# CHANGES IN INDUSTRIAL STRUCTURE AND POTENTIAL: THE CASE OF LITHUANIA

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## Introduction

Every economy aspires to enlarge the share of high-tech industries in its industrial structure, considering this share as one of the main determinants of country's economic development. Hence, the induction of high and medium-high technology industries through R&D support, stimulation of innovation activities and higher quality may help economies to avoid getting trapped in the low-tech specialization during the long term. It must be noted that promotion of high-tech industries is an extremely difficult task for small economies, including the small open Lithuanian economy. Nevertheless, the significance of high-tech industries is based on the marginal social benefit, provided by these industries to economics, taking into account their large technological spillover effect on the rest of economy. It should be pointed out that high-tech industries still hold a small share in Lithuanian industrial structure. Since 1991, Lithuania has been facing the radical problems of the economic system restructuring, and must deal with decreasing demand for the domestically produced merchandise, which has already led to the bankruptcy of the number of domestic companies. Low-tech companies are the ones that have been able to adapt to shifting market conditions due to their flexibility. The indicator of the value-added confirms the significance of low-tech industries, which generate nearly 70 per cent of the overall value-added in Lithuanian economics. The relevance of the research problem has been determined by the fact that small open economies are exposed to the impact of international competition in global markets as well as the effects of integration and globalization. Economic integration in the EU, trade liberalization, competitive pressures and changing structure of the world demand call for reassessment of the determinants and efficiency of country's manufacturing industry. This encounters the emergence of the changes in business environment and industrial development. Predominance of exports at the forefront of Lithuanian industry demonstrates that the country is highly dependent on the demand in the global markets.

The core aim of the paper is to analyze the changes of the key manufacturing industry indicators, which enable to assess the actual performance and potential of Lithuanian manufacturing industry. It is purposeful to establish to what extent Lithuanian industrial structure has moved from lower to higher value-added knowledge and technology intensive industries, to identify which manufacturing industries can be characterized as having the highest potential to generate long run income, and to ascertain how the potential of Lithuanian industrial structure as well as contribution of particular industries to the development of the overall manufacturing industry have changed over the researched period.

The paper presents evaluation of the changes in Lithuanian industrial structure and its potential during the period of 2000-2014. The study covers the assessment of Lithuanian manufacturing industry restructuring; the key indicators of industrial structure were employed for the estimation of the composite index, which allowed to qualify the main structural changes in manufacturing, to reveal the significance of individual industries and to explore how Lithuanian industry is influenced by global processes. A deeper understanding of the structural changes in the industry is the basis for implementation of the national industrial policy. The analysis was conducted for the period of 2000-2014; it covers the research of the influential processes of country's integration in the EU in 2004, trade liberalization, reorientation of the exports markets, and, finally, the impact

of global economic and financial crisis since 2008. The results of the research feature the potential of Lithuanian manufacturing industry to generate increasing revenue in the long run, reveal the significance and potential of individual manufacturing industries, and disclose how Lithuanian industry is influenced by global processes.

The first section of the paper covers the review of the scientific literature, the second section introduces the methodology of the empirical study and presents the main indicators that were employed for the analysis of the structure and potential of Lithuanian manufacturing industry. The third section of the paper covers the findings of the conducted analysis. The paper has been ended with the summary of the results and conclusions. The methods of the scientific research, employed in this empirical study, include analysis and review of scientific literature, mathematic calculations and the comparative analysis of statistical indexes.

## 1. Literature Review

Most of economies are dependent on the achievements of their national manufacturing industries. Hence, the significance of industrial structure and development induces scholars to perform the deeper research on how the potential of industrial sectors contributes to the advancement of economic performance. Different sets of factors are addressed in the scientific literature as a part of industrial structure analysis – some studies highlight the composition of industry with reference to the level of technology intensity (Carrol et al., 2000; Hatzichronoglou, 1997), others introduce the assessment of the competitive environment based on the five-force model provided by Porter (1980), a part of the studies are developed for the analysis of the value-chain (Porter, 1985; Shank et al., 1992), industry concentration (Lien & Foss, 2009; Bos & Jalil, 2006) or the assessment of the impact of international competition and innovation. The latter factors are considered to be the main determinants that force constant changes in manufacturing industries, although the research on the other economic and non-economic factors that could shape the industrial structure is available.

The shifts in industrial structure involve reallocation of resources and transfers of innovations and investments from one manufacturing industry to another, which, in turn, determines the emergence of new industries and the decline of the others. As was noted by Lin (Lin & Chang, 2009), "[…] the optimal industrial structure is endogenous to the country's endowment structure – in terms of its relative abundance of labor and skills, capital, and natural resources. Upgrading the industrial structure requires first upgrading the endowment structure […]." (p. 485). Scholar stated, that after capital accumulates and capital intensity of its endowment structure increased in economy, labor-intensive industries should undergo a process of upgrading towards more capital-intensive ones. In addition, the changes in the structure of manufacturing industries not only entail expansion and upgrading within existing industries, but also determine the transfer from mass-market commodities to more exclusive ones, developed for specialized applications.

The issues of industry potential and competitiveness are closely related to the analysis of endogenous and exogenous factors that influence industrial performance and development. The list of the factors, which were grouped considering their affinity, and employed in qualitative and quantitative analysis of industrial performance, was provided by Orozco et al. (2010), Lu et al. (2008) and Henricsson and Ericsson (2005). Industrial structure is also analyzed by employing several taxonomies that allow to divide industries with regard to different dimensions. The quality dimension was engaged in Revealed Quality Elasticity (RQE) taxonomy, created by Aiginger (2000) who distinguished quality-sensitive and price-sensitive industries. The proposed method enables to evaluate the industrial outputs as well as the structure of export. Roubickova and Heryan (2014) classified industrial companies to foreign and domestic ownership in analyzing their impact to economy. What is more, industrial structure can be analyzed employing the typologies, which provide the information on how manufacturing industries produce and incorporate factor inputs and labor skill modes into their output indicators. Every company need specific skills, but actually it is difficult to measure the right quantity and quality of knowledges and skills (Kanovska & Tomaskova, 2014). The taxonomies of manufacturing sectors, distinguished with regard to the typical combination of factor inputs and labor skills,

are based on the classifications suggested by Peneder (1999).

Different frameworks of industrial structure analysis have been provided by scholars in the modern literature. Barry and Kearney (2003), who analyzed state's industrial structure as a portfolio composed of various industries, argue that the principles of portfolio theory bear the trade-off between sectoral employment growth and volatility. While performing the analysis of industrial structure, Sasaki and Ueyama (2009) employed the input-output table, which provides systematic descriptions of the input-output structures between particular industries. Such model enables to perform the quantitative analysis of industrial structure and reveals the development of industrial relationship. Obren (2009) studied the links between industrial changes and increasing returns on the basis of the generalized linear model. The author confirmed the hypothesis that the industries with increasing returns experience greater frequency of changes in comparison to the industries with constant returns. Szirmai et al. (2005) applied the method of unit value ratios for the comparative analysis of value-added and labor productivity in the industry. In this case, value-added and labor productivity were treated as industry growth rates. Uri et al. (1989) modelled industrial structure and economic performance employing the model of simultaneous equations, composed of profitability, concentration, advertising expenditures and R&D outlays. Liu and Mu (2010) engaged the analysis of grey correlation degree for the research of industrial structure and economic growth. In their study, the variable of the industrial structure was characterized by multiple factors. Findings of the empirical study confirmed that both economic growth and industrial structure are highly correlated. The review of the scientific literature showed that the analysis of industrial structure covers different dimensions, although in many cases industrial structure is researched assessing its current condition and future prospects by shifting miscellaneous features.

## 2. Methodology

This research is based on the approach that the changes in industrial structure should be treated and analyzed as a complex (Tikhomirova, 1997). In this case, the Index of the Long Run Income Potential of Industrial Structure is developed for the assessment of the changes in industrial structure in different countries. Five key indicators – value added per employee, wage per employee, global export growth, sectoral export intensity and R&D intensity – are employed to characterize the changes with a particular emphasis on the long run income potential in the industrial structure. Tikhomirova (1997) notes that "the index, an analytical tool for the evaluation of the structure of manufacturing, and is based on the proposition that the other things being equal, a country with an industry structure showing a high value of the index should be able to generate a high level of per capita income for its citizens" (p. 1). The scholar does not specify that a high or rising value of this index is invariably associated with high and increasing income per capita. The key indicators of the index enable to highlight the relevant features of particular industries, and provide an insight to the changes of industrial structure and performance in different countries. The composite index is a descriptive tool, which is capable to compress several industrial structure indicators in a quantitative form, and is readily available for a comparison of the changes in industrial structure that emerge over time or across countries.

The Index of the Long Run Income Potential of Industrial Structure (CI) is defined as follows (Tikhomirova, 1997):

$$CI_T^i = \frac{\sum_j^n (X_j^i I_j)}{\sum_j^n X_j^i} \quad (1)$$

where *CI* is the Index of the Long Run Income Potential of Industrial Structure; *I* – the overall composite rank, calculated as average of ranks of five key indicators. Every industry *j* is ranked in descending order for each of five indicators (value added per employee, wage per employee, global export growth, sectoral export intensity and R&D intensity), thus overall composite rank *I* is calculated as the sum of ranks divided by 5 (number of indicators); *i* – a country; *j* – an industry; *n* – the total number of manufacturing industries; *X* – the exports.

If the exports were equally divided across manufacturing industries, then:

$$X_j^i = \frac{X_T^i}{n} = \frac{\sum_j^n X_j^i}{n} \quad (2)$$

where $X^i_T$ is total manufacturing exports of country i.

$$CI^i_T = \frac{\sum_j^n \left[ \left( \frac{\sum_j^n X^i_j}{n} \right) I_j \right]}{\sum_j^n X^i_j} = \frac{\sum_j^n X^i_j \sum_j^n I_J}{n \sum_j^n X^i_j} = \frac{\sum_j^n I_j}{n} = \overline{CI_T} \quad (3)$$

$$\overline{CI_T} = \frac{\sum_j^n I_T}{n} = \frac{I_T}{n} \quad (4)$$

where $\overline{CI_I}$ – the average value of the Index of Income Potential; $I_T$ – the sum of the values of the overall composite industry rank for all manufacturing industries.

$\overline{CI_T}$ value can be used as a base for benchmarking the value of the Index of Income Potential:

$$RCI^i_T = \frac{CI^i_T}{\overline{CI_T}} = \frac{\sum_j^n \left( X^i_j I_j \right)}{\left( \sum_j^n X^i_j \right) \overline{CI_T}} \quad (5)$$

where RCI is the Rebased Index of the Long Run Income Potential of Industrial Structure if the value of the CI index is equal to the average value, the RCI is equal to one.

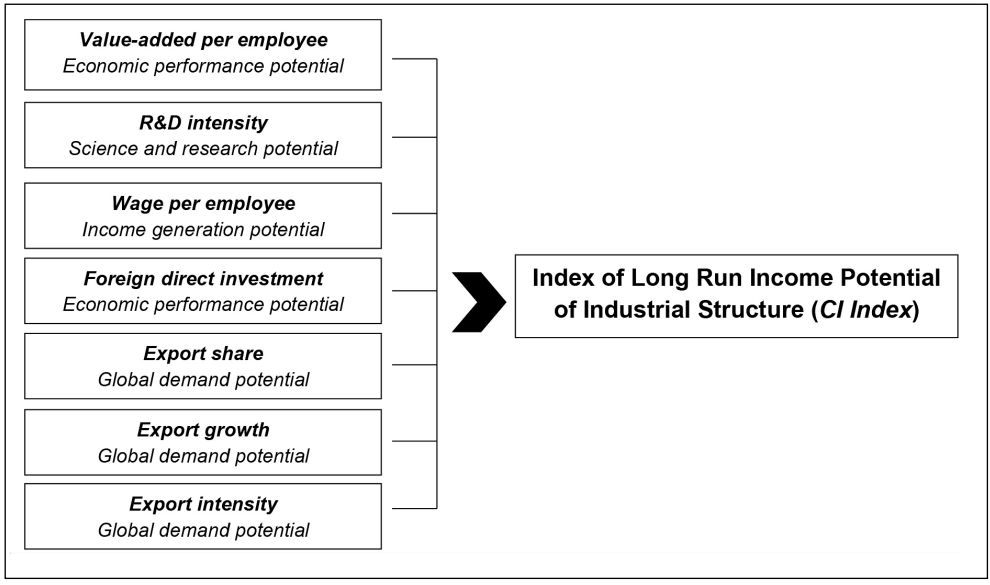
The growing values of the indexes, which are estimated comparing different time intervals, reflect that the industrial structure is biased towards the areas with the potential to generate higher income. Particular manufacturing industries, characterized by higher values of the overall composite rank, are considered to have a larger impact on the development of the overall industry in the future. Therefore, the actual income levels, achieved by different economies, depend on the ability of these economies to utilize the potential of their manufacturing sectors with higher values of the composite rank. This approach can serve as a basis for further analysis on the performance and potential of manufacturing industries in the overall economy.

On the basis of the above-introduced framework, our empirical study employs CI index as an composite index that allows to assess the potential of the structure of Lithuanian manufacturing industry the most explicitly. Since the key indicators, applied to estimate CI index, are also significant criterions of industry, it can be argued that CI index indirectly reflects the competitiveness of manufacturing industry.

Freudenberg (2003) pointed out the significance of quality of the data, which is employed for estimation of composite indexes since the accuracy of the indexes much depends on the possibility to measure the chosen problem quantifiable. Hence, the key indicators, included in the estimation of the Index of the Long Run Income Potential of Industrial Structure, were selected by their relevance for the analysis and accessibility from the sources of Lithuanian databases. In our empirical study, CI index is grounded on seven key indicators: (1) value-added per employee; (2) average wage per employee; (3) sectoral export growth; (4) the share of the export from particular industries in the total export of manufacturing industries; (5) sectoral export intensity as the ratio between the shares of export and the industrial production; (6) R&D intensity as the ratio between the R&D expenditure and the industrial production; (7) foreign direct investment (see Fig. 1).

Following the methodology created by Tikhomirova (1997), the weights of the structural components are equal to 1 for the overall composition ranks, which are derived as arithmetic means of all the key ranks. Assignation of the weights to particular indicators is the most discussed problem since the technique of weighting has a significant impact on the results of the estimation. Scholars (Saisana et al. 2005; Freudenberg, 2003) argue about the expedience of weighting, motivating that it is extremely difficult to substantiate the measurement of weight coefficients; in addition, it is important to take into account that specified weight coefficients enable to estimate the index more accurately. Bruneckiene and Cincikaite (2009) empirically tested the robustness of the methods that are employed for determination of weight of the coefficients. In their research, the authors verified different techniques

**Fig. 1:** **The key indicators of the Index of the Long Run Income Potential of Industrial Structure**




Source: own

– employment of equal weights for all indicators, employment of different weights for indicator groups and subgroups, and employment of different weights for all the indicators that are included in the estimation of the composite index. The results of the research revealed that an accurate statistical estimation of the composite index is achieved by applying equal weights for all indicators, i.e. the empirical study confirmed that different weighting had no significant impacts on the final results of the estimation.

The employment of equal weights for all the key indicators is based on the argument that indicators are indices rather than the determinants of potential. Hence, application of different weights for the key indicators does not ensure more accurate final results. The numeric value of the overall composition rank discloses the combined effect of all the key components.

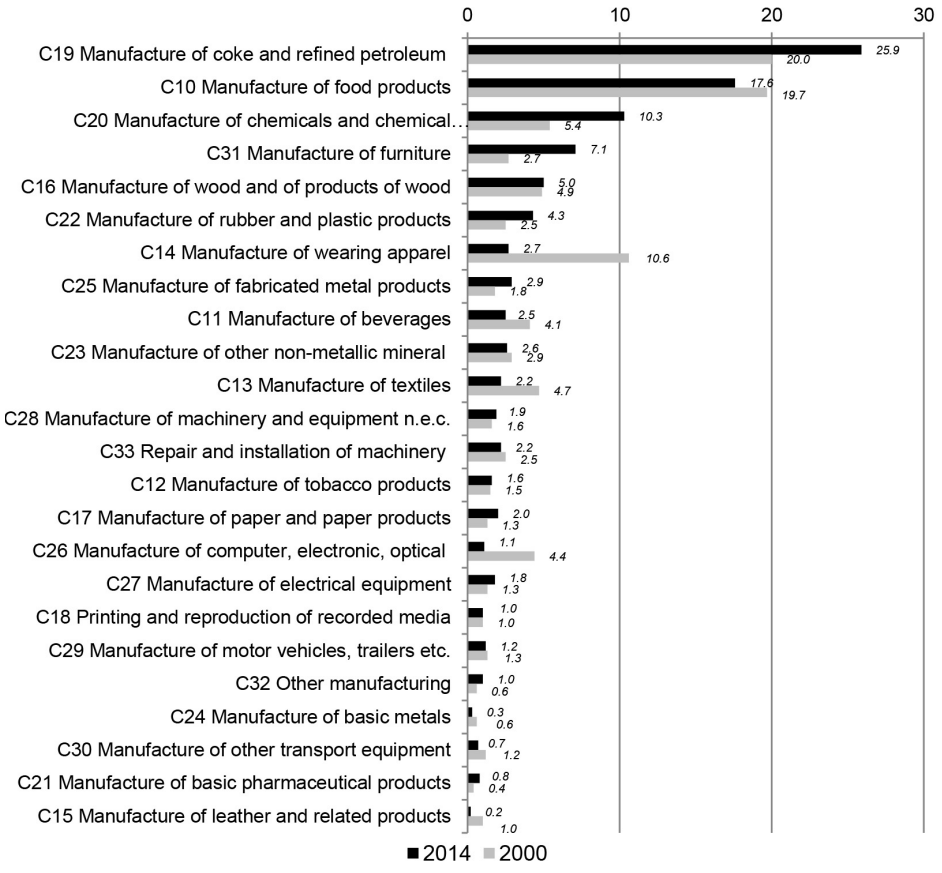
The statistical data was obtained from Lithuanian Department of Statistics (Statistics Lithuania) for the period from 2000 to 2014. Taking into account the availability of the statistical data, the research analysis covered nineteen manufacturing industries in the fifteen-year period. In order to estimate the overall composite ranks, the selected manufacturing industries were ranked in accordance with each indicator, and a higher value of an indicator was associated with a higher value of the rank. The overall composite ranks, estimated for individual Lithuanian manufacturing industries, have been presented for five three-year terms, which has enabled to assess the industrial changes during the researched period. The indicators of CI were averaged over a three-year period in order to eliminate the impact of annual variations.

## 3. Results

The most common way to express the structure of manufacturing industry is to estimate the percentage of sales shares aiming at both revelation of the largest industries and comparison of the sales shares over time intervals (Fig. 2). The results of the estimations have revealed the visible declines of sales shares in the industries C26 Manufacture of computer, electronic and optical products, C10 Manufacture of food products, C13 Manufacture of textiles and C14 Manufacture of wearing apparel.

The percentage of sales share increased by one and a half times in the industry

**Fig. 2: The structure of the sales in Lithuanian manufacturing industry, %**




Source: Department of Statistics to the Government of the Republic of Lithuania

C19 Manufacture of coke and petroleum. Nevertheless, this industry holds the lowest indicator of the value-added per employee. Due to the fact that Lithuania has a single petroleum company in its manufacturing industry, the access to the statistical data was limited. The sales shares in the industries C20 Manufacture of chemicals and chemical products and C31 Manufacture of furniture, which enlarged nearly twice, imply the need of a deeper insight analysis in these industries. The analysis of industrial sales has disadvantages since it does not disclose the actual performance of the industries while assessing their significance and potential.

In order to perform the in-depth analysis and assess the changes in the overall structure of Lithuanian manufacturing industry, the set of the key indicators (see Fig. 1) has been employed for the estimation of the Index of the Long Run Income Potential of Industrial Structure (CI). Being the main criterions of industrial development and progress, the selected indicators allow highlighting the relevant features of Lithuanian manufacturing industries. Consideration of the whole set of

**Tab. 1: The overall composite ranks (I), estimated for the key indicators of Lithuanian manufacturing industries**

| Manufacturing industry | Overall composition rank 2000-2002 | Overall composition rank 2003-2005 | Overall composition rank 2006-2008 | Overall composition rank 2009-2011 | Overall composition rank 2012-2014 |
|---|---|---|---|---|---|
| C10-C11 Manufacture of food products and beverages | 10.86 | 10.71 | 10.29 | 11.00 | 10.86 |
| C13 Manufacture of textiles | 10.00 | 8.29 | 8.29 | 6.71 | 7.00 |
| C14 Manufacture of wearing apparel | 7.86 | 6.86 | 6.29 | 6.71 | 6.29 |
| C15 Manufacture of leather and related products | 5.14 | 4.43 | 4.14 | 7.86 | 7.29 |
| C16 Manufacture of wood and of products of wood | 8.71 | 8.71 | 9.57 | 9.14 | 8.71 |
| C17-C18 Manufacture of paper, printing and reproduction | 11.57 | 10.86 | 8.86 | 10.43 | 8.14 |
| C20 Manufacture of chemicals and chemical products | 13.57 | 15.43 | 16.71 | 15.57 | 15.14 |
| C21 Manufacture of basic pharmaceutical products | 10.00 | 10.14 | 11.00 | 12.14 | 11.71 |
| C22 Manufacture of rubber and plastic products | 12.00 | 11.43 | 12.43 | 10.43 | 12.00 |
| C23 Manufacture of other non-metallic mineral products | 8.57 | 8.43 | 10.71 | 9.00 | 10.71 |
| C24 Manufacture of basic metals | 7.71 | 8.14 | 8.43 | 9.00 | 7.86 |
| C25 Manufacture of fabricated metal products | 8.71 | 10.14 | 10.00 | 9.71 | 9.43 |
| C26 Manufacture of computer, electronic, optical products | 12.00 | 11.71 | 9.86 | 11.43 | 11.29 |
| C27 Manufacture of electrical equipment | 13.43 | 13.86 | 10.71 | 8.57 | 11.86 |
| C28 Manufacture of machinery and equipment | 11.43 | 11.29 | 12.71 | 10.29 | 10.57 |
| C29 Manufacture of motor vehicles | 8.00 | 10.00 | 12.14 | 10.14 | 9.57 |
| C30 Manufacture of other transport equipment | 15.29 | 13.43 | 12.14 | 11.43 | 9.29 |
| C31 Manufacture of furniture | 9.57 | 9.86 | 9.14 | 11.14 | 11.57 |
| C32 Other manufacturing | 5.57 | 6.29 | 6.57 | 9.29 | 10.71 |

Source: own

indicators enables to make up a profile of an individual manufacturing industry, and allows assessing its competitiveness. The selected indicators provide the comprehensive view of the actual industrial performance and outcomes. It is important to note that the low level of several key indicators indirectly reveals the problems, which emerge in particular sector in the long run. Thus, the overall composite rank was calculated as the average of all the ranks that were estimated for all the selected indicators (Tab. 1).

Employment of the overall composite rank I, based on the weights of particular industries, allows to estimate the Index of the Long Run Income Potential of Industrial Structure, and to

evaluate the significance of each manufacturing industry according to its contribution to the overall value of the composite index CI. The values of CI index, calculated for five three-year terms that compose the researched fifteen-year period, have been provided in Tab. 2. The values of CI index, which were marginally increasing during the five three-year terms in comparison to the average value $CI_{average}$ = 10.0 (see formula 4), enable to consider that Lithuanian industrial structure is marginally biased towards the areas with the potential to generate higher income as $CI_{2000-2002}$ = 10.4 increased by 7.8% to $CI_{2012-2014}$ = 11.21.

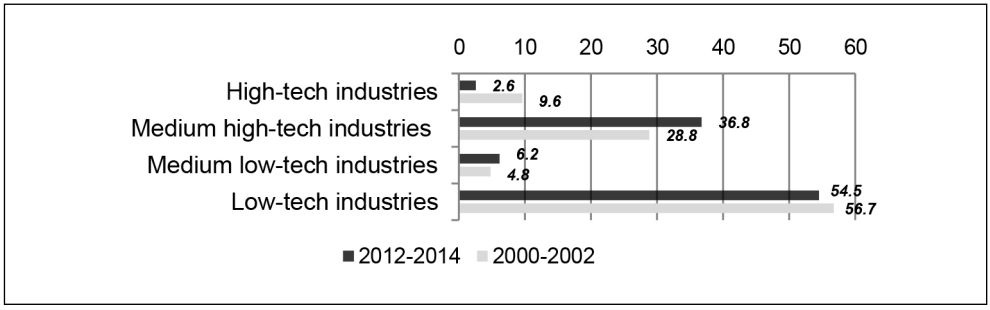
This presumption has been confirmed after the estimation of Rebased Index RCI, which refers to the ratio between the achieved CI index values and the average CI index value, and reveals the gap between the actual values and the average value (based level) of $RCI_{average}$ = 1. The estimations specified that the values of RCI during the analysed three-year terms exceeded the value equal to 1, and increased from $RCI_{2000-2002}$ = 1.04 to $RCI_{2012-2014}$ = 1.12. This

**Tab. 2: The Index of the Long Run Income Potential of Industrial Structure (CI), estimated for Lithuanian manufacturing industry**

| Manufacturing industry | 2000-2002 | 2003-2005 | 2006-2008 | 2009-2011 | 2012-2014 |
|---|---|---|---|---|---|
| C10-C11 Manufacture of food products and beverages | 1.38 | 1.55 | 1.80 | 2.36 | 2.41 |
| C13 Manufacture of textiles | 1.06 | 0.66 | 0.43 | 0.24 | 0.24 |
| C14 Manufacture of wearing apparel | 1.47 | 0.82 | 0.42 | 0.37 | 0.30 |
| C15 Manufacture of leather and related products | 0.07 | 0.02 | 0.01 | 0.04 | 0.05 |
| C16 Manufacture of wood and of products of wood | 0.76 | 0.77 | 0.70 | 0.58 | 0.60 |
| C17-C18 Manufacture of paper, printing and reproduction | 0.19 | 0.19 | 0.17 | 0.22 | 0.19 |
| C20 Manufacture of chemicals and chemical products | 1.18 | 1.57 | 3.32 | 3.45 | 3.13 |
| C21 Manufacture of basic pharmaceutical products | 0.05 | 0.05 | 0.03 | 0.03 | 0.03 |
| C22 Manufacture of rubber and plastic products | 0.40 | 0.45 | 0.66 | 0.56 | 0.71 |
| C23 Manufacture of other non-metallic mineral products | 0.16 | 0.11 | 0.19 | 0.16 | 0.25 |
| C24 Manufacture of basic metals | 0.22 | 0.27 | 0.24 | 0.11 | 0.09 |
| C25 Manufacture of fabricated metal products | 0.15 | 0.26 | 0.33 | 0.32 | 0.36 |
| C26 Manufacture of computer, electronic and optical | 0.94 | 0.87 | 0.42 | 0.37 | 0.26 |
| C27 Manufacture of electrical equipment | 0.41 | 0.67 | 0.36 | 0.23 | 0.38 |
| C28 Manufacture of machinery and equipment | 0.40 | 0.50 | 0.60 | 0.34 | 0.34 |
| C29 Manufacture of motor vehicles, | 0.03 | 0.08 | 0.26 | 0.17 | 0.13 |
| C30 Manufacture of other transport equipment | 0.92 | 0.78 | 0.33 | 0.30 | 0.14 |
| C31 Manufacture of furniture | 0.57 | 0.88 | 0.86 | 1.23 | 1.43 |
| C32 Other manufacturing | 0.02 | 0.04 | 0.07 | 0.15 | 0.19 |
| **Index of the Long Run Income Potential of Industry Structure – *CI*** | **10.40** | **10.53** | **11.21** | **11.25** | **11.21** |
| The average value of *CI* | 10.0 | | | | |
| **Rebased Index of Long Run Income Potential of Industry Structure – *RCI*** | **1.04** | **1.04** | **1.12** | **1.13** | **1.12** |
| Base level of *RCI* | 1.0 | | | | |

Source: own

**Fig. 3:** **The percentage contribution of Lithuanian industries to the value of CI index according to technological classification %**




Source: own

implies that Lithuanian industrial structure is favorable for generation of higher income level, but the actual income level, achieved by the country, depends on country's ability to utilize the potential of its manufacturing industries with higher values of the composite rank. The relevance of this approach, developed for the analysis of industrial structure, lies in both its suitability to provide the insights in the actual performance and applicability for future performance prognostications. Nevertheless, it is important to take into account that the estimated index does not reflect the optimal industrial structure.

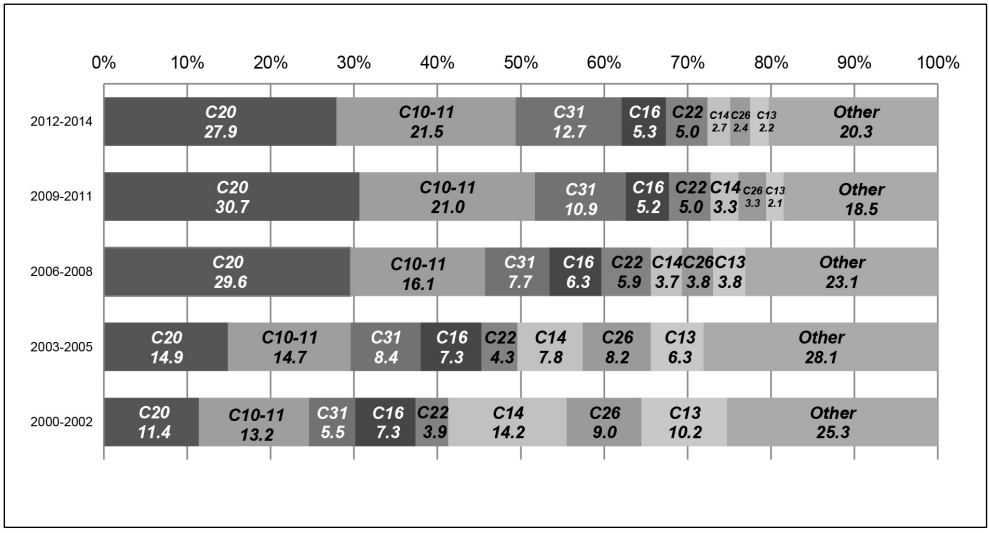
The employment of CI index enables to analyze the contribution of manufacturing industries according to their technological level, which were assessed on the basis of OECD's (2011) technological classification and the overall value of the Index of the Long Run Income Potential of Industrial Structure (Fig. 3).

The value of the contribution indirectly reflects the impact of an individual industry on the overall economics, considering the income and potential outcome, generated by this industry. It is important to highlight the decreased contribution of Lithuanian high-tech industries to the value of CI index, which dropped as a result of less efficient performance of the industry C26 Manufacture of computer, electronic and optical products, and very poor performance of the industry C21 Manufacture of basic pharmaceutical products and pharmaceutical preparations. More significant contribution to the value of CI index was generated by the industry C20 Manufacture of chemicals and chemical products, which increased its share more than twice and thus determined the growth of potential in medium high-tech sector. The traditional low-tech sector maintained its largest contribution to CI index, but individual industries in this sector experienced different shifts. It should be noted that the industries C10-C11 Manufacture of food products and beverages and C31 Manufacture of furniture increased their contribution to the value of CI index, and this way raised their significance in the overall economics of the country. The slight decline of contribution to the value of CI index was captured for the industry C16 Manufacture of wood and of products of wood and cork, the significance of which can be considered as relatively moderate whereas the industries C14 Manufacture of wearing apparel and C13 Manufacture of textiles can be treated as less significant since their contribution to the value of CI index decreased more than threefold. The industries of C25 Manufacture of fabricated metal products and C29 Manufacture of motor vehicles, trailers and semi-trailers slightly increased their contribution to the value of CI index, although the total value of this contribution remained comparatively low.

The percentage composition of CI index during the five analyzed three-year terms demonstrates the changes in Lithuanian industrial structure, and discloses the significance of individual industries (Fig. 4).

The calculations have revealed that Lithuanian manufacture has been led by the industry C20 Manufacture of chemicals and chemical products, which jumped from the third to the first position in Lithuanian industrial structure respectively in the terms of 2000-2002

**Fig. 4: The percentage contribution of Lithuanian manufacturing industries to CI index**




Source: own

and 2012-2014, and currently accounts for 27.9% of the value of CI index. The stable second position has been occupied by the industry C10-C11 Manufacture of food products and beverages, the percentage contribution of which increased from 13.2% to 21.5% during the researched period.

The percentage contribution of the industry C31 Manufacture of furniture increased from 5.5% to 12.7% during the researched period, raising this industry from the eighth to the third position in Lithuanian industrial structure whereas the forth position has been taken by the industry C16 Manufacture of wood and of products of wood and cork, which moved up from the former seventh position, although its percentage contribution to the value of CI index declined from 7.3% to 5.3%.

It is also important to highlight the declined position of the industry C26 Manufacture of computer, electronic and optical products, which dropped from the fifth to tenth in Lithuanian industrial structure as a result of much lower percentage contribution that decreased from 9.0% to 2.4% during the researched period.

The industry C14 Manufacture of wearing apparel experienced the greatest decrease (from 14.2 to 2.7 per cent) in contribution to the value of CI index, exchanging its first position, occupied in the term of 2000-2002, for the ninth position, occupied in the term of 2012-2014. The industry C13 Manufacture of textiles also lost its significance in the value of CI index. Hence, the analysis of the potential of Lithuanian manufacturing industry, performed on the basis of CI index estimation, has confirmed that the significance of low-tech industries such as C10-C11 Manufacture of food products and beverages, C31 Manufacture of furniture, C16 Manufacture of wood and of products of wood and cork and C22 Manufacture of rubber and plastic products still remains high in the overall structure of Lithuanian manufacturing industry.

## Conclusions

Despite some limitations, application of the Index of the Long Run Income Potential of Industry Structure is the method relevant to the analysis of industrial structure and potential since it enables to have a deeper insight in the remarkable changes that are affected by trade liberalization and competitive pressures in the international market. The employment of key indicators for estimation of the composite index enables to analyze industrial structure in accordance with quantitative particulars.

This approach is advantageous for the revision of the alteration of key indicators in different manufacturing industries. The key indicators – value-added per employee, average wage per employee, sectoral export growth, export shares, sectoral export intensity, R&D intensity, and foreign direct investment share – were selected as the determinants best reflecting the actual performance and competitiveness of particular industries in Lithuania, and employed in this empirical study due to their relevance and accessibility.

Transition of Lithuanian economy has undergone numerous structural changes that have been related to the shifts in country's manufacturing industry since 1991. The processes of the transformation have determined the current industrial structure with prevalent traditional low-tech industries. The paper aimed to reveal how Lithuanian industrial structure has changed over the last fifteen years, and which industries have the potential to accelerate the development of country's overall manufacturing industry. The empirical analysis has revealed the significance of medium-high and low-tech industries, and disclosed the variance of the contribution of individual manufacturing industries to the overall potential of Lithuanian manufacturing industry. The potential of medium high-tech sector has increased only due to the growth of the manufacture of chemicals and chemical products, however the other industries of this sector have not improved their positions in the overall structure of country's manufacturing industry. The potential and significance of the low-tech sector has been confirmed by the largest contribution of low-tech industries to the value of CI index, which has increased due to the growth of the manufacture of food and beverages, furniture and wood products. Since the estimated values of CI and RCI indexes showed only a slight increase, it can be concluded that the overall growth of Lithuanian manufacturing industry has been very modest, and the potential of Lithuanian industrial structure is a controversial issue. The actual performance of high-tech industries has not been remarkable, and the evident shift into high-value added manufacturing industries, where knowledge and technology intensive sectors play the central role, has not been confirmed.

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## Abstract

# *CHANGES IN INDUSTRIAL STRUCTURE AND POTENTIAL: THE CASE OF LITHUANIA*

**Asta Saboniene**

*The core aim of the research paper is to analyze the changes in the structure and potential of Lithuanian manufacturing industry, affected by the long process of economic transformation experienced since 1991. The purpose of this paper is to disclose how Lithuanian industrial structure has been moving towards the level of advanced industries, to analyze which sectors have the potential to contribute to the development of the overall manufacturing industry, and to explore how the contribution of individual manufacturing industries has changed over the researched period. The study provides the analysis of several key indicators, which enable to estimate the potential of Lithuanian industrial structure in accordance with quantitative particulars and revise the alteration of the contribution of individual manufacturing industries to the overall potential of Lithuanian manufacturing industry. This paper intends to present the estimations of the changes in Lithuanian industrial structure and its potential during the period of 2000-2014 on the basis of the composite Index of the Long Run Income Potential of Industrial Structure. The empirical analysis has revealed the significance of medium-high and low-tech industries and disclosed the variance of the contribution of individual manufacturing industries to the overall potential of Lithuanian manufacturing industry. The empirical study has disclosed that Lithuanian industrial structure shows a very modest potential of growth and development, and the potential of Lithuanian industrial structure remains a controversial issue. The evident shift into high-value added manufacturing industries, where knowledge and technology intensive sectors play the central role, has not been confirmed.*

***Key Words:*** *Manufacturing industry, industrial structure, potential, the Index of the Long Run Income Potential of Industrial Structure.*

***JEL Classification:*** *L16, L60, F14.*

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