businesses, but also **within the organisational units of the university**. Within the universities, FIEK Centres are open to involve other departments and institutions in the collaboration, if they can contribute relevant added value.

- The FIEK Centre enables the university to engage in **multidisciplinary research addressing socio-economic challenges**, which require collaboration among departments and faculties from various scientific fields.
- As mentioned above, FIEK Centres are responsible for **connecting projects**. The FIEK Centre enables the professional coordination of basic research projects as well as targeted industrial research projects within the university, thus ensuring the efficient use of the capacities, knowledge transfer and synergies between the projects.
- FIEK also differs from other funding schemes in that the **NRDI Office provides greater flexibility to projects.** The NRDI Office delegates an experienced leader to each FIEK Professional Supervisory Body who continuously supports the implementation of the FIEK.
- As another important feature, the FIEK scheme assigns **high priority to monitoring activities.** The Professional Supervisory Body plays a fundamental role in this. The consortium leader university has 10% of all votes, and the remaining 90% of the votes are shared between the consortium members according to their respective financial contribution to the total project costs. The FIEK management reports quarterly to the PSB. Reporting includes professional progress reports and management reports too.

2.1.2. Funded projects under the FIEK_16 scheme

The FIEK programme is implemented in two funding schemes: FIEK_16 and GINOP-2.3.4-15 due to the regional limits of using the resources. The FIEK_16 scheme is implemented from domestic funds and was open to project proposals from the Central Hungary region. The GINOP-2.3.4-15 has identical content but is co-financed from the Structural Funds, so it was open to applicants from less developed regions. (The Central Hungary region is a "more developed region" according to the classification of NUTS2 regions from 2014 to 2020 and is therefore not eligible for funding from GINOP calls. All the other regions of the country are "less-developed regions".)

Table 2 **provides examples of the FIEK_16 projects only.** Out of the five applicants the following three consortia received funding under the FIEK_16 call. For detailed project descriptions see Annex C.

Table 1. FIEK projects analysed in detail in this case study

Leader od Consortium	Partners	Field of science, sector
Budapest University of Technology and Economics (BME)	MVM Hungarian Electricity Private Limited Company Nokia Solutions and Networks Ltd. Gedeon Richter plc. Siemens Zrt.	ICT/energy/pharmaceuticals
	The goal of the consortium is to lead the domestic molecular biomarker research and to create a service portfolio, among others for industry, clinics and health insurers. This would be supported by an internationally accredited laboratory supporting clinical trials and diagnostics at an outstanding level. The processing of large amounts of data also justifies significant biometrics development.	
Eötvös Lóránd University (ELTE)	CRU Hungary Hungarian Academy of Sciences - Research Center for Natural Sciences Servier Hungary	Biotechnology, molecular biomarker
	The goal of the consortium is to develop ICT methods and platforms for the pharmaceutical and energy sectors and to develop new and smart solutions. The open-access laboratory develops information and communication technologies controlled by knowledge-based, innovative and highly digitized procedures. The programme creates a digital ecosystem where research findings based on industry specific needs.	
Szent István University (SZIE)	'AXIÁL' Zrt. Asseco Central Europe Hungary ENERGOTEST Ltd. SKC-Consulting Ltd.	Agricultural informatics
	The goal of the consortium is to create compatibility between on-board IT networks, transforming devices into digital, which traditionally do not have such technologies. Further objectives are the development of a digital production system (DPS), the creation of an ISOBUS laboratory for the testing and development of on-board IT technologies on agricultural machinery, the creation of a research and education hub and, last but not least, the linking of research projects at the University.	

2.2. Where is knowledge transfer in the FIEK?

2.2.1. Channels of knowledge transfer in the FIEK programme

Collaborative research: It forms an integral part in FIEK projects and is arguably the most important channel of knowledge transfer. Joint research does not necessarily mean physical collaboration but definitely requires active participation and contribution from both sides (e.g. in the case of digital developments there is no need for the joint use of labs).

Contract-based research: From a policy perspective, the FIEK scheme primarily aims to facilitate long-term cooperation, sustainability and commercial utilisation. Therefore, one of the declared aims of the FIEK scheme is to increase the number of research assignments from businesses after the project.

Special services: FIEK aims to improve the readiness of universities to operate as service providers and thus generate market revenue, meet the necessary conditions, and have the necessary capacities and experience.

Academic consultancy: FIEK projects are strongly characterised by professional consultations between universities and businesses. As part of the institutionalised cooperation, the stakeholders regularly report on the progress of professional and management tasks. The professional reports provide excellent opportunities for identifying new technological challenges and problems to be addressed.

Intellectual property related transactions: Specific IP transactions, that is, IP purchases do not form part of the FIEK programme.

Researcher mobility: From a policy perspective, it does not form part of the FIEK programme. Mobility programmes run the risk of enabling businesses to attract the most outstanding professionals away from universities.

Spin-off: It is not a policy priority to facilitate spin-offs, but there is a clear opportunity for this as well as for creating university start-up laboratories. During the knowledge transfer FIEK focuses more on large enterprises than on SMEs.

Labour force mobility: It is enabled but is not a declared aim of FIEK projects. The employment of fresh graduates is a matter of importance primarily for businesses. To this end, businesses try to participate, for example, in teaching activities at universities. Their presence at the universities helps them recruit new researchers.

Publication of public research results in scientific journals: Publications form an integral part of FIEK projects. At the same, time this is a sensitive area, which reflects the conflicting interests between universities and companies: if a research project is purely commercial, publication is not the primary objective. Accordingly, in all three examined FIEK projects, the main emphasis is on patenting, and publication is second to this.

Conferences and networking: They are prerequisites for knowledge sharing and awareness raising. These channels of information and knowledge sharing are easier to manage than publications.

Networking facilitated by geographical proximity: Part of the respondents did not consider geographical proximity an important factor, but practice often shows the opposite. Physical proximity does seem to be an important factor in case of regular professional consultations and joint research projects.

Facility sharing: This feature depends on the project content, mainly the research field and the nature of investments. In some projects shared laboratory usage is a key element, while in others, such as in the area of digitisation, facility sharing is not justified.

Courses and continuing education: They are not policy priorities in the programme but provide a great opportunity for universities to integrate all the information and experience gained from the collaborative partnership into university education. This is important:

- to provide students with the most advanced knowledge gathered from businesses;
- to improve the university's attractiveness/competitiveness in the education sector;
- to ensure the next generation of researchers that will use project results for further research.

Different universities provide different examples.

- At BME the aim is to prepare the students. It is difficult to integrate rapidly changing industrial knowledge into undergraduate education. However, in elective courses, which have more flexible curricula, this knowledge transfer is possible.
- SZIE offers information and demonstration events, training courses and forums for exchanging experience to the wider professional audience in the framework of the project.
- ELTE uses the training element of the project to raise the next generation of researchers. The FIEK project's aims are facilitated by the fact that in the autumn of 2018 the university launched its master's degree in biotechnology, which is a priority project for the university. The training programme places great emphasis on practical skills, in which the FIEK plays an important role.

3. Interactions with other elements of the policy mix

3.1. Subsidies or grants (direct financing)

Direct financial support type policy instruments have a significant role in domestic RDI policy. After its formation in 2015, the NRDI Office developed a coherent portfolio of competitive calls to facilitate the coordinated, purpose-oriented and value-creating utilisation of grants disbursed from the National Research, Development and Innovation Fund (NRDI Fund), co-financed from dedicated EU funds. The portfolio set out five major development directions:

- support of RDI in the business sector;
- development of research infrastructures;
- promotion of transfer type cooperation;
- facilitation of international cooperation; and
- support of discovery research.

Transfer type collaborations, therefore, are priorities in the funding system. Transfer type funding schemes have in common that they support cooperation between HEIs/PRIs and businesses to facilitate the commercial utilisation of the research results. Depending on the purpose, there are two main types of such cooperation:

- joint R&D activity and knowledge creation involving both the university and the business side, where knowledge building and sharing are integral parts of the project;
- (often routine like) activity performed (on demand) by the university according to the needs of a business as a customer, where the university is not necessarily involved in knowledge building, the production of outstanding R&D results or knowledge sharing, as the aim is to increase the revenue of the business.

Accordingly, the different funding schemes focus on different factors.

Table 1 below shows the main characteristics, similarities and differences of transfer type funding schemes launched since 2015. The main source of funding for the listed schemes are the NRDI Fund and the Economic Development and Innovation Operational Programme (GINOP) and the Priority 2 of the Competitive Central-Hungary Operational Programme (VEKOP) co-financed from the Structural Funds. It is important to note that these funding schemes have gone through a natural process of development since 2015 as the NRDI Office continuously integrated into them the lessons learnt from the first National Competitiveness and Excellence Programme (NVKP_16).

Table 2. Main features of funding schemes promoting RDI transfer

	NVKP_16	GINOP-2.2.1, VEKOP-2.2.1	FIEK_16, GINOP-2.3.4	NKP_17, NKP_18	VKE_17, VKE_18
Name of the scheme	National Competitiveness & Excellence Programme	R&D Competitiveness & Excellence Cooperation	Higher Education & Industry Cooperation Centres	National Excellence Programme	Competitiveness & Excellence Cooperation
Objective(s)	Encourage long-term cooperation of strategic importance between universities, research institutes of the HAS and domestic companies, aimed to create new, marketable products/services/technologies having significant intellectual added value	Encourage long-term (sustainable) cooperation aimed to create commercially utilisable scientific results	Provide the research base for industrial research by involving excellent research units of the given discipline	Encourage durable joint research activities addressing large-scale, inter-disciplinary S&T challenges, conducted in cooperation between scientific, industrial and social actors	Encourage long-term (sustainable) cooperation of strategic importance between domestic companies and HEIs, aimed to create commercially utilisable results
Thematic orientation	Yes	No	No	Yes	Yes
Focus on socio-economic problems	Yes	Yes	Yes	Yes. It targets the solution of large-scale, inter-disciplinary S&T challenges.	Yes. It targets the solution of complex tasks of big importance, and the creation of multi-disciplinary RDI results.
Consortia of HEIs and industry as applicants	Only consortia of universities and companies can apply. Either can be the consortium leader.	Only consortia can apply, but the involvement of research entities universities/research institutes) is not compulsory.	Only consortia of universities and companies can apply, but a university needs to be the consortium leader.	Universities and research institutes can apply. Companies can be involved as partners.	Only consortia of research institutes and companies can apply, but a company needs to be the consortium leader.
Commercial utilisation as a requirement	Yes. The focus is on developing a new product/technology/ service.	Yes. The emphasis is on business utilisation, IP protection and prototyping.	Yes. The emphasis is on creating a sustainable business model.	Not required	Yes
Duration of the project	36 months	48 months	48 months	48 months	36 months
The mandatory period of maintenance	2 years	5 years	5 years	3 years	3 years
What does the transfer type of the call consist of?	Depending on the consortium leader (university or company), emphasis on business utilisation/ knowledge creation varies. This determines how knowledge transfer works in the given project.	Focuses on concrete company needs and business utilisation, and not primarily on knowledge building. Aims to facilitate knowledge transfer.	Focuses on sustainability, research capacity building fitting market needs, and knowledge building and sharing. A dedicated transfer programme.	The emphasis is on inter-disciplinarily. Aims to enable experimental research to more easily integrate into education, and reach companies.	Projects are coordinated by an industrial consortium leader. The emphasis is on industry needs, and not primarily on knowledge transfer.

One of the most important lessons was learnt from the NVKP scheme. In this funding scheme, R&D activities had to be implemented in industry-academia cooperation as well but it was not specified whether consortia should be led by universities or businesses. Experience has shown that the content and purpose of projects were **completely different if the consortium leader was a university or a business.** In the former case, the focus was more on knowledge building and sharing, while in the latter case universities' activity was much closer to research on demand. Accordingly, the results were also different. Based on the NVKP experience, in the planning process **the experts divided transfer type projects into several groups**. There are separate calls now: one for consortia led by businesses (VKE) and the other for consortia led by universities. The latter type has two subgroups: one is dominated by commercial utilisation (FIEK), the other by knowledge building (NKP). **As a result of the focused planning, the funding schemes now cover a wider scope of more targeted RDI activities.**

Due to the coordination of the schemes, different projects can have a positive impact on each other if the same actor participates in several projects. For instance, if a university has a funded FIEK project and has also submitted a VKE type project (see table above), the synergies can be ensured between the two projects.

Thanks to the coordination of the FIEK Centre, non-transfer type schemes (such as basic research calls) can have similar effects on FIEKs.

The most important aspect during the design of the **knowledge transfer policy mix** is to **ensure the balance** between the different schemes so that the policy instruments support the widest possible spectrum of the innovation chain and R&D activities from discovery research to corporate applied research, and that the schemes do not compete with each other.

3.2. Tax incentives

The domestic tax system provides **several types of tax benefits** in relation to R&D activities. Overall, however, it can be said based on feedback from the companies that they do not relate to the transfer process, thus they do not directly **affect FIEK and transfer type cooperation projects**.

3.3. Financial support to university start-ups and spin-offs.

This instrument is not really relevant to FIEK. Feedbacks gathered during the interviews suggest that spin-offs are mainly relevant to universities. Large-scale R&D projects, such as the FIEK project, require larger companies because they can provide suitable capacities. Spin-offs and start-ups are primarily important in the innovation ecosystem because of their ideas. Of course, in certain cases there may be connection points between start-ups and FIEKs.

3.4. Innovation voucher

The GINOP-2.1.4-15 Innovation Voucher scheme forms part of the domestic RDI portfolio of calls. Its purpose is to help SMEs implement innovation services, which are actually provided by universities. Details of this policy instrument are provided in Table 3. **The innovation voucher and FIEK are complementary schemes with a positive interaction.** The service provider function to be strengthened under the FIEK programme can greatly facilitate the successful implementation of the innovation voucher.

Table 3. Main characteristics of the GINOP-2.1.4 – Innovation Voucher scheme

GINOP-2.1.4-15 (**Innovation voucher**)	
General purpose and main characteristics	In less developed regions the involvement of non-RDI-performing micro enterprises and SMEs in the innovation chain by enhancing their RDI activity through innovation services received from universities or research institutes.
Eligible organisations	Business
Duration and funding per project	Max. 6 months HUF 1 to 5 million
Estimated budget per year, in euro:	320 000 euro was the budget for the period of 2016-2018. It was open from 2016 to 2018.
Voucher amount, in euro:	Min 3000 euro max: 15 500 euro
Eligibility criteria:	Eligibility for funding: Micro, small and medium enterprises a. having had at least one closed financial year; b. having employed at least one employee in the preceding year. Approval: c. use double-entry book-keeping, and have their seat either in Hungary or in an another EEA country with a branch in Hungary; d. are not subject to Simplified Entrepreneurial Tax (in Hungarian: EVA). Enterprises having already been funded in this call are excluded. Moreover, enterprises having already been funded, or having submitted application(s) that are under consideration in any calls of the Economic Development and Innovation Operational Programme (EDIOP) Priority axis 2 are also excluded.
	Service providers are: a. public research entities under the Act LXXVI of 2014 on scientific research, development and innovation (RDI Act); or b. public or private entities having been accredited by the National Accreditation Authority as service providers; or c. enterprises having been granted 'certified innovative enterprise' certification.

3.5. Public funding made available to develop infrastructures and intermediary organizations

3.5.1. Technology and transfer offices (TTOs)

The FIEK scheme did not aim to build cooperation with technology transfer offices. Based on previous actions, TTOs were established at all universities, but **there is no direct contact with them.** Part of the responsibilities of FIEK Centres is similar to those of TTOs, for example, the promotion and management of industrial relations. However, there is a big difference between the two organisations. TTOs have been formed in universities without any scientific or sectoral specifications (and without the relevant active, external, personal professional relations). By contrast, FIEK Centres are linked to specific research topics and industries and have been brought to life by existing relationships based on shared business goals. Moreover, FIEKs are expected to integrate the relevant academic research capacities and industrial stakeholders. FIEKs can coordinate RDI activities not from "above" but from "within". They ensure direct contact and dialogue between science and industry stakeholders.

3.5.2. Incubators

The GINOP-2.1.5-15 and ÖKO_15 (Table 4) funding schemes are aimed at strengthening the innovation ecosystem by directly supporting business incubators which use such funding to support start-ups. A FIEK, as noted above, is **not intended to support start-ups and spin-offs directly, but it has the opportunity to do so.** There is no substantial alignment with incubators at policy level or during practical implementation.

Table 4. Main characteristics of the GINOP-2.1.5-15 and ÖKO_15 – Incubator schemes

GINOP-2.1.5-15 and ÖKO_15	
General purpose and main characteristics	Strengthening of the innovation ecosystem. The first component aims to select incubators. The second component aims to ensure that incubators use the funding to provide support to start-up businesses.
Eligible organisations	Incubators can be business companies with at least HUF 5 million registered capital and proven professional competence.
Duration and funding per Project	Max. 36 months Min. HUF 300 million, max. HUF 600 million

3.6. Regulations regarding the ownership of IP resulting from university-industry research

The manner and regulation of intellectual property management fundamentally influence the effectiveness of transfer type projects, such as FIEK projects, so there is a clear correlation in this respect. Pursuant to Section 33(1) of Act LXXVI of 2014 on scientific research, development and innovation, universities are required to create an Intellectual Property Management Policy. However, experience shows that **the use of template policies do not guarantee the effective management of intellectual property.** Certain universities have established good practices with businesses on the management of intellectual property. Yet, IP management is a great challenge for other universities. (The severity of the problem varies by sector and field of science.) Currently, consultations are taking place in the FIEK programme to understand and align the positions of the broad range of stakeholders. The aim is to introduce good practices at the universities concerned that can be relied on by researchers in the future.

3.7. Regulations regarding open access of publicly-funded research

In line with the relevant EU directives, several initiatives have been taken in Hungary to support open access to research results. These initiatives generally have a positive impact on knowledge sharing and dissemination. At the same time, according to the feedback from businesses involved in FIEK projects, **in a funding scheme supporting commercial utilisation patenting and intellectual property management are the primary questions** and publication can only be second to these. Thus, an open access requirement (due to business secrets) could result in negative interaction.

3.8. Outreach activities that raise awareness of the importance of collaboration, such as conferences and seminars

The NRDI Office regularly organises information days and events to inform potential applicants about available calls for proposals. All transfer type calls experienced over-application which suggests that the policy instrument managed to reach the target group.

3.9. Networking events where representatives from firms, universities and PRIs are brought together to get to know each other

According to the respondents, networking type events are primarily organised by companies, the media, chambers and service providers, but on the policy side the NRDI Office also holds similar events. **According to feedbacks, networking clearly positively influences FIEK projects.** Following discussions with FIEK stakeholders, it should be noted that in the case of networking events the main focus is on content and quality.

4. Impacts

The FIEK programme is under implementation and has not been evaluated yet. However, the following observations can be made with regard to its impact:

4.1. Impact on the academic environment

The academic environment is very important in terms of the implementation of the project, as mentioned above in relation to the external environment. FIEKs strengthen the service provider function of universities in order to increase the weight of professional considerations in collaborations between universities and businesses and to help avoid the limitation of such relationships by administrative hurdles.

4.2. Impact on the networking of universities

It can be considered as one of the most important effects that partly or fully owing to FIEK projects, more specifically the FIEK Centres, **universities can now connect and align their projects** to manage resources more efficiently. Without the institutional and service development processes generated by the FIEKs, there would be no connection between the projects. FIEK clearly influences **networking not only within, but also between universities.** Universities which have no running FIEK projects are often eager to join ongoing projects and be part of the network.

4.3. Generation of new research and cooperation projects

FIEK also provides an **opportunity for increased cooperation in research and for generating revenue from commercial utilisation**. The first research results already generated demand for the research output from new external organisations that were not involved in the funded project. In addition, FIEK results also contributed to the launch of new research projects in areas, which were originally not part of the project. These can be regarded as the results of the programme.

4.4. Improvement of the competitiveness of universities

The improvement of the competitiveness of universities are also among the indirect goals of the FIEK programme. By strengthening the service provider function of universities, **FIEKs help universities to build relationships with the private sector and keep their technological knowledge up to date.** This greatly sharpens their competitive edge. It is important, however, that this development should focus on professional excellence while increasing competition among universities.

4.5. Impact on the quality of education

The new capacities and business partnerships created in FIEK projects **provide students access to practical experience and knowledge**, which increases the quality of education and competitiveness of the universities, which is a clear benefit to students and businesses as well.

4.6. Impact on the labour market

The laboratories created in FIEK projects also **enables businesses to demonstrate their research infrastructures in universities.** These infrastructure elements ensure businesses continued presence at the university and thus the next generations of qualified employees.

4.7. Impact on monitoring and assessment culture

The monitoring of professional and financial progress is an integral part of FIEK projects. It has a positive effect on the monitoring and assessment culture of universities. No programme-level assessment has taken place as implementation only started in 2017.

5. Conclusions

The main difference from other policy instruments is **the FIEK institutional centre itself and the service centre built around it**. This essentially means a paradigm shift in networking in relation to RDI activities. The FIEK Centre and the resulting research network makes it easier for partners to keep in contact and build external collaborative relations, and makes it a routine task to launch new projects. Competition between research groups and projects are replaced with cooperation.

Another important aspect is that FIEK projects are primarily implemented **based on existing university-business collaborations.** Taking advantage of established research relationships, FIEKs build a base that will enable the wider dissemination of know-how, and the involvement of more academic institutes, faculties and businesses.

It should also be highlighted that the expected positive results of the FIEK_16 scheme assume that **only "good projects" were selected as the result of the evaluation process.** Projects are expected to:

- be potentially capable of building a suitable centre of competence (i.e. they are sufficiently prepared, well-established and have proper experience for this), including a competitive research infrastructure and qualified and motivated researchers.
- respond to real market demand; and
- have appropriate professional and business relationships for networking.

Success of the FIEK project fundamentally depends on the **local university regulatory frameworks and the organisational culture.** These aspects have a key role in achieving the goals set by FIEKs.

It is essential for sustainability that **the use of research infrastructures, the utilisation of research results and the management of intellectual property are clearly regulated.** The regulated environment is also necessary for being able to engage further partners (businesses) in the future. This is the only way for universities to ensure that research projects are strictly separated from each other where the presence of market actors so requires (due to competitive considerations).

Annex A.

Table 5. Characteristics of the FIEK_16 call

Open between	July 2016 – September 2016.
Source	National Research, Development and Innovation Fund (NRDI Fund, local source)
Eligibility	Within FIEK_16 only the Central Hungarian region could be submitted. This is because the FIEK is the mirror program of the GINOP-2.3.4-15. GINOP-2.3.4 contains the same objectives, and conditions, but the source is the Structural Funds and could be applied outside the Central Hungarian region from the less-developed regions.
Beneficiary groups	Application may only be submitted by consortia submitted by the supervision of HEIs (other knowledge-based organizations) and enterprises. The number of consortium members can be up to 5.
Budget	The minimum amount of support is EUR 6,43 Million, the maximum EUR 12,86 Million.
Funded projects	Three projects were funded in total amount of EUR 26 million. Eötvös Lóránd University – Molecular markers and their identification Budapest University of Technology and Economics – Future technologies Szent István University – Agricultural informatics
Funded projects in the GINOP-2.3.4-15	In the framework of GINOP-2.3.4-15 5 grants were supported in the amount of EUR 88 million: University of Miskolc - Nanotechnology: new materials and intelligent technologies. University of Debrecen – Health industry Széchenyi István University – Vehicle industry/E-mobility/ICT/Packaging János Neumann University (until 31 July 2017. Pallasz Athéné University) – Vehicle Industry University of Kaposvár – Food & agriculture
Evaluation process	A professional, focused, realistic program had to be drawn up in the application supported by appropriate competences. Listed below are the evaluation criteria that examine the transfer characteristics of the projects: • Excellence of partners in the given field of science. • The existence of necessary scientific capacity at the HEI. • The sales potential of industrial partners at local and international market. • As the project goes on, project actors are able to respond to changing market conditions. • The construction of the professional tasks of the project, the structuring of the work plan. • The international competitiveness of the expected results at the closure of the project. • Market analysis and target group analysis of project results. The support was provided on the basis of the professional opinion of the panel of experts invited by NRDI Office.
Field of research activity	Basic research Applied research Experimental development
Planned results	Increase the number of R&D personnel Prepare a business plan based on the project results To complete three commitments of the further options: • excellent publication activity • trade marks • new product, service, process, prototype • creating spin-off • number of PhD degrees

Annex B. Policy mix and possible interactions between the FEIK and the elements of the transfer policy mix

Table 6. Policy instruments supporting knowledge transfer and their possible interactions with the FEIK scheme

Elements of knowledge transfer policy mix	Instrument	What is this instrument all about?	What are the potential interactions between the FIEK and other instruments?
Subsidies or grants (direct financing)	FIEK-16	A separate call-for-proposals target corporate-led projects (VKE) and university-led projects. There are two types of the latter: Market utilization dominate in the FIEK, and the knowledge creation is stronger in the NKP	The call-for proposals are focused so they can cover wider transfer processes. This also avoids duplication.
	GINOP-2.3.4		
	2018-1.3.1-VKE, VKE_17		
	NVKP_16		
	GINOP-2.2.1-15		
	VEKOP-2.2.1-16		
	NKP_17, 2018.1.2.1-NKP		
	EU_KP_16		
	NEMZ_15, 16, 18		
	EUREKA_15, 16, 18		
Tax-incentives		There is tax-incentive associated with RDI activities, but it is not related to transfer activities.	No interaction is expected.
Financial support to university start-ups and spin-offs	GINOP-2.1.5-15; ÖKO_16 -	The program aims indirectly (through the support of indicators) to strengthen start-ups.	No interaction is expected.
Performance-based funding system		It is being prepared.	-
Public procurement of technology, pre-commercial procurement		-	-
Innovation voucher	GINOP-2.1.4-15	There is innovation voucher call-for-proposals in Hungary.	This instrument has positive interaction with FIEK. FIEK can facilitate the successful implementation of Voucher. They complement each other.
Public funding made available to develop infrastructures and intermediary organizations	TTOs	All university had to create a TTO.	FIEK has no direct contact with TTOs. There are no positive or negative interactions between them.
	Incubators	Incubators are operating in Hungary.	No interaction is expected.
Regulations regarding the level of autonomy of HEIs with regard to industry relation		There are organizational, legal, administrative and technical conditions that require simplification and greater flexibility to encourage transfer programs at universities.	They fundamentally influence the effectiveness of FIEK projects. Negative interaction can be triggered by not enough flexible regulation.

Elements of knowledge transfer policy mix	Instrument	What is this instrument all about?	What are the potential interactions between the FIEK and other instruments?
Regulations regarding the ownership of IP resulting from university-industry research		Pursuant to Section 33(1) of Act LXXVI of 2014 on scientific research, development and innovation, universities are required to create an Intellectual Property Management Policy	They fundamentally influence the effectiveness of FIEK projects. There is interaction between them. Based on previous experience, template solutions and regulations are not solution.
Regulation regarding the setting-up of spin-off companies by university researchers and students		The practice and significance is differ at each university.	The successful operation of the FIEK centre can have a positive effect on spin-offs.
Regulations regarding the career track of university researchers, with specific rewards for building linkages with industry		There is no such instrument.	No interaction is expected.
Regulations regarding sabbaticals and mobility programmes that allow university researchers to join industry and vice versa for temporary projects.		There is no such instrument.	No interaction is expected.
Regulations regarding open access of publicly-funded research		It is an important part of transfer projects, but sometimes they are in conflict with patents and IP management. In case of a transfer project with companies the patent and IP is the primary issue.	To avoid negative interactions it is important to fix the relevant rules in each project.
Outreach activities that raise awareness of the importance of collaboration, such as conferences and seminars		There were more applicants for the FIEK than who were supported. It suggests that the information reached the target group.	There is positive interaction. The representatives of HEIs and companies can get in touch each other on these events.
Networking events where representatives from firms, universities and PRIs are brought together to get to know each other		Mainly organizations, media, chambers and service providers organize such events, but the NRDI Office also organizes similar events.	The instrument has a positive interaction on the development of transfer projects. The focus has to be in the content of the events.
„Collective road-mapping"		There is no such instrument.	No interaction is expected.
Voluntary guidelines and codes of conduct		All university had to develop its own IP management policy. But based on experience this cannot be done with template documents.	It basically influences the effectiveness of the FIEK, the interaction is clear. Based on previous experience, templates and regulations are not quite effective.

Annex C. Methodological background

The case study was prepared along with the Template 2 in the OECD document "Assessing the impacts of the policy mix for knowledge transfer between industry and science" (DSTI/STP/TIP(2016)6).

The source of possible policy instruments: "TIP Policy Mix for Science-Industry Knowledge Transfer: Towards a mapping of policy instruments and other interactions" (DSTI/STP/TIP(2017)7).

Methods used in the case study: Gathering primary data (project documents, reports, strategies, NRDI Office internal documents, reports, structured interviews, small group interviews.)

In the case study we conducted interviews with the staff of the NRDI Office who participated in the planning of the FIEK and who are members of the Professional Supervisory Board set up under the FIEK project and with the representatives of the HEIs and companies.