Smart specialisation: some considerations of the Croatian practice

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Abstract: The paper deals with the concept of smart specialisation in technology-follower countries, using the example of Croatia. Developed countries, especially in the European Union, have growing interest in smart specialisation as a new policy measure and as a way of overcoming uncoordinated focus on supporting the same technological, research and production areas that does not pay-off investments and efforts. Although smart specialisation suits the socio-economic circumstances of developed countries due to their mature co-evolutionary process between technologies, institutions and business activities, it has a potentially significant role in less developed countries, too. Smart specialisation appears to be a useful tool for less developed countries as an alternative to the current bundle of mainly horizontal policy measures that are usually not only disconnected but also stand in mutual competition. The latter sometimes creates rivalry among the public institutions and programmes and leads to a lack of synergy and efficiency of the public policies, undecided and hesitant development strategies and thus a low impact on fostering technological transformation and economic growth.

Keywords: smart specialisation; innovation system; economic growth; policy measures; technological transformation; Croatia; catching-up countries.

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1 Introduction: the concept of smart specialisation

The concept of smart specialisation is increasingly attracting the interest of policy makers and scholars in the developed countries, especially the European Union (EU) (EC, 2009) and is a leading idea of the Knowledge for Growth Expert Group (K4G)[1]. Although, there is no clear definition of smart specialisation, it is understood to be a policy measure whose goal to avoid uncoordinated competition of the member states in the same technological areas, as well as the unnecessary duplication in technology and research programmes that result in waste of resources and effort. As pointed out by Dominique Foray (EC, 2009) it should also increase the cohesion of polices towards the new member states that are mainly technological followers and cannot realistically catch-up with the cutting-edge of research, notably in advanced 'general purpose technologies' (GPTs), at least in the short term.

The idea behind smart specialisation is the complementarity between the GPTs or frontier of inventions and generation of new opportunities for developing co-inventions or applications in particular sectors. By definition, major innovations in the GPTs require a huge mass of scientific and technological resources and therefore, are usually carried out by the leader regions. By contrast, follower regions are naturally oriented towards smart specialisation that assumes application of GPTs through the myriad of economically important innovations that result from the co-invention of applications [e.g., application of nanotechnologies in fishing or wine or cheese producing mentioned by Foray et al. (2009, p.189)].

Smart specialisation should help them to select the most appropriate specialisation patterns based on their specific competences, which are primarily aimed at the application and co-invention of the advanced technologies usually developed by the technology leaders. The main idea is driven by the goal of more efficient and realistic inclusion of the less developed countries into the regional development of the EU. This kind of inclusion is based on 'shared responsibility' instead of the subordinated participation that is typically the result of technology specialisation by imitation and replication. Some of the smaller countries clearly have some difficulties in securing inclusion in EU funded projects and programmes because their scientific capacities, infrastructural and capital assets are relatively weak. Although Foray and van Ark (2007) emphasise that "the national and regional public policies have over-emphasised new science-based leading edge industry in an unimaginative way, resulting in an enormous uniformity of national knowledge bases" it is also important to take into account that technology dynamism in a globalised economy and the catching-up process require highly sophisticated knowledge and intellectual capital as well as a skilled labour force.

The local science base plays a critical role in the absorption of new foreign technologies and their application in local economies. This is a process of knowledge and technology transfer that also requires huge investments in local research capacities and education (Nelson, 1990; Bell and Pavitt, 1993).

The idea of smart specialisation does not call for enforcing specialisation through the kind of old-fashioned industrial policy based on a top-down, picking the winners approach. It is also different from the concept of the regional innovation system that suffers from the absence of a unified conceptual framework and empirical validation which may guide policymaking (Doloreux and Parto, 2004). Smart specialisation is more a mechanism for creating new opportunities through government policy programmes that support genuine entrepreneurial initiatives and their needs for establishing linkages and synergies with the different stakeholders. These linkages include, besides standard business networks, the links with scientific community and universities which are typical for the triple helix model of interaction among university, industry and government (Etzkowitz, 2002). Within a knowledge driven economy, smart specialisation also relies upon knowledge flow, teaching and circulation of experts and information between different helices, but should be more exposed to individual initiatives than to the top-down government programmes.

In contrast, smart specialisation shares common ground with the 'new industrial policy' that strives for technology specialisation to be transformed into competitive advantage through the flexible fine-tuning process supported by public policy. According to Hausmann and Rodrik (2003) smart specialisation is an entrepreneurial process of discovery and a learning process of what one (state or company) 'is good at producing'. Learning what can be produced and choosing appropriate investments among the numerous modern-sector activities are, for Hausmann and Rodrik, key challenges in the process of transformation into a modern economy and a key to future growth.

Public policies have a dual role in fostering industrial growth and transformation. They need to encourage entrepreneurship and investment in new activities *ex ante*, but push out unproductive firms and sectors *ex post*. For Foray et al. (2009), public policies also play an important infrastructural role by providing and collating appropriate information about emerging technological and commercial opportunities and constraints, products and processes in order to assist local entrepreneurs.

For Giannitsis and Kager (2009), specialisation strategies are based on technical change and innovation since they are powerful engines for enhancing 'dynamic' specialisation advantages of firms and industries and constructing 'differences' *vis-à-vis* competitors. This is a substantial way of achieving cumulative growth, rents and power. The localisation of specialisation along the R&D chain is important. Technological specialisation could be embodied in the late phases of the R&D chain, e.g., in production processes that lead to competitive advantage, and thus directly affects growth, employment or income. In contrast, specialisation in the early stage of R&D remains in the sphere of scientific knowledge with no direct economic benefit. Therefore, Giannitsis and Kager proposed a taxonomy of specialisation that includes: specialisation in scientific knowledge, specialisation regarding technologies and innovations, specialisation related to production processes, specialisation related to clusters, and horizontal vs. vertical specialisation.

Specialisation strategies contain many options, models and approaches with inherent policy risks since the essential question remains the same: how to be selective, what risks

have to be taken and how efficient policies can be designed and implemented. The success of specialisation depends on how selected technology and industrial areas interact with diverse locally available labour forces, capital or other inputs. Government decisions should be taken in cooperation with research and technology-active firms and research organisations. Therefore, such mechanisms are much more suitable for developed countries with established co-evolutionary processes among the different actors. By contrast, the absence of co-evolutionary processes between technologies, institutions, business activities and public policies in technologically weaker players increases the policy risks and uncertainties. As a consequence, the outcomes of 'evolutionary targeting' or 'smart interventions' in the former group of countries are less risky while in technology followers targeted interventions are more uncertain and risky (Giannitsis, 2009).

2 The case of Croatia

Addressing the issue of specialisation in research, innovation and industry is of particular importance for countries that are not leaders in any of the major science or technology domains, like Croatia. The theory and practice of economic development of technology followers have converged in the last two decades, as Hausmann and Rodrik (2003) emphasised, taking a remarkably simple view of growth fundamentals. In the most simple and stark form, this view states that economic growth requires two things: foreign technology and good institutions. This perspective is well grounded in the neoclassical model of economic growth, which predicts that poor countries will experience rapid convergence with advanced economies once they open their economies and markets for foreign investments, have the access to state-of-the-art technologies and their governments respect property rights. These fundamentals of neoclassical technology converging theories have been the cornerstones of development strategy in virtually every developing country during the last 15 years, including Croatia. However, Croatia as well many other catching-up countries have not witnessed this rapid technology and economic growth despite having strongly focused their economic policies towards, market openness, enterprise privatisation and macroeconomic stabilisation. It makes a room for exercising the technology gap theories (Posner, 1961; Fagerberg, 1988) that emphasise the critical role of technological change in long-term development and the need for technology accumulation, human capital and learning.

Croatia is a small open economy with a population of 4.4 million people and a GDP that amounted to €47.3 billion in 2008 at current prices (GRC, 2008). Over the last few years, Croatia has remarkably improved its macroeconomic framework. Its average GDP growth rate over the period 2000–2008 reached 4.3%, while the average growth for EU-25 was 2.2%. Despite the decrease in 2008, since 2002 GDP growth, at over 4%, surpassed the EU average. GDP per capita (on a purchasing power parity basis) has risen from €7,375 in 2004 to €15,100 in 2008 while EU27 is €25,100, enabling Croatia to reach around 63% of the EU-27 average.

The Croatian economy is a service-oriented economy, i.e., services account for more than 60% of gross value added (GVA). Comparing the GVA structure in 1995 and 2006, one can see a decrease in the share of the agriculture, hunting and forestry sector from 10.7% to 7.4%. The share of manufacturing industry has also fallen from 24.3% to 20.3%, whilst there is a noticeable trend of increase in the share of services from 60.9%

to 68.1%. In this process the following sectors are important: financial intermediation, wholesale and retail trade and transport, storage and communications.

In the industrial sector, though manufacturing predominates in terms of employment, number of enterprises, value of sales and GVA, labour productivity is lower than in other sectors, notably electricity, gas and water supply.

Small and medium entrepreneurship has been one of the core drivers of the Croatian economy in the recent period, playing an important role in industrial restructuring, competitiveness and innovation and in generating new employment. SMEs account for 99% of all registered enterprises, 55% of GDP and 25% of exports. SMEs have been slowly increasing in number and total employment. The most active sectors are wholesale and retail trade, with real estate and manufacturing trailing behind. Data on the location of economic activity on the regional level of counties, measured in terms of registered businesses, shows that SMEs are concentrated in a few major urban centres (Zagreb, Split, Rijeka, and the surrounding areas), a fact that demonstrates a lack of balanced business development among the Croatian counties.

The structure of the economy in the most developed regions (Zagreb region and Adriatic North) is characterised by a high share of services. In recent years, the coastal regions, Adriatic North and Adriatic South, have experienced strong growth of GVA from increased tourism. Central Croatia and, in particular, Eastern Croatia have a quite unfavourable economic structure, with a relatively large share of agriculture. In order to ensure that investors are aware of these opportunities and can make an informed decision about which regions to consider when evaluating an investment opportunity the Ministry of Economy, Labour and Entrepreneurship (MELE) together with Croatia's Investment and Export Promotion Agency (APIU) supports the Investment Certification Programme for Regions (ICPR). They recognise that the attraction of investment is a highly competitive business worldwide. Investors always have a choice. Thus, success in attracting international investment depends not only on the overall macroeconomic conditions of Croatia but also on the ability of regions to offer attractive and competitive conditions to potential investors that meet their business needs. However, the indigenous capabilities like technological competences and tacit knowledge embodied in the human capital which produce a return on investment play a critical role in attracting foreign investments based on competitive production or service provision and not on exploitation of enforced privatisation of state companies, cheap labour or natural resources and raw materials.

The present economic situation in Croatia urgently requires structural adjustment to meet the challenges of international competition (exports) and integration with the EU that make policies with regard to technological specialisation crucially important. At the same time, it is evident that both the high tech industries and related scientific disciplines have not really become new growth areas in Croatia. Therefore, the specialisation strategies in Croatia have to consider which part of the R&D chain (scientific, production, clusters...) should be selected for specialisation and in exactly which technological areas. Further on, the question of significant importance is: should Croatia as an EU candidate country focus its growth policies on fitting into the still imaginary regional development of the EU or should it foster selected areas of research, technologies and industries based on its own choice and preferences? The next essential question is also how to select these technological, research and production areas. It appears quite logical that the most promising strategy of specialisation is to encourage

investment in programmes that will complement the country's other productive assets to create national comparative advantage and will also fit into regional development strategies at the EU level.

However, smart specialisation is not only a matter of technological knowledge and economic expertise. It is dealing with more complex socio-cultural and political issues that link 'good' governance, past experience, cognitive maps, social values and intellectual assets with the path of technology accumulation and shaping of productive processes into the unique process of development.

In the case of Croatia, the socio-cultural and politically specific historical heritage requires that pro-active technological and industrial policies be considered with a dose of scepticism. The main reason is the long period of state dictated economy and interventionist-type industrial policy during the period of socialism that causes any kind of planned economy and government interference with the 'invisible hand of the market' to be perceived as obstacles to economic progress. Therefore, all the polices, including research policy, are mainly horizontal and generic in character and focused on supporting all scientific disciplines, technological areas and innovations on an equal basis. In addition to the socio-cultural heritage that hinders specialisation, there are other more pragmatic factors that generate scepticism among leading elites towards specialisation among which at least three can be specified:

- first of all, it is highly uncertain and unpredictable to foresee where the advantages can lie for a country or a region
- second, the technological competences of the Croatian industrial sectors are mostly lost during the transition period while building up of new competences cannot be simply determined by the government through a top-down process; instead it requires co-evolution of many sectors which are still in their infancy (market regulation, entrepreneurial spirit, judiciary, industrial R&D)
- finally, the dominant horizontal approach protects the political and economic elites in power from the risk of having to take responsibility for policy failures and thus having to answer to critics.

3 Policy issues: a role for public S&T policies

In Croatia, interest in science and technology as the driving forces of the transition to a knowledge-based economy has been growing at least since 2000. The government is trying to promote the transition of Croatia into a knowledge society, influenced by the Lisbon agenda and Barcelona targets. The long-term trends in Croatian science and technology policy partly reflect the main European movements, such as the integration of science and innovation policy or the balance between direct and indirect funding of public research. The process of the 'Europeanisation' of research policy in Croatia started quite recently, in 2000, and was intensified after 2005 when Croatia started accession negotiations with the EU. The significance of research policy is also evident from the increased investment in R&D over the period 2003–2008, the creation of new jobs in the science and education system and the increased number of science policy documents produced in 2006 and 2007, such as: the Science and Technology Policy of the Republic of Croatia 2006–2010 (MSES, 2006), the Action Plan for the Implementation of the S&T

Policy 2007–2010 (MSES, 2007a), and the Action Plan for Increasing the Number of Investments in Science and Research (MSES, 2007b). The documents deal with the five main structural shortcomings of the R&D system and set out, in compliance with the Lisbon strategy, appropriate measures with the main aim to increase financial allocation to R&D towards 3% of GDP.

The next policy document is the Action Plan to Strengthen the Absorption Capacity of Croatian Scientific Organisations for the Seventh Framework Programme (FP7) in the Period 2008–2013 (MSES, 2008). It reflects the efforts of the Government to increase the participation of Croatian scientists in the FPs. This is the first document that systematically describes and analyses participation of Croatia in the FPs and provides recommendations for strengthening participation. One of the important measures is related to inclusion of Croatia into the EU technology platforms and joint technology initiatives since currently Croatia participates in only one technology platform – the European construction technology platform. The next important measure concerns the relationship between doctoral studies and FP7 projects, while the remaining measures stress the administrative and absorption capacities.

Policy makers have also made an effort to harmonise the research priorities within FPs with national research priorities. As a result, progress in biotechnology, new materials and nanotechnologies is emphasised as a scientific priority for Croatia in Science and Technology Policy 2006–2010 (MSES, 2006). However, a range of nation-specific research themes such as understanding of humanity and national identity or preservation of natural wealth and cultural heritage are listed as important and complement the FP priorities.

Croatia, as an EU candidate country, is not obliged to produce a national reform programme which also includes monitoring implementation of the Lisbon goals in the domain of R&D. Instead, the Strategic Development Framework 2006–2013 (CODSCF, 2006) is the main strategic document. It defines ten priority areas for the forthcoming period. Among them, knowledge, education, science and information technologies have a prominent role. Besides, the Pre-accession Economic Programme (PEP) (GRC, 2010), a national strategic document that defines main economic policy guidelines on a annual basis for integration with the EU, stresses the need for further reforms in science and education in order to develop knowledge-based society.

The specific programmes for science and technology development are, for the first time, included in the pre-structural funds, which had previously served primarily for the expansion of infrastructure and capacity building of public administration to facilitate Croatia's preparation for EU membership. For example, within the Instrument for Pre-accession Assistance (IPA), an initiative launched in 2007 by European Commission, the Ministry of Science, Education and Sports (MSES) participates with two programmes with a total value of €10.5 m. One programme is aimed at developing a bio-science incubator in order to employ bio-technical scientific resources among the most advanced in Croatia while the other should support the transfer of knowledge from universities to the business sector (see Section 4).

Finally, it should be emphasised that the Government of Croatia established the National Foundation for Science (NZZ) in 2001 as the first independent foundation for research activities. The NZZ implements a range of different programmes in the areas 'brain gain', international mobility of researchers and upgrading the quality and reform of the higher education sector.

4 Key research policy focus: knowledge production instead of capitalisation

Research policy in Croatia is mainly generic in character while support programmes for specific thematic areas are not common policy practice. The main policy instruments for financing science follow a horizontal approach in which all research areas are to be developed and treated equally. The substantive part of budget resources for R&D is distributed by the MSES through the programme of research projects (Z-projects) intended to support all fields of science regardless of thematic area and type of research. It is designed to assure the balanced development of the six main fields of science (natural sciences, technical sciences, bio-medical and health sciences, bio-technical sciences, social sciences, humanities) that are generally used by MSES for the planning, monitoring and evaluation of research activities in Croatia.

However, the bio-medical and health sciences and biotechnical sciences are allotted a slightly higher priority because majority large proportion of the budget for research projects (e.g., 39% in the period of 2007–2011) will be spent on bio-medical and biotechnical research, such as biochemical engineering, molecular biology, medicine, pharmacy and related fields. It is expected that these thematic areas will be much more pronounced in the future since the first step has already been taken by establishing the bio-technology incubator within the pre-structural fund – IPA. The reason behind this 'favouritism' is a 'strengthening of the strengths' policy, i.e., the judgement that bio-medical research in Croatia has the highest potential to bridge the existing gap in technology transfer and the commercialisation of science. Croatia has a solid platform for cutting-edge research in these fields and a critical mass of researchers located all over the country in such institutions as the Medical School of Zagreb, the Medical School of Split, the Institute of Immunology and a series of research units in polyclinics and hospitals (25 research units). The recently established Mediterranean Institute for Life Science (MedILS) in Split, whose founders are world-famous scientists working for the commercial application of research in molecular biology, can catalyse the whole process.

In addition to bio-medicine, traditional bio-technological research in the food and agriculture industry, forestry, energy (bio-fuels) and the environment (waste and water treatment) is of special interest for Croatia since it has a long tradition and significant research resources in these fields.

The process of research capitalisation through the development of new technologies has been initiated by the first innovation policy programme entitled *The Croatian Programme for Innovative Technological Development (HITRA)* (MSES, 2001) launched by the MSES in 2001. The launch of the programme was driven by the growing interest of policy makers in fostering cooperation between the public research sector and private businesses as a fundamental prerequisite and practical tool for raising R&D investment and for building the 'knowledge society'. The HITRA programme has been significantly extended and upgraded since 2001 and today has been developed into the rather complex national innovation system (NIS) although still deficient in the sector of industrial research and business development. The responsibility for developing the NIS is shared between MSES and MELE. While the MSES, as a line ministry for scientific research, supports primarily 'science-based' innovation through various programmes and institutions, the MELE runs the programmes for strengthening technological capabilities of small- and medium-sized companies such as: computerisation, automatisation of business operations, introduction of ISO quality standards, etc.

Today the main institutional set-up for science-industry cooperation and fostering innovation under the auspices of the MSES consists of the Business Innovation Centre of Croatia (BICRO), the Croatian Institute for Technology (HIT) and the Unity for Knowledge Fund (UKF). The BICRO is carrying out several programmes aimed at university-business interaction: the Development of Knowledge-based Enterprises Programme (RAZUM), Technology Infrastructure Development (TECHRO), Venture Capital Industry Development (VENCRO), Cooperation between the Academic Community and the Economy (IRCRO), and Competitiveness and Technology Process Advancement (KONCRO). The HIT is carrying out the Technology-related Research and Development Programme (TEST), providing support to innovative technology projects in the academic community, preferably in cooperation with private business sector.

The UKF runs the programme 'Research in Industry and Academia Grant', while the NZZ started the programme 'Partnership in Basic Research' in 2005. The first programme supports engagement of young researchers and professionals with a doctorate degree in Croatian enterprises while the latter programme is aimed at increasing non-governmental investment in basic research. In 2009, the MSES launched the programme 'Science and Innovation Investment Fund', which was developed under the IPA to support the transfer of knowledge from universities and public research institutes to the business sector.

The responsibility for the substantive part of the innovation system related to entrepreneurship and business infrastructure development (supporting entrepreneurial zones, incubation centres, business centres and regional development agencies) rests within MELE. According to the latest available data the entrepreneurial infrastructure supported by MELE comprises 27 business centres, 16 business incubators and six regional development agencies. In addition, there are 15 economic free zones and 235 entrepreneurial zones, out of which 140 are fully functioning. Fourteen incubators out of the 16 established are in the early stages of development.

In addition, there are nine pilot technologies transfer centres attached to universities and large public institutes as well as the several technology and innovation centres/parks which are supported by the European projects and the BICRO.

In 2004, the Croatian government decided to make balanced regional development a national priority. Great support was provided by the EU assistance programme CARDS 2002, 'Strategy and Capacity Building for Regional Development', since the National Strategy for Regional Development (NSRD) (MSTI, 2005) had been drafted within this project in order to create a functional policy of regional development to 2013. The NSRD is the first document that addresses regional development comprehensively and also includes two strategic goals. The first goal is to improve the efficiency of the counties in order to sustain development. The second is to create efficient legislative and governmental frameworks.

In the period from 2007 to 2013, the main instrument for financial assistance for regional development is the new IPA. The IPA provides assistance for the management of structural funds on accession and has a significant role in harmonisation of the national development plans with the Lisbon goals. The documents which incorporate and harmonise the Lisbon guidelines and IPA programmes with the national implementation policy measures are as follows:

1 'Strategic Development Framework 2006–2013 (SDF)'

2 'Strategic Coherence Framework 2007–2013 (SCF)'

3 'Pre-accession Economic Programme 2009 (PEP)'

4 Sectoral operational plans for IPA implementation

5 Regional (county) development plans (ROP): prepared so far in 19 of 21 counties.

Among the sectoral operational plans for IPA implementation the most important for R&D is the Regional Competitiveness Operational Programme (RCOP), which is primarily focused on SMEs, R&D and innovation. All counties in Croatia are obliged to produce regional operational programmes (ROP), which are prerequisites to use, seek out and channel national, EU and other funding for development projects in the regions.

5 The incentive framework to encourage research, innovation and entrepreneurship

Since formerly strong industries deteriorated during the transition process, Croatian economic structure is rather diverse and follows the natural assets of particular regions. Economic activities range from organic farming to advanced manufacturing and from software design and development to financial services and logistics. One of the primary goals of the Croatian Government's economic and industrial policy is to promote the development of small and medium-sized enterprises. On the basis of this programme (Government of Croatia, 2008); the MELE adopts annual plans for incentives for this enterprise category. For example, the Small and medium-sized enterprises operational plan for 2010 (Government of Croatia, 2010) contains the plan of individual incentives and activities/projects, sources of financing and payment procedures.

The incentive measures intended for small and medium-sized entrepreneurs are also horizontal and include measures aimed at creating the conditions for going into entrepreneurship, education, creation of an entrepreneurial infrastructure. The instruments by which these measures are implemented are direct subsidies and guarantees. Currently, the measures most preferred by companies are as follows:

5.1 Tax incentives

Tax incentives are now being used more than in recent years. At present they are designed as governmental instruments to support business R&D (in order to raise the level of private investments in R&D), e.g., investment allowances, tax allowances for R&D, initial allowances, tax deductions (these tax incentives are designed for firms which are planning to invest in R&D over a certain period of time – *based on increment of R&D*).

Investment (€ million)	*People employed*	*Period (years)*	*Corporate income tax*
0.3–1.5	10	Up to 10	10%
1.5–4	30	Up to 10	7%
4–8	50	Up to 10	3%
> 8	75	Up to 10	0%

Source: Trade and Investment Promotion Agency (http://www.apiu.hr)

5.2 State aid (subsidies)

The system of state aid control (authorisation, monitoring of implementation and recovery of state aid) was established under the State Aid Act (Official Gazette 47/2003, 60/2004) and Regulation on State Aid (Official Gazette 121/2003)[2]. The State Aid Act determines the following state aid categories:

a *Horizontal aid* – cross-industry or 'horizontal' rules cover particular categories of aid which are aimed at solving different difficulties which may arise in any industry or region, such as:

- aid for small and medium-sized enterprises
- aid for research and development and innovation
- aid for environmental protection
- risk capital measures
- aid for services of general economic interest
- aid for the rescue and restructuring of firms in difficulty
- employment aid
- training aid.

b *Regional aid* – this aid category involves measures to promote the development of areas where the standard of living is particularly low or where there is a serious underemployment. The aim is to promote the less-favoured areas mainly by supporting initial investment and job creation linked to the investment.

c *Sector specific aid* – industry specific or sectoral rules apply to particular industries where state aid may significantly impede competition. The separate rules applicable in this context are the following:

- *General sectors*: the sectors featuring specific types of problems or conditions currently include shipbuilding, steel, synthetic fibres industry, audiovisual production, broadcasting, electricity production and postal services.
- *Transport*: transport includes: road transport, inland waterways transport, rail transport, maritime transport and air transport.
- *Agriculture and fisheries*: in the agriculture and fisheries sector separate state aid rules apply. Within the meaning of the Croatian State Aid Act, Article 1 paragraph 2, state aid to agriculture and fisheries fall outside the scope of the State Aid Act and the jurisdiction of the competition agency.

d *State aid by allocation instrument* – in Croatia the state aid by allocation instruments fall into four basic groups:

- subsidies and tax exemptions
- proprietary interest

- favourable loans and tax deferrals
- state guarantees.

5.3 Investment incentives

These incentive measures are regulated by the Investment Promotion Act and apply to investment projects that cover:

- manufacturing sector activities
- technology centres
- strategic business support services.

Beneficiaries of incentive measures must retain their eligibility status and maintain the investment and new employment linked to the investment during a minimum period of 5 years which shall not be shorter than the period during which they make use of the incentive measures.

5.4 Employment incentives

Employment incentives are specific incentives targeted to SMEs to reduce the unemployment rate by the follow schemes:

Table 1 Employment incentives for SMEs

Unemployment rate	*Incentive rate in relation to eligible costs of opening new workplaces*	*Increase for technology innovation and development centres*	*Increase for business support strategic activities*
< 10%	10% till 1,500 EUR	+50% (750 EUR)	+25% (375 EUR)
10 – 20%	15% till 2,000 EUR	+50% (1,000 EUR)	+25% (500 EUR)
> 20%	20% till 3,000 EUR	+50% (1,500 EUR)	+25%(750 EUR)

Source: Trade and Investment Promotion Agency (http://www.apiu.hr)

6 Government measures focused on enhancing entrepreneurial capacity of Croatia

The brief overview of the major policy measures (Table 2) reveals that the majority of policy measures aimed at supporting research, innovation and entrepreneurship are not sector specific and are selective in terms of prioritisation of certain technological, business or research areas. The main advantage of the current horizontal approach, at least in the area of scientific research, was the successful maintenance of a national research base and its scientific diversity during the turbulent period of change towards a market economy. The justification for the generic approach could also be that technological development, scientific breakthroughs and their various applications are non-deterministic. Even what appears as duplication very often generates diversity and new opportunities.

Table 2 National supporting measures/instruments and type of funding

Government bodies/funding agency	*Supporting measures/instruments*	*Type of funding*	*Focus by fields of science/by sectors economic activities*
MSES**	1 Z-projects (Research projects)	1 Competition-based research grants provided by MSES	1 No specific focus by field of science and priorities. They are based on the priorities of Croatia's science development plan and the priority fields of the EU FP7. The programme supports research projects from all fields of science regardless of the type of research (basic, applied or development) and thematic priorities
	2 I-projects (Applied Information Technology projects)	2 Competition-based research grants provided by MSES	2 Information technologies in education and similar areas
	3 Junior Research Programme	3 Block grants provided by the MSES	3 All fields of science
	4 Science and Innovation Investment Fund (SIIF) project – planned within the Operational Programme for Regional Competitiveness (IPA)	4 IPA – grants scheme and national component*	4 Not sector specific
BICRO*	1 Technology programmes: RAZUM, TEHCRO, VENCRO, IRCRO, and KONCRO	1 Conditional loans Co-financing provided by the government	1 The programmes do not have a specific technology focus and are open to all areas of innovative technology. However, preferred sectors are: ICT, electronics, energy, environment, materials, medicine, biomedicine, pharmaceutics, food technology
	2 Incubation Centre for New Bio-science Technologies Creation and Commercialisation	2 Operational Programme for Regional Competitiveness (IPA)	2 Biotechnology Bio-tech companies

Notes: *Programmes focused on promoting entrepreneurship; **programmes focused on science, technology and innovation.

Source: Author – base on lines government bodies

Table 2 National supporting measures/instruments and type of funding (continued)

Government bodies/funding agency	*Supporting measures/instruments*	*Type of funding*	*Focus by fields of science/by sectors economic activities*
MELE*	1 Industrial policy of the Republic of Croatia in preparation for accession to the EU, 2007	1 Grants (non-repayable funds)	1 Within industrial policy list of industrial sectors development until the year 2013: • Manufacture of basic metals and fabricated metal products • Manufacture of textiles and apparel • Manufacture of pulp, paper and paper products • Manufacture of electrical and optical equipment • Manufacture of machinery and appliances • Manufacture of rubber and plastic products • Manufacture of chemicals and chemical products • Wood processing and wood products • Manufacture of food products, beverages and tobacco products • Manufacture of transport equipment • Electricity, gas and water supply • Manufacture of leather and leather products • Production of other non-metal mineral products.
	2 Programme for the Support of Small and Medium-sized Enterprises 2008–2012	2 Micro loans investments in entrepreneurial infrastructure construction	2 Within the government's export strategy it is planned to set up six export-oriented clusters in the fields of water, small shipbuilding, textiles (apparel), ICT solutions, wood processing (furniture) and aquaculture.
	3 The Operating Plan for Support to Small- and Medium-sized Enterprises	3 Interests subsidies in promotional credit lines	
	4 Government's Export Strategy	4 Guarantees	
	5 Strategy of Clusters Development in the Republic of Croatia (draft 5.2, 2009)	5 Grant incentives for clusters	
	6 Action Plan of Clusters Development in the Republic of Croatia (draft 1.1, 2009)		
HIT**	1 Technological Research and Developmental Projects (TEST) programme – support to innovative technology projects in the academic community (aimed at pre-commercial technological projects)	1 Competition-based research grants provided by MSES	1 No specific technology sectors are prioritised. Between 2001 and 2004, 200 projects had been accepted for financial support. 28% of the projects were biotechnology related.

Notes: *Programmes focused on promoting entrepreneurship; **programmes focused on science, technology and innovation.

Source: Author – base on lines government bodies

Table 2 National supporting measures/instruments and type of funding (continued)

Government bodies/funding agency	*Supporting measures/instruments*	*Type of funding*	*Focus by fields of science/by sectors economic activities*
NZZ**	1 'Brain gain' programme which consisted of the three sub-programmes – 'Senior', 'Visitor' and 'Postdoc' 2 Partnership in Basic Research 3 International mobility programmes 4 Attracting scientific Diaspora 5 Reforming of higher education sector		1 Strategic fields are defined in the NZZ strategic plan for the period 2004–2008 and includes: • Information and communication technology • Biotechnology • New materials and new production processes • Environmental sciences and sustainable development • Socio-cultural transition from industrial to knowledge-base society.
UKF**	1 Research in industry grant – intersectoral mobility programme 2 International mobility programmes 3 Attracting scientific Diaspora	1 Competition-based research grants provided by the MSES and the World Bank	1 Not sector specific

Notes: *Programmes focused on promoting entrepreneurship; **programmes focused on science, technology and innovation.

Source: Author – base on lines government bodies

On the other hand, the horizontal approach and generic polices could be perceived as opposing the national interest for accelerating faster economic growth since they contradict the need for concerted action and targeted investment in selected technologies and businesses. The shortage of priorities could lead to disorientation of strategic development and confusion of goals in the long run. This disorientation can lead to waste of resources and consequently impede techno-economic progress. The overview of the measures reveals that in Croatia there co-exists a surplus of specific policy measures with a shortage of specific sectors for the implementation of these measures. The partial similarity and quantity of policy measures with parallel lack of specified key driving sectors can be justified by the present limited administrative capacity for governing the strategic development and growth processes in the country. However, the acceleration of technological advancement and structural adjustment of the economy surely requires more selectivity and specialisation in the near future.

The main shortcomings of the government measures focused on enhancing the entrepreneurial capacity of Croatia observed by the OECD experts [OECD, (2007), p.31] concern:

- conceptual confusion among ministerial officials and staff about policies and programmes since they often see programmes as policies
- although many programmes exist, they are fragmented, not well connected and overlapping, while the performance measures are missing
- institutional arrangements in delivering policies and programmes are complicated, not transparent and usually ministry-centred.

The policy failures are found in the traditional vertical hierarchical structure of the government and inefficiency of the horizontal communication. However, a more substantial reason for inconsistent policies is lack of knowledge on what the policies are and how to develop them. Besides, too much politicisation instead of professionalisation prevents opening the process of developing policies to different stakeholders. On the other side, a lack of policy activities in the MELE is compensated with being too busy with many overlapping programmes. This contributed to the situation whereby HAMAG could not profile itself, because the majority of activities for implementing programs stayed with the MELE. In situations where policy does not exist, all programmes have the same priority [OECD, (2007), p.40].

The OECD experts concluded that a number of programmes have been introduced in the last few years, but the system has still not reached cruising speed. Much more room for new private initiatives and entrepreneurship should be provided. It means that the present system of public policies should be reversed in order to enable current as well future entrepreneurs to be less dependent on central government funds for their survival.

7 Instead of conclusions: some remarks

The short overview of the policy measures for supporting research innovation and entrepreneurship reveals that Croatia has a rather complex NIS that consists of various institutions, programmes and actions. However, it also reveals that the government prefers horizontal and generic policy measures and state aid programmes while the sectoral approach and support of the selected technology or research areas are rather

neglected. The entire strategy of economic and technological development remains rather undefined and vague, illustrating that political and economic elites have not yet succeeded in defining priority areas and sectors that could be key drivers of progress.

It also produces vagueness in science and innovation polices, which tend to define their own priorities and direction of development, mainly following the European strategies and recommendations. However, they are rarely related to the national down-to-earth needs of the 'real' production/service sector, while missing the synergy and co-evolution loop. This fact is reflected in the mismatch between the needs of the economy and the actual research going on in scientific institutions as well as in the 'horizontal' policy programmes that indiscriminately try to support all ideas and innovations.

It is well known that the shape and potential of industries worldwide will be transformed over the next five to ten years. New goods and services will be created. A significant part of the goods and services that will be available in the market in 2020 are as yet unknown, but the main driving force behind their development will be the deployment of key enabling technologies (KETs). Nations and regions mastering these technologies will be at the forefront of managing the shift to a low carbon, knowledge-based economy, which is a precondition for ensuring welfare, prosperity and security of their citizens. Hence the deployment of KETs in the EU is not only of strategic importance but is indispensible (EU, 2009).

Given these globalised processes, political and economic elites should think about what Croatia and its regions are 'good at producing' and which sectors could be the engines of growth. The simple imitation and copying of the European strategic papers and action plans is not sufficient for national development. Priority interest could include various sectors that are similar to other EU countries such as biotechnology (genomics, molecular biology, nanobiotechnology, and bioinformatics), nanotechnology (new materials, nanoelectronics including semiconductors), energy (new sources of energy), water technologies and waste treatment, agriculture and food, ICT and tourism. However, in the majority of these areas Croatia should find specific niches of application of advanced technologies coming from frontier research while innovation breakthroughs are possible in a rather small portion. Yet, it would be useful to decide which of those areas should be prioritised as the engine of technological development and economic growth at least on the regional level. Regional development supported by the pre-structural funds (IPA) provides an excellent window of opportunity.

Smart specialisation can be understood as a new policy instrument that can support this process. Smart specialisation appears as a useful tool for Croatia to overcome the current bundle of mainly horizontal policy measures that are usually not only disconnected but also stand in mutual competition and can sometimes create rivalries among the public institutions and programmes and lead to a lack of synergy and efficiency of public policies, undecided and hesitating development strategies resulting in low impact on fostering technological transformation and economic growth.

However, there are many obstacles to the process of smart specialisation in technology follower countries like Croatia. The principal one arises from the lack of interactions between technology, institutions and social factors that commonly shape priorities and specialisations through the mutual co-evolution process. Since entrepreneurs, not public administration, should be the key players of smart specialisation, it is extremely difficult to design and implement an appropriate

institutional framework and public policy supporting programmes. From the theoretical point of view it is clear that government should only encourage entrepreneurs to find their own way of growth and provide general support like education and research. The right question for countries like Croatia with high unemployment, underdeveloped markets and obsolete technology competences is: are the entrepreneurs able to recognise the prospective areas of their specialisation? Some recent examples like resistance to changes in some declining industries such as shipyards or extremely slow restructuring of the whole economy give rise to some serious doubts about realistic self-positioning. On the other hand, the complex government policies mainly oriented towards science and technology presented in the paper have also not produced the hoped-for transformation. Therefore, it seems reasonable to conclude that only entrepreneurs and companies are the agents of change. They should take a lead in future development through their institutional set-ups and associations while smart specialisation would occur, very probably, as the natural way of catching-up. The key to economic development is in their hands, while government actions could produce results only by complementing the initiatives of the private sector.

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Notes

1 The K4G Expert Group advises the Commissioner for Science and Research, Janez Potočnik, on the economic implications of research and innovation.

2 Details of the state aid and its implementation are available at http://www.aztn.hr.