

PECULIARITIES OF THE CONSTRUCTION SECTOR DEVELOPMENT ACROSS THE WORLD ECONOMIES



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Abstract. The importance of the construction sector and its place in the country's economy are highlighted. The development of the construction sector in different countries of the world is analyzed by using the industry indicators: level of industrial production, material intensity, energy intensity, market import dependence, export orientation, import dependence of production. The integral index of development in the construction sector in some countries of Europe is determined. We assessed the impact of sectoral performance indicators of the construction sector in 36 countries on their GDP by using dynamic balance cross-sectional regression within years 2013-2018. Due to multidimensional statistical analysis we could identify 6 groups of countries, each with common features of the construction sector.

Keywords: *building, construction sector, country's economy, development.*

Introduction

The construction sector is one of the basic economic branches of every country in the world. The level of its development has a significant impact on the state economic security. Participation of construction sector in many socio-economic processes and its interconnection with all sectors of the economy make it an important element of the economic growth of the country. With its participation the primary physiological needs of society in housing and protection are being realized. Due to the fundraising function, basic funds (buildings and structures) are provided to the subjects of private, state and communal ownership regardless the type of economic activities. At the same time, capital markets, goods and services, labor resources are being formed; develop commercial, transport and socio-cultural infrastructures.

The development of the construction sector in Ukraine is hampered by some different issues of socio-economic, financial, institutional, technical, technological and organizational nature. Despite

the significant scientific contribution of researchers, a number of issues remain unresolved such as: the development of housing, commercial, industrial, and infrastructural construction, especially, the expansion of opportunities for using public-private partnership mechanisms in the construction sector; harmonization of construction and socio-economic needs of society; formation of institutional environment for the effective functioning in construction sector; innovative support for the construction development. All this actualizes the need for a theoretical and methodological substantiation of strategic priorities and mechanisms for the development of the construction sector of Ukraine, in particular using the valuable experience of Ukraine in the development of construction, which led to the choice of research topic.

The purpose of the article is to study the features of the construction sector development in the economies of the world.

Research methods. The development of the construction sector in different countries of the world will be analyzed with the use of industry indicators, the most favorable of which based on expert estimates, in particular: the level of industry production; material consumption; energy consumption; import dependence of the market; export orientation; import dependence of production (Table 1).

To evaluate the impact of sectoral performance indicators of the construction sector production, gross value added (GVA) in construction; intermediate consumption in construction; intermediate consumption of imports in construction; direct material costs of energy in construction; exports and imports in construction in 36 countries) gross domestic product (gross) GDP) we use multivariate dynamic regression modeling tools, in particular, dynamic cross-sectional regression within years (2013, 2015, 2018), which allows us to make a broad general pattern (756 cases). The software package Statistica 10.0 is used for calculations.

Table 1.

Calculation of industry indicators to analyse the construction performances in different countries of the world

Indicator Name	Calculation formula	Feature
Industry Production Level	$BP_{cs} = \frac{GVA}{output} \quad (1)$ <p>where <i>GVA</i> is – gross value added in construction; <i>ВВП</i> is – output in construction.</p>	Reveals the economic efficiency of production in the industry.
Material consumption	$MC_{cs} = \frac{ICwER}{output} \quad (2)$ <p>where <i>ICwER</i> – intermediate consumption without energy resources in construction.</p>	Determines the efficiency of the use of material resources in the construction sector.
Energy intensity	$EI_{cs} = \frac{DMCEC}{output} \quad (3)$ <p>where <i>DMCEC</i> is – direct material costs of energy in construction</p>	Defines the level of consumption of fuel and energy resources for the manufacture of construction products.
Export orientation	$E_o = \frac{E}{Output} \quad (4)$ <p>where <i>E</i> is– export in construction;</p>	Demonstrates the efficiency of export activity in construction.
Market import dependency	$I_{dCM} = \frac{I}{output - E + I} \quad (5)$ <p>where <i>I</i> is – importation in construction; <i>(Output – E + I)</i> – capacity of the domestic construction market.</p>	Determines the dependence of the domestic construction market on imported products.
Import dependence of production	$I_{dPcs} = \frac{IdPcs}{output} \quad (6)$ <p>where <i>IdPcs</i> is – intermediate importation consumption in construction.</p>	Reveals the dependence of industrial production in construction on imported products.

* Source: Formed by the authors

For grouping countries of the world according to various indicators of the development potential in the construction sector of economy we use the multidimensional analysis (MDA), what allows to form taxonomic groups (Electronic textbook on statistics StatSoft). Using the MDA we determine the most favorable solution; the grouping and unification analysis allows us to reveal taxa with defined distances, which can be displayed in the form of a vertical and horizontal diagrams (Mokey & Vasiltsiv ed., 2010, p. 54). The Euclidean metric to calculate distances between objects (in multidimensional space) is used for that goal. (Chobal, 2015, p. 29). The software package Statistica 10.0 is also used for calculations.

Main Features. The construction sector plays an important role among economies of the world. Namely, it accounts for 9% of GDP in the European economy and provides about 18 million jobs. It is considered the driving force of economic growth and business for 3 million enterprises, mainly small and medium-sized businesses. Construction is the main consumer of semi-finished products (raw materials, chemical products, electrical and electronic equipment, etc.) and related services. The quality of construction products (its technical and technological properties and energy efficiency) has a significant impact on the socio-economic development and European standard of living. (Eurostat: Your key to European statistics; Strategy for the sustainable competitiveness of the construction sector and its enterprises).

The research results. The most active in the construction sector while shaping the economy within recent years among the studied countries were Australia, Slovakia; Romania, Lithuania, Canada, Mexico, Poland. The Netherlands, Poland, Estonia, Belgium, Denmark, Latvia, Portugal, Slovenia have the highest level of export oriented construction

(World Input-Output Database; Official site of the State Statistics Service of Ukraine).

High industrial production indicators in construction are observed in those countries: Mexico (0,56), USA (0,55), Lithuania (0,55), Slovakia (0,47), Sweden (0,46), Brazil (0,46), Germany (0,44), Japan (0,44). The group of countries with the most material consumption in construction sector includes Ukraine (0,76), Bulgaria (0,76), China (0,75), Latvia (0,71), Ireland (0,70). Below-mentioned countries show a high level of energy consumption: Romania (0,0571), Spain (0,0238), China (0,0155), Russia (0,0151), Turkey (0,0135), Ireland (0,0112), Czech Republic (0,0112), India (0,0108), Poland (0,0104). The most import-dependent construction markets are in Estonia (0,0892), Belgium (0,0648), Denmark (0,0574), Slovakia (0,0405), Netherlands (0,0367), Hungary (0,0348), Germany (0,0288), Czech Republic (0,0218), Slovenia (0,0208). Significant dependence on imported products while the construction process is observed in Ireland (0,3025), Hungary (0,2641), Estonia (0,2308), Denmark (0,2225), Ukraine (0,2206), Bulgaria (0,2164), Belgium (0,2155) (Table 2).

Based on the above indicators, the integral index of construction sector development was calculated in the article, where for each indicator (the level of industry production, material consumption, energy consumption, market import dependency, export orientation, import dependence of production in the construction sector), a reference value was determined (best indicator among countries). The ratio to the reference value for each country determines the appropriate level for each indicator (in case of negative economic impact, the ratio is reversed (the reference value is divided, the value of the country is a divisor). Their sum forms an integral indicator of development in the construction sector (Table 2).

Table 2.

Development level of the construction sector in Europe, in 2018.

Nº	Country	BP _{cs}	MC _{cs}	EI _{cs}	E _o	I _{dCM}	I _{dP_{cs}}	IID _{cs}
1.	Slovakia	0,470	0,510	0,003	0,041	0,036	0,117	1,000
2.	Lithuania	0,550	0,420	0,005	0,021	0,059	0,102	1,000
3.	Estonia	0,370	0,600	0,005	0,089	0,106	0,231	0,996
4.	Denmark	0,360	0,610	0,003	0,057	0,069	0,223	0,934
5.	Greece	0,410	0,560	0,003	0,024	0,044	0,124	0,855
6.	Germany	0,440	0,540	0,008	0,029	0,008	0,116	0,824

7.	UK	0,400	0,560	0,006	0,011	0,005	0,062	0,808
8.	Belgium	0,300	0,680	0,005	0,065	0,075	0,216	0,805
9.	Austria	0,400	0,590	0,004	0,021	0,019	0,141	0,767
10.	Sweden	0,460	0,520	0,005	0,007	0,011	0,136	0,763
11.	Spain	0,420	0,550	0,024	0,006	0,019	0,062	0,738
12.	Hungary	0,380	0,580	0,006	0,035	0,042	0,264	0,732
13.	Italy	0,350	0,630	0,009	0,011	0,009	0,062	0,697
14.	Netherlands	0,330	0,650	0,006	0,037	0,193	0,200	0,679
15.	Finland	0,380	0,590	0,005	0,006	0,001	0,137	0,679
16.	France	0,390	0,590	0,005	0,009	0,120	0,120	0,676
17.	Portugal	0,370	0,590	0,008	0,012	0,048	0,113	0,644
18.	Turkey	0,430	0,520	0,014	0,003	0,019	0,152	0,629
19.	Poland	0,350	0,630	0,010	0,014	0,074	0,117	0,588
20.	Romania	0,370	0,550	0,057	0,014	0,026	0,147	0,586
21.	Slovenia	0,330	0,630	0,009	0,021	0,063	0,166	0,577
22.	Czech Repub.	0,300	0,680	0,011	0,022	0,033	0,121	0,550
23.	Latvia	0,260	0,710	0,009	0,020	0,030	0,155	0,464
24.	Bulgaria	0,210	0,760	0,006	0,025	0,036	0,216	0,433
25.	Ireland	0,260	0,700	0,011	0,010	0,006	0,303	0,321
26.	Ukraine	0,230	0,760	0,008	0,004	0,015	0,221	0,243

** BP_{cs} – Level of branch production in the construction sector; MC_{cs} – Material consumption in the construction sector; EI_{cs} – Energy intensity in the construction sector; E_o – Export-orientated construction sector; I_{dCM} – Import dependence of the construction market; I_dP_{cs} – Import dependence of production in the construction sector; IID_{cs} – Integral indicator of development in the construction sector.

* Source: Formed by the authors.

The last position of Ukraine in terms of construction sector development among 26 European countries is due to the low level of industry production (0.230), high material consumption (0.760) and energy consumption of construction process (0.008), low export orientation (0.004), high import dependence of production in construction (0.221) and other economic factors.

The results of the balance cross-sectional regression are statistically significant, as evidenced by the relevant indicators: correlation coefficient (0,9881); adjusted coefficient of determination (0,9756); Fisher's F-test $F(3,104)=1428,2$; Standard error (0,25324); p- level (0,0000). The results of the research prove a significant impact of the construction air condition on the GDP of states ($X_2 = 0,975$). The low impact on GDP is made by intermediate consumption of imports in construction ($X_3 = 0.263$) and the inverse small impact is shown by intermediate consumption of construction ($X_4 = -0,245$).

The results of the cluster analysis allow to identify 6 groups of countries in the world, with common features of the construction sector (Table 3).

Table 3.

Clusters formed according to the results of 2018 research on the performance of the construction sector in some states of the world

Cluster №	Cluster Countries	Cluster features and common traits
I	USA	High level of economic development; the first place in the world on GDP; the highest level of construction output; high level of industry production; low level of import dependency and export orientation in the construction sector.
II	Australia, UK, India, Germany, France,	Mainly high level of economic development; average level of industrial production and material consumption in the

	Japan	construction sector; high energy consumption; significant intermediate consumption; low export orientation and average import dependence of the construction sector.
III	China	Significant dynamics of economic development; second place in the world GDP; the highest level of output, GDP, intermediate consumption, of direct material costs of energy in construction sector; second place for export and third largest import in the construction sector.
IV	Brazil, Italy, Canada, Russia	High and low level of economic development; high level of industrial production in the construction sector; low power consumption; extremely low export orientation of construction; low import dependency of the construction market and average import dependence of production in the construction sector.
V	Belgium, Spain, Korea, Mexico, Netherlands, Poland, Turkey	Mainly average level of economic development; average level of industry production, high material and energy consumption in the construction sector; mostly high export orientation; significant intermediate consumption of imports in the construction sector.
VI	Austria, Bulgaria, Greece, Denmark, Estonia, Ireland, Latvia, Lithuania, Portugal, Romania, Slovakia, Slovenia, Hungary, Ukraine, Finland, Czech Republic, Sweden.	Mainly average level of economic development (most EU countries and Ukraine); the lowest level of GDP, intermediate consumption in construction, intermediate consumption of imports in construction, direct material costs of energy in construction; high import dependency of the construction market and highest import dependence of production in the construction sector.

**Source: Formed by the authors.*

Ukraine joined the sixth group together with countries such with countries as Latvia, Lithuania, Estonia. Since 2013 to this group has been added Bulgaria, Greece, Denmark, Ireland, Portugal, Romania, Slovakia, Slovenia, Hungary, Finland, Czech Republic. In 2015, Austria and Sweden joined there. These are countries, mainly with an average level of development, a low level of Gross value added (GVA), intermediate consumption in construction, intermediate consumption of imports in construction, direct material costs of energy resources in construction; high import dependence of the construction market and high import dependence of production in the construction sector. These important features should be taken into account in further studies of mid- or long-term development prospects in the context of active globalization.

Conclusions

Analysis of the theoretical researches and actual trends of sectoral development allows us to state that due to peculiarities of its economic structure, each state has a number of specific features concerning the definition and support of dominant industries and sectors of the economy, which are related with different stocks, opportunities and policies of rational use, conservation and enhancement of natural, material, financial and labor resources and, consequently, different levels of socio-economic development.

We believe that the strategic priorities for the development of the construction sector should be chosen for high-tech construction based on innovative principles of energy conservation, alternative energy use and environmental friendliness practiced by the world developed countries and which outlined expediency has been confirmed by their high socio-economic indicators. It substantiates the need to develop capacities for the production of basic building materials using the local raw materials and also their high technical and technological support.

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