Analysis of intersectoral technological linkages on mettalurgy innovative development

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Abstract
The article deals with theoretic bases of intersectoral technology linkages in metallurgy and methodic bases to determine its potential with reference to technological package conception. Methodic of intersectoral technology transfer effects identification is suggested.
Keywords: INTERSECTORAL LINKAGES, TECHNOLOGY TRANSFER, INNOVATION, TECHNOLOGY, METALLURGY

1. Introduction

In metallurgical industry development in global crisis production costs are in primary foreground. New technologies that increase efficiency and reduce costs in sector enterprises is one of the key factors of competitiveness of industry and economy in general, as mining and metallurgical complex occupies an important place in GDP structure, and metal acts as the material base of production apparatus. Domestic demand for the metal is characterized by reducing the supply of specialized metal-working industries, primarily in mechanical engineering and production of construction materials.

The relevance of this study is caused by the fact that after years of unstable situation of metallurgical industry is entering a new qualitative level of development, caused by cross-sectoral technology transfer. Modern metallurgy includes a wide range of manufacturing operations of producing metals and alloys. For estimates place of metallurgy in economy and influence on development of related industries we propose to use intersectoral analysis. The idea about

relative value of inter-branch technologies transfer as a source of the industrial technological development can be received after having determined ratio between two effects (Kholmeckiy, 2006):

1) growth of total productivity in all economy sectors through intersectoral technology diffusion;

2) growth of total productivity in linked sectors.

Numerous researches show tendency of technological multiplier values increase practically in all OECD countries. It is preconditioned with complications of the consumed industrial production in technological plan and with more increasing sectoral specialization and growth of industrial equipment, components and materials intersectoral trade volumes.

Informational technologies can radically change modern economic realities. For example, principle of recourses superfluity mostly appears through opportunities to copy information infinitely. It allows to maximize economic effects on society and economic system. When we talk about growth of information share in producing goods, we suppose that information about product, which is necessary for its production, has basic value. International studies show close connection between ICT and economic development of traditional industries. Wide use of high-speed communication and Internet technologies is promoter for ICT projects development, and also provides great multiplicative effect for various sectors in national economy, quickens and enlarges technological progress and finally provides GDP growth either in separate regions, or in the country on the whole. One has also to mention, that developing countries with more developed telecommunication infrastructure are able to attract many outsourcing companies and foreign investments.

It was estimated that in 2010 corporations spending on R&D began to recover quickly and metallurgical industry is also included in this trend (\EU Industrial R&D Investment Scoreboard. 2010).

Intersectoral innovations have either local origin, i.e. they are investigated by the enterprise independently, or they can have inter-regional and international sources. New research in EU found out that local and national clusters suit to innovations. Researchers Rune Andres and Rodriguez Posera analyzed experience in Norway companies and found that "global pipelines", considered to be sustainable interrelations between actor – member of cluster and external actor) in practice determine bigger success of company than local relations. This conclusion is contrary to that one, which was expected after ten years of investment policy in innovative clusters development at the national level (Hwang, V. and Horowitt, G.).

For example, the USA leadership in production of packing consumer goods and long-term use goods contributed into the success of advertisement creation and marketing. Japanese positions in production of electronics became result of the fact that Japanese success in semi-products branches was oriented to production of memory cells and integral schemes, used in production of various electronic goods (Porter, 1993).

2. Intersectoral technology linkages

Modern metallurgical production is a complex industry the most important features of which are multidisciplinary and cyclicality of processes, presence a lot of processes types, high resource and capital intensive and high impact on environment. Perspectives of intersectoral interconnections first of all deal with ability for further metallurgy technologies improvement. Potential of intersectoral linkages must be observed based on fact that any technological process has to be examined as a part of more complicated process and as a set of less complicated technological processes. Every of these processes is able both to form unique competitive advantages and grade advantages of its processes.

Today together with specialization and differentiation of sectoral productions, cooperation and integration processes are developed, which lead to formation of sustainable producing relations between sectors and create intersectoral complexes. Practically every science-intensive sector can be observed as intersectoral complex, which is integrative structure, characterized by interaction of various sectors and their elements, various stages of production and goods distribution.

One of reasons of innovation clusters appearing is formation of technological relations between producers in value chain and ability to form competitive advantages through clusters in interconnected economy areas. One competitive sector can lead to creation of another one in process to strengthen partnership relations through cluster mechanism. This sector may often be the most exacting purchaser of goods and service from sectors, on which it depends on. Its existing in country becomes important factor, determining competitiveness of sectors-suppliers.

Competitive technology sector develops all connected with it sectors, through more strict requirements for production and technological support through innovation exchange (fig. 1). New technologies of production supplier stimulates introduction of new goods on firm-purchaser.

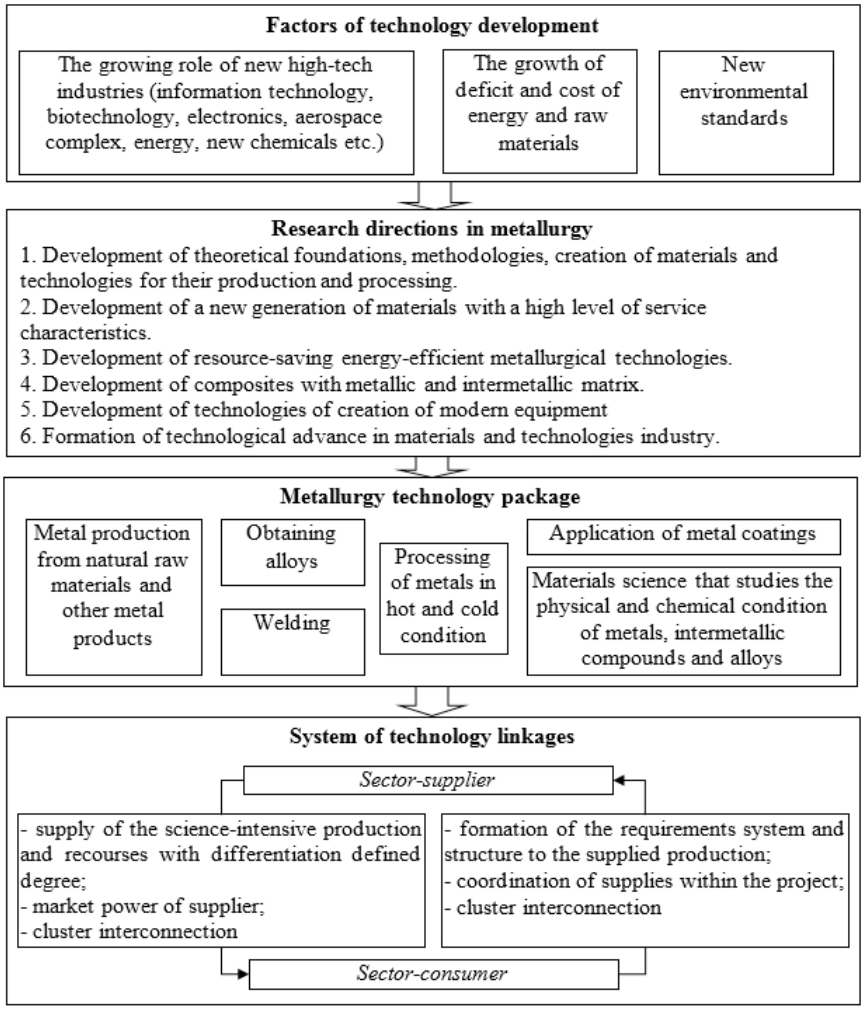

Figure 1. Technology linkages system factors in metallurgy

Nowadays green technologies are important tools to develop many sectors, state in which directly impacts the economic security and comfort in ecosystem. Metallurgical sector cross other constantly, that's why it allows to consider green technologies as intersectoral development tool. Recycled materials are not only essential component of metallurgy resource base, but also causes significant changes in technological structure and its intersectoral linkages.

2. Methodic of intersectoral technology transfer effects identification

Various sectors, which are developed owing to uneven development of enterprises separate groups, face with difficulties in introduction of intersectoral innovations (Schlafman, 2013).

Intersectoral technology linkages of metallurgy can be analyzed through:

- direct influence on achieving of industry main goals;
- inter-sectoral linkages in supply and using of products;
- feedbacks between the industry-consumer and industry-supplier.

However technological connection in metallurgical process can also take place in reverse order, because uncompetitive sector may blow up other sectors, connected with it, when it is consumer (Tretiak, 2008).

New technologies can be distributed both at horizontal (sectoral and inter- sectoral transfer) and vertical level (transfer between large and small business). Distribution and sectoral level is caused by competition between analogical companies, and inter-sectoral innovations diffusion is connected with decreasing of various barriers and sectoral reviewing. At the vertical level innovations are moved through technologies transfer by two contrary directions: from small venture companies to large producers and from last ones to small business, which uses innovative technologies.

Many investigations show the innovative traps or technologies break in intersectoral interaction. Technologies purchase requires more expenses, than buying of separate machines and equipment. Purchasing

of technologies (technological package), needs definite level of personal powers, where new technology can be successfully integrated, and out-of-date po-wers cause narrow places in production and in its inter-branch interactions (Balatsky, 2003).

Technologies market is described with less capacity than market of machine and equipment. Separate machines and equipment purchase is better coordinated with active technologies and adapted to productive requirements. As a result branch stage-by-stage may transfer to state, which will allow to purchase complex technologies. In these branches innovations are provided by the proper industrial policy, oriented to stimulate and support new equipment purchase.

External factors (competition, level of sectoral concentration, mass and norm of income, another peculiarities of sectoral markets) lead to paradoxical situation in funds reproduction, which is closely connected with investments and innovations. The average age of funds in those branches which must produce more productive equipment for final consumption branches, is higher, than in branches, which produce final consumption items and mining branches.

Technological trap in two directions: not low-technology branches can absorb new technologies, but medium-tech branches do, which have to provide technological progress in them, have old-fashioned powers.

Intersectoral technologies of additional value are supposed to be an important aspect. One of innovative development aspects can be ecological constituent improving in production, which is important for metallurgy.

4. Conclusion

The scenario of innovative development of metallurgical industry is characterized by the development of domestic demand for products with high added value, which in turn will contribute to the development of new technologies and manufacturing high-tech products. Selection of innovative policy priority directions in industrial sectors has to provide achievement of definite level in inter-sectoral efficiency.

Currently the main objective of metallurgical industry it to make industry high-tech, a dynamic, efficient and competitive. The processes of global and domestic economy are reflected in change of indicators of metallurgy and quantitative characteristics of its cross-sectoral linkages.

Parallel convergence development will accelerate development of list scientific and technological areas with strong economy impact. Special interest is presented by probable qualitative changes of the economic system, influenced by technologies, because in long-term perspective economy development, particularly average labor efficiency is determined by technologies development in most. It includes firstly technologies of production and labor tools use, producing and business-processes.

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