

# Domestic Demand as a Driving Factor of Structural Changes in the BRIC Economies

Evidence from 1995 – 2011

[ Aleš Kocourek ]

**Abstract**—The article quantifies the structural changes that have taken place during the period 1995 – 2011 in the four emerging markets forming the BRIC grouping. Author discusses the consequences of these changes for the grouping as a whole and for its individual members. In agriculture, hunting, forestry, fishing, electricity, gas, and water supplies, transport, post and communication, but also in public administration, education and health the driving forces of the restructuring have been formed by the domestic customers in the BRIC emerging markets. The results for China and India show a transition from primary manufacturing and from production of merchandise with low added value to more sophisticated goods. In the Brazilian and Russian sectors of mining, quarrying, and partly also in manufacturing the foreign demand for exports (coming mainly from China and India) plays a crucial role in changing the output structure of these economies.

**Keywords**—BRIC, Final Consumption, Expenditure, Government, Fixed Capital, Household, Industry, Restructuring, Value Added

## I. Introduction

Since 2001, when economic expert of the investment bank Goldman Sachs, Jim O’Neill [9] coined the acronym BRIC for the first time, these rapidly growing countries of the world, Brazil, Russian Federation, India, China,<sup>1</sup> have experienced a dramatic development which can be hardly described as stable or fluent [5]. From more or less a journalistic label with indistinctive common economic content of the potentially world’s most successful emerging markets, the BRIC grouping has been continuously transforming itself into one of the most important players in the global policy and economy. Together the countries represent nearly a quarter of the world area, 40 % of the world population, 20 % of global GDP, and 15 % of the world international trade in goods and services. All the BRIC members are connected by the disappointment from being permanently marginalized within the system of international relations and by their endeavor to transform it (especially the UN Security Council, but also the World Bank Group and the

International Monetary Fund) or to rebuild it (founding a joint development bank, creating a reserve fund for mutual support of the national currencies, planning a monetary union).

Nevertheless, the BRIC countries represent quite divergent opinions on a number of international issues (be it the civil war in Syria, the global climate change, the territorial ruptures between China and India, Chinese economic expansion to Middle East and eastern Russia, Russian political intentions in Ukraine, or growing competition on the global commodity markets).

The aim of this article is to shed some light on the structural changes that have taken place in the four BRIC emerging markets during the last two decades and to discuss the consequences of these changes for the grouping as a whole and for its individual members. The focus of this article concentrates on the structure of production and structure of domestic demand. According to Cui and Syed [3], Kojima [6] or Kocourek [4], the BRIC are continuously changing their export orientation from primary manufacturing and from production of merchandise with low added value, to more sophisticated goods. The whole group of the BRIC is gaining competitive advantages mainly in the sector of machinery and transport equipment, but also in some others. The position of individual countries has been transforming significantly as well: China seized and is consolidating the export positions mainly in the chemical industry (together with Russia), manufacturing, consumer goods, and of course machinery and transport equipment (together with India) [4].

The rudimentary issue for this paper is the question of the driving forces leading to these changes. Is the development within the BRIC countries determined by the growing domestic demand from the establishing numerous middle class? Or are these transformations induced by the demand from abroad, the demand for exports?

The analysis itself is rather straightforward: The shares of each individual industrial sector on the total value added, on the intermediate consumption, on the final household and government consumption, on gross fixed capital formation and also on exports were calculated from the data published by World Input-Output Database [12]. The shares were in the following steps analyzed using the statistical methods of time series analysis.

The results show a linkage between the structure of value added and the structure of domestic demand especially in the sectors of retail trade, financial intermediation, electrical, optical and transport equipment, post and telecommunication. Sectors such as mining and quarrying, basic and fabricated metals, coke, refined petroleum, and nuclear fuel tend to have

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Aleš Kocourek  
Technical University of Liberec  
Czech Republic, Europe

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<sup>1</sup> In 2011, South Africa officially became the fifth member of the BRIC grouping extending the abbreviation to BRICS. Unfortunately, the World Input-Output Database [12] used as a data source for the following analysis does not offer the data set for South Africa. For this reason, the paper concentrates on the four BRIC economies only.

strong export links in Brazil and Russian Federation and indicate dependence on domestic demand as well as on imports in China and India. Weaker relationships were identified e.g. in construction, inland transport, electricity, gas, and water supply, real estate activities, where the domestic demand by households, producers, and national governments represent a powerful driving factor of growing importance.

## II. Research Methods

For consistency, comparability, and overall homogeneity reasons, one single data source was used for the analysis. All the data were provided by the World Input-Output Database [12][11] run by Rijksuniversiteit Groningen. They offer national Input-Output Tables for more than 30 countries (as noted above, South Africa is not one of them). The oldest data come from 1995, the latest are not more recent than 2011. A great advantage of this data source comparing to e.g. the United Nations Statistics Division is a more detailed structure following the International Standard Industrial Classification of All Economic Activities (ISIC, rev. 3) in value added indicator as well as in all expenditure indicators (incl. exports). The shares for each BRIC country, each year, and each of the 34 tabulation categories or subcategories (see appendix for a list) of ISIC, rev. 3 were computed using the following formulas:

$$va_{i,t}^C = \frac{VA_{i,t}^C}{\sum_i VA_{i,t}^C}, \quad (1)$$

where  $VA$  is the value added in the country  $C$  and period of time  $t$  (year) for the  $i$ -th tabulation category/subcategory of industries according to ISIC (rev. 3).

$$ic_{i,t}^C = \frac{IC_{i,t}^C}{\sum_i IC_{i,t}^C}, \quad (2)$$

where  $IC$  is the intermediate consumption of the  $i$ -th industry output.

$$fch_{i,t}^C = \frac{FCEH_{i,t}^C}{\sum_i FCEH_{i,t}^C}, \quad (3)$$

where  $FCEH$  are the final consumption expenditures by households.

$$fcg_{i,t}^C = \frac{FCEG_{i,t}^C}{\sum_i FCEG_{i,t}^C}, \quad (4)$$

where  $FCEG$  are the final consumption expenditures by government.

$$gfcf_{i,t}^C = \frac{GFCF_{i,t}^C}{\sum_i GFCF_{i,t}^C}, \quad (5)$$

where  $GFCF$  is the gross fixed capital formation.

$$x_{i,t}^C = \frac{X_{i,t}^C}{\sum_i X_{i,t}^C}, \quad (6)$$

where  $X$  are the exports.

It is worth noting, the six shares (1) – (6) are not related to the total value of output or of the aggregate demand of the economy. The reason is rather obvious in the case of (1), but (2) – (6) have deeper grounds than a simple symmetry to (1). They represent a share of a concrete industry on the total of all industries, rather than their respective contribution to the total aggregate demand. It is so because these shares shall not analyze primarily the structure of economic subjects forming the aggregate demand (in terms of households, government, corporations, and exporters). They shall monitor the structure of the aggregate demand for output of individual industries regardless of the changes of proportions among the total  $IC$ ,  $FCEH$ ,  $FCEG$ ,  $GFCF$ , and  $X$ . The influence of taxes and subsidies on sector shares of value added will not be taken into account here. The share of final consumption expenditure by non-profit organizations serving households as well as the share of changes in inventories and valuables will be omitted as marginal.

The shares (1) – (6) were calculated in every year of the period 1995 – 2011, which made it possible to investigate further their time series using the methods of regression analysis. The linear mean annual paces of change over the 17-year-long period have been estimated using ordinary least square correlation analysis:

$$[shr]\beta_{ii}^C = \frac{n \sum_{t=1}^n [shr]_{i,t}^C t - \sum_{t=1}^n [shr]_{i,t}^C \sum_{t=1}^n t}{n \sum_{t=1}^n t^2 - \left( \sum_{t=1}^n t \right)^2}, \quad (6)$$

where  $[shr]$  stands for  $va$ ,  $ic$ ,  $fch$ ,  $fcg$ ,  $gfcf$ , or  $x$  for the  $i$ -th category of industries according to ISIC (rev. 3) in a country  $C$  and  $t$ -th year of the 17-year-long period of time ( $n$  is a number of years, i.e.  $n = 17$ , from 1995 to 2011). The values of  $[shr]\beta_1$  were tested for their statistical significance using T-test against 95% confidence level. Only the statistically significant values of  $[shr]\beta_1$  were accepted for the following outcomes of the analysis.

The positive values of  $x\beta_1$  indicate a long-term growing importance of the particular sector or industry for export orientation of the domestic economy. The rise of the share on exports is considered to be a consequence of a higher demand from abroad. Similarly, positive values of  $ic\beta_1$ ,  $fch\beta_1$ ,  $fcg\beta_1$ , or  $gfcf\beta_1$  document a growing share of the domestic demand.

The assumption set by Caparriello [2], that in each sector the value added embodied in a good produced for export is equal to the value added of the same good produced for domestic consumption, was applied here. Therefore, the positive  $va\beta_1$  gives a proof of an increasing importance of the particular industry for domestic production, which can be a result either of growing domestic or of growing foreign demand for the output of this particular industry (though it can be also induced by decreasing productivity in other sectors of the economy). Especially on these grounds, it seems crucial to discuss the development of all the calculated paces ( $va\beta_1$ ,  $ic\beta_1$ ,  $fceh\beta_1$ ,  $fceg\beta_1$ ,  $gfcf\beta_1$ , and  $x\beta_1$ ) together, when searching for the driving factors of restructuring of the BRIC economies.

If the share of a certain industry on the total value added is changing over the time significantly ( $va\beta_1$  differs significantly from zero), the industry is facing restructuring. If over the same period the industry's  $ic_{i,t}^C$ ,  $fceh_{i,t}^C$ ,  $fceg_{i,t}^C$ , or  $gfcf_{i,t}^C$  recorded a significant pace of development in the same direction as the  $va_{i,t}^C$ , then the dynamics within the domestic demand is probably enforcing the restructuring of the industry. If the direction of  $va_{i,t}^C$  dynamics is the same as the long-term pace of  $x_{i,t}^C$  development, then the driving power propelling the restructuring is likely coming from the foreign market. Obviously, both can happen at the same time.

### III. Results of the Analysis

The statistically significant findings of the research are demonstrated in the Fig. 1 – 4. The linear mean annual paces of change are depicted on the horizontal axis, the industrial structure of the economy on the vertical axis. The wider black rectangles illustrate the  $va\beta_1$ , the narrow ones in shades of grey represent the  $ic\beta_1$ ,  $fceh\beta_1$ ,  $fceg\beta_1$ ,  $gfcf\beta_1$ , and  $x\beta_1$ .

In Brazilian economy (see Fig. 1), the mining a quarrying industry (C) recorded an intensive growth driven by exports and to smaller proportion also by the domestic demand for their output. A similar situation can be identified in the sector of coke, refined petroleum and nuclear fuel (D.23), but also in inland transport (I.60) and post and telecommunications (I.64), although they experienced strengthening of their respective

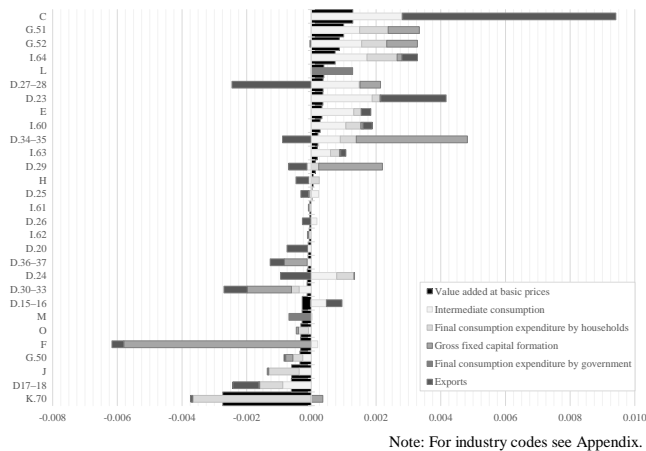


Figure 1. Brazil

position in Brazilian economy as a result of intensive growth in domestic demand (especially intermediate consumption, household consumption, and gross fixed capital formation), and slightly smaller growth in exports. For such industries as basic and fabricated metals (D.27–28), transport equipment (D.34–35), and machinery not elsewhere classified (D.29), the domestic demand represents the dominant driving factor of the structural shifts supporting the growth and development of these industries, while exports have been on a decline. Similarly, in wholesale and commission trade (G.50) and in retail trade (G.52), the domestic demand is the only driving factor increasing the share of these sectors.

The role of government in Brazilian economy seems to be rather small. Long-term drift of attention from the sector of education (M) to public administration, defense, and compulsory social security (L) has been apparent source of changes in these two industries. But even a relative decline of importance and funding for education is a warning sign for the future development of the country.

One of the most rapid declines in the share of value added was recorded by the sectors of real estate activities (K.70) and financial intermediation (J), driven by dramatic slowdown in household expenditures. Other falls in their respective value added shares were witnessed by textiles and textile products (D.17–18), and sale, maintenance and repair of motor vehicles and motorcycles (G.50). They have been pulled down by domestic demand and decreasing exports, both crowded out by cheap Chinese production. Construction (F), electrical and optical equipment (D.30–33) were hampered by cuts in gross fixed capital formation and slowdown in exports.

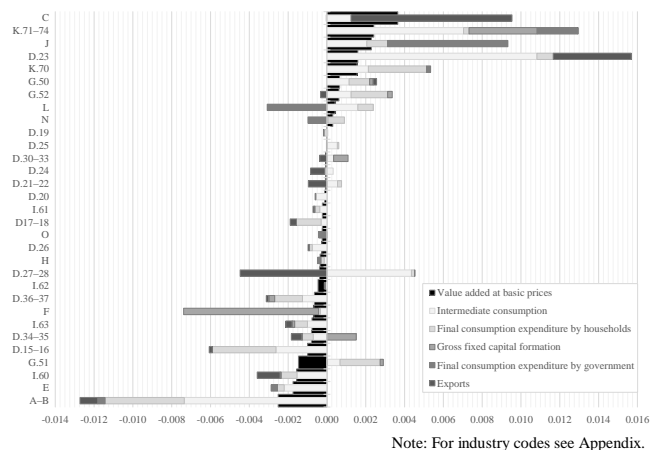


Figure 2. Russian Federation

The Russian Federation experienced several structural changes that are parallel to the development in Brazil (see Fig. 2). It is the case of mining a quarrying industry (C) pushed up by exports and domestic intermediate consumption; the case of coke, refined petroleum and nuclear fuel (D.23) drawn up by exports supported by intermediate and household consumption; or the case of retail trade (G.52) where growing domestic demand exceeds the reduction in exports. The long-term growth of share of sale, maintenance, and repair of motor vehicles and motorcycles (G.50), financial intermediation (J), as well as real estate activities (K.70) and renting of

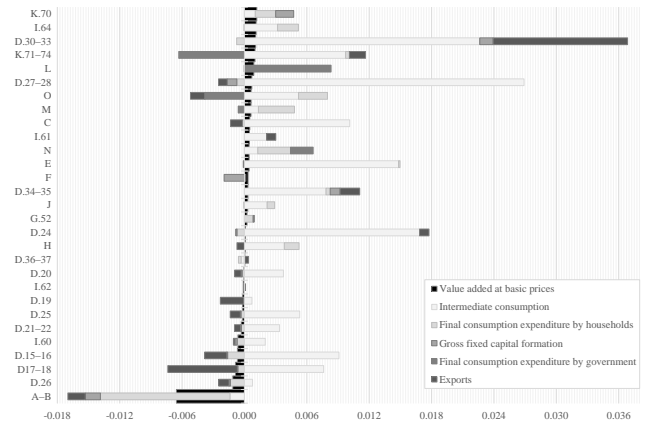
machinery and equipment and other business activities (K.71–74) was predominantly driven by increasing domestic demand. The latter one especially by gross fixed capital formation.

Generally, Russian economy has gone through a period of increasing specialization, as a majority of sectors recorded a decline in their share of value added. This process was prevalently supported by domestic demand factors, especially by drops in intermediate consumption, in expenditures by households, but also by cuts in gross fixed capital formation (esp. in construction; F) or reductions in consumption expenditures by government (esp. in agriculture, hunting, forestry, and fishing; A–B; and in electricity, gas, and water supplies; E). Sinking exports drew down several industries of Russian economy, but most significantly the manufacturing sector of basic and fabricated metal (D.27–28) despite the rise in the intermediate domestic demand for its output.

Government expenditure play more important role in Russian Federation, than in Brazil. The systematically shrinking final consumption expenditures by government have diminished the share of hotels and restaurants (H) together with decreasing demand by domestic households. They have depleted the industry of other community, social, and personal services (O). Sectors of health and social work (N) and public administration, defense and compulsory social security (L) resisted only thanks to increasing final consumption expenditures by households and rising intermediate consumption. On the other hand the long-term support by government has helped to increase the share of financial intermediation (J) as well as renting of machinery and equipment and other business activities (K.71–74).

been extenuated by long-term growth in the share of intermediate consumption.

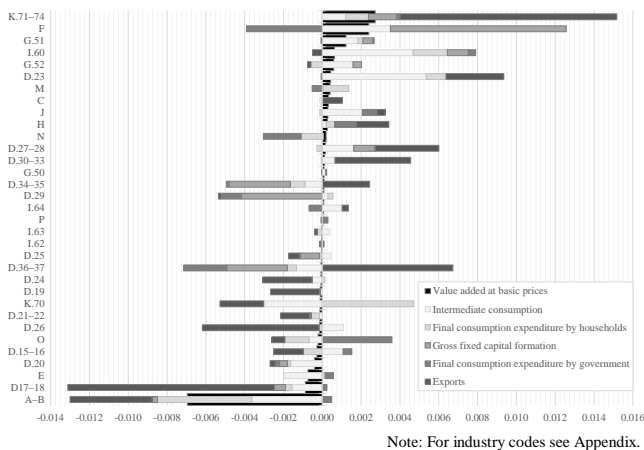
The final consumption expenditures by households have been transferred to propel the development of education (M) and of inland transport (I.60). A great support has been provided by gross fixed capital formation and intermediate consumption to the wholesale and commission trade (G.51), and mainly to construction (F). The renting of machinery and equipment and other business activities (K.71–74) has been pushed up predominantly by exports, as well as coke, refined petroleum and nuclear fuel (D.23) demanded by China in gigantic volumes.



Note: For industry codes see Appendix.  
Figure 4. China

Already a short look at the Fig. 4 bears a clear finding: the Chinese economy has gone through a period of vast and deep restructuring providing the country with a more diverse structure of production and moderated by rising intermediate consumption for most of the industries. Due to decreasing share on final expenditures of households, the Chinese agriculture, hunting, forestry, and fishing (A–B) has been losing large shares on value added, 0.66 % each year. A number comparable only to India, where the share of the same industry on value added has been shrinking by 0.69 % annually. No other sector has witnessed such an intense change.

The Chinese manufacturing has been changing rapidly too. Under the joint pressure of reduction in share of households expenditure, slight decrease of gross fixed capital formation share, and in many cases rather deep drop in share on exports, the food, beverages, and tobacco industry (D.15–16), textile and textile products (D.17–18), leather and footwear (D.19), wood and products of wood and cork (D.20), pulp, paper, printing and publishing (D.21–22), rubber and plastic (D.25), and especially other non-metallic minerals (D.26) recorded falling shares on the total value added. Chinese manufacturers seem to focus on chemicals and chemical products (D.24), transport equipment (D.34–35), basic and fabricated metals (D.27–28), and electrical and optical equipment (D.30–33). The momentum has been provided predominantly by exports, and intermediate consumption by other Chinese industries economy, to a lesser extent also by gross fixed capital formation.



Note: For industry codes see Appendix.  
Figure 3. India

It is not surprising that also in Indian government (with still persisting 5-year-planing) has played a visible systematic role in forming the structure of the domestic economy (see Fig. 3). However, most of the industries that have seen long-term lost of their positions in Indian national economy are driven down by plummeting shares on exports, by shrinking shares on final consumption by households and by declining intermediate demand. That counts for agriculture, hunting, forestry, and fishing (A–B), as well as for textiles and textile products (D.17–18) or wood and products of wood and cork (D.20). The fall in food, beverages, and tobacco (D.15–16) has



The role of Chinese government is noticeable in the sector of health and social work (N), but it has a dominant influence in public administration, defense, and compulsory social security (L). Education (M) recorded a decreasing share on government expenditure, however this decline has been outbalanced by intermediate expenditure and final household consumption. Real estate activities (K.70) followed by post and telecommunications (I.64) reached the highest levels of pace of growth in their shares on value added, fuelled exclusively by domestic demand.

## iv. Conclusions

The results of this paper proved a persistent structural reorientation of the BRIC from elementary raw materials processing and from low added value production, to more sophisticated merchandise driven by domestic demand. With some exceptions in Russian Brazilian economies, the analysis generally confirms the Akamatsu's flying geese paradigm [1]. The success of Chinese export-oriented policy bears fruits for its economy and society, it intensifies the relations within the BRIC members, but also leads to a tougher competition, especially in the manufacturing sector. Chinese dominance as well as its size and ambitions have been already causing some fears and tensions challenging the very basics of the concept of the BRIC grouping as a sustainable economic entity.

The side effects and reflections of this continuous process unfold in the form of growing dependence of Indian, but especially Chinese economies on import of raw materials. They are absorbing the growing exports from Brazil and Russian Federation as the increase of their own mining and quarrying industry is insufficient. In this context, a further deepening of mutual relations of the BRIC countries and strengthening the integration processes within the grouping seem sensible and advantageous for all the member states.

A relevant role in the complex and perpetual processes of restructuring has been certainly played by the foreign direct investment (see e.g. [11]) and also by the changing situation in the developed market economies (see e.g. Puškárová [10] or Montobbio and Rampa [8]). Analysis of importance of these factors for restructuring the BRIC economies open a space for further research and offers a potential to provide new arguments to the debate on the future of the BRICS.

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## Appendix: Industry Codes

**A–B** = Agriculture, Hunting, Forestry and Fishing; **C** = Mining and Quarrying; **D.15–16** = Food, Beverages and Tobacco; **D.17–18** = Textiles and Textile Products; **D.19** = Leather, Leather- and Footwear; **D.20** = Wood and Products of Wood and Cork; **D.21–22** = Pulp, Paper, Printing and Publishing; **D.23** = Coke, Refined Petroleum and Nuclear Fuel; **D.24** = Chemicals and Chemical Products; **D.25** = Rubber and Plastics; **D.26** = Other Non-Metallic Mineral; **D.27–28** = Basic Metals and Fabricated Metal; **D.29** = Machinery, not elsewhere classified; **D.30–33** = Electrical and Optical Equipment; **D.34–35** = Transport Equipment; **D.36–37** = Manufacturing, not elsewhere classified; Recycling; **E** = Electricity, Gas, and Water Supply; **F** = Construction; **G.50** = Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel; **G.51** = Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles; **G.52** = Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods; **H** = Hotels and Restaurants; **L.60** = Inland Transport; **L.61** = Water Transport; **L.62** = Air Transport; **L.63** = Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies; **I.64** = Post and Telecommunications; **J** = Financial Intermediation; **K.70** = Real Estate Activities; **K.71–74** = Renting of Machinery and Equipment and Other Business Activities; **L** = Public Administration and Defense; Compulsory Social Security; **M** = Education; **N** = Health and Social Work; **O** = Other Community, Social, and Personal Services; **P** = Private Households with Employed Persons.

About Author:



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