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Exchange Rate, Imports of Intermediate and Capital Goods and GDP Growth in Belarus

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Abstract

The paper analyzes the short-run and long-run effects of imports of intermediate and capital goods on Belarusian economic growth for the period 2005 to 2015 taking into account large upward and downward exchange rate adjustments of Belarusian ruble. The empirical findings from the autoregressive distributed lag regressions indicate that there are negative effects of imports of intermediate goods on economic growth both in the short and long run. Second, contrary to the theory devaluation of the Belarusian ruble negatively influences both GDP growth and imports of intermediate goods in Belarus. Third, the results of Toda–Yamamoto causality test shows that GDP growth Granger causes growth in imports and exports, supporting the hypothesis that trade is more a consequence of the rapid economic growth in Belarus than a cause. Fourth, the findings from forecast error variance decomposition (VDC) confirm results obtained from TY causality test and additionally emphasize that changes in imports in Belarus are mostly driven by changes in exports especially in the long-run. Finally, the findings from VDC also indicate that the main contributor to growth fluctuations are domestic capital investments.

Keywords: imports of intermediate and capital goods, domestic capital investments, economic growth.

JEL Classification: C32, O11, O24, O33, O47, O52

1. Introduction

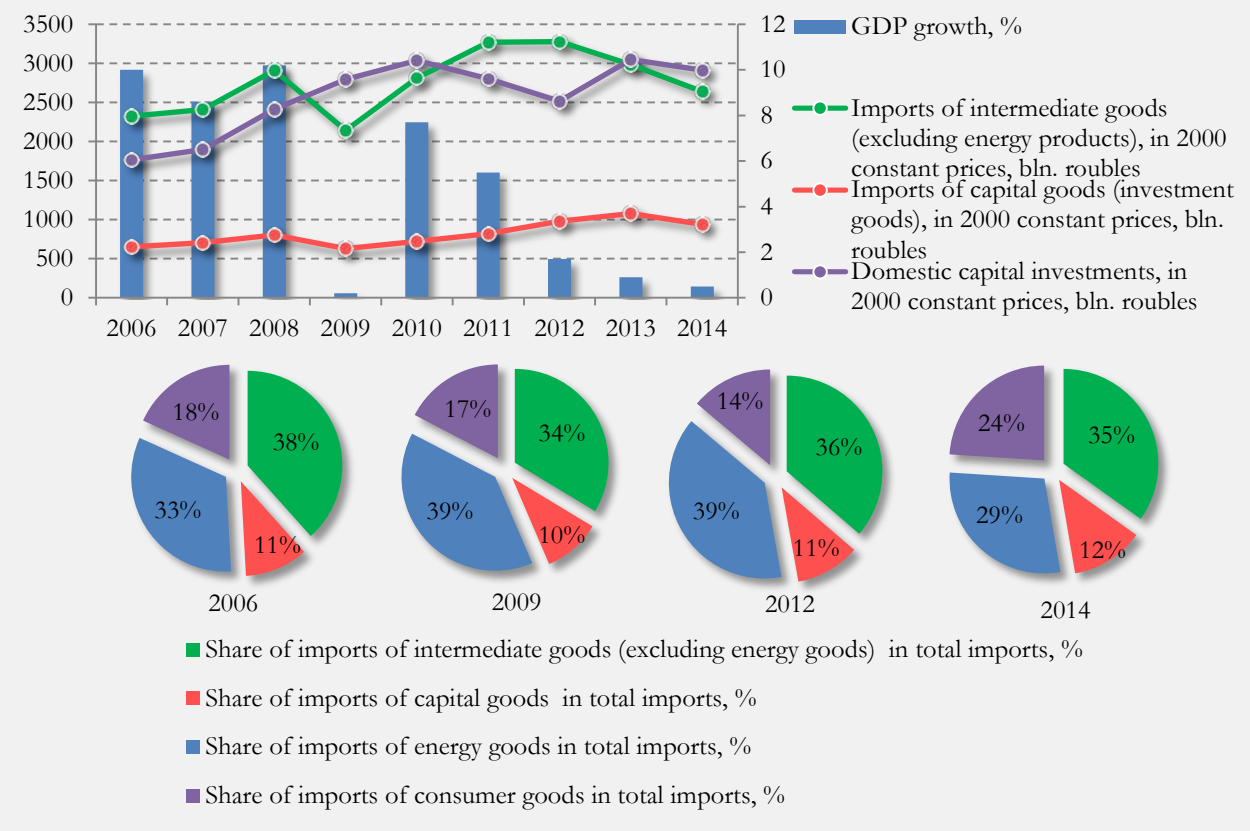
According to the endogenous growth theories technological progress is a key factor that enhances long-run growth both in developed and developing countries. Although technological progress is defined to be exogenous in the traditional (neoclassical) growth models, in the endogenous growth models it is considered as a process that is determined by the internal forces of the system. Technological progress materializes in intermediate and capital goods, in innovations, in improved organizational efficiency of production or in the skills of human capital. It increases competitiveness and through technological spillovers facilitates the invention of new goods and enhances innovation processes in the domestic economy (Grossman and Helpman, 1991). Furthermore, these spillovers improve production efficiency, which subsequently increases economic growth (Rivera-Batiz and Romer, 1991; MacDonald, 1994). However, Grossman and Helpman (1991) noted that in the developing countries scarce commercial activities in R&D limit technological progress and decrease the role that it plays in the growth and development of the economy.

From this point of view imports of intermediate and capital goods play the same role for the developing economy as R&D activities in developed countries. It allows transferring foreign technology and innovations from R&D intensive countries, thus, increasing productivity, enhancing quality of produced goods and export performance (Coe et al., 1997; Lee, 1995; Mazumdar, 2001; Eaton and Kortum, 2001; Caselli and Wilson, 2004). Moreover, the influence of imports of intermediate and capital goods on economic growth in developing countries is also dependent on effective reallocation of resources and on increase in domestic investments. This evidence is also relevant for Belarus, where the increase in imports of capital goods is followed by the increase in domestic capital investments (see Figure 1). From 2006 till 2014 imports of capital goods increased by 44.5 percent, but domestic capital investments increased even more by 64.9 percent. Country's technology import policy is linked with another core economic objective – industrial modernization of state-owned enterprises.

These all indicate that the analysis of trade in intermediate and capital goods should be one of the important factors that are supposed to explain changes in Belarusian economic growth. Such goods account for a sizable fraction of all country's imports: the share of energy and investment intermediate imports exceeds 70 percent (see Figure 1). As a result, the difference between the value of domestic production and domestic value added tends to be larger in Belarus than in its destination countries of intermediate inputs.

Thus, through the cost of imported intermediates, the exchange rate has also an important influence on Belarusian economy. In the presence of foreign exchange rationing, the availability of foreign exchange may have a direct effect on the position of the economy's short-run supply curve (Pierre-Agénor & Montiel, 2015). Therefore, the economic policy related to imports in intermediate and capital goods is seriously conditioned by the foreign exchange constraint and more precisely on appreciation and depreciation of exchange rate of national currency (see Mazumdar, 2001; Lee, 1995 and Wall, 1968).

Figure 1. Structure of Belarusian imports, 2006-2014



Generally, depreciation increases the domestic currency price of imported goods and decreases the quantity of imports leading to so-called the direct cost effect. From the other hand, depreciation leads to growth in the domestic currency price of domestic export motivating local companies to expand production for export. As a result, demand for intermediate and capital inputs increases resulting in so-called the derived demand effect. The direct cost effect and derived demand effect have opposite signs, if the depreciation occurs both to import source and export destination countries the marginal effects will have the comparable magnitude, leading to almost insignificant effect on overall imports of intermediate and capital goods. Substantial reliance of the Belarusian export sector on imported inputs jointly with these side effects causes cost-push inflation in the export sector decreasing its competitiveness and, overly, economic growth in its open economy.

Taking all together, the aim of the research is to study the influence of imports of intermediate and capital goods and effects of large upward and downward exchange rate adjustments of Belarusian ruble on economic growth in Belarus. The paper uses a monthly dataset covering 10 years of Belarusian economic history between 2005 and 2015.

Overly, the paper addresses the following **questions**:

1. What happens to GDP growth, imports of intermediate and capital goods in Belarus over the short and long term due to changes in their forcing variables including upward and downward exchange rate adjustments of Belarusian ruble? Answering this question the paper contributes to the literature (mostly to endogenous growth theory (Helpman and Krugman, 1985; Grossman and Helpman, 1994; and Romer, 1990)) in providing new evidence of the role played by imports of

intermediate and capital goods in the process of economic growth on the example of Belarusian economy, while the majority of works in this field focuses mainly on exports. The obtained results reject imports-led growth (ILG) hypothesis for Belarus, but supports relevance of growth-led imports (GLI) hypothesis for the country in case of intermediate and capital goods.

2. Are there any causal relationship between import of intermediate and capital goods and GDP growth in Belarus? What is the direction of the causality? (If any?). Using Toda Yamamoto (TY) Granger causality approach the paper reconfirms relevance of GLI and additionally growth-led exports (GLE) models for Belarus and supports the arguments stated by Rodrik (1995), who promoted the hypothesis that trade is more a consequence of the rapid economic growth in developing countries (on the example of Asian states) than a cause.

3. How much of the fluctuations in imports of intermediate and capital goods and GDP growth in Belarus are explained by changes to each of their explanatory variables over a two-year forecasting period? The findings from forecast error variance decomposition (VDC) show that growth in imports of intermediate and capital goods in Belarus are mainly driven by changes in GDP growth and exports growth. However the impact of exports growth increases substantially in the long-run. Additionally, the findings also show that the main contributor to GDP growth fluctuations is growth in domestic capital investments, but with decreasing influence in long-run.

4. What is the impact of large upward and downward exchange rate adjustments of Belarusian ruble on GDP growth and growth in imports of intermediate and capital goods? The obtained results indicate that contrary to the theory (see Hausman et al. (2005), Eichengreen (2007), Korinek and Serven (2010)) depreciation of exchange rate negatively influences both GDP growth and imports of intermediate goods in Belarus.

The **approach** is the following: the first step is to identify the large exchange rate appreciations and depreciations in Belarus. The definition of such events consists a 5 percent and larger appreciation or depreciation of the nominal effective exchange rate of Belarusian ruble per month that leads to real effective appreciation or depreciation in the same period. The second step is to study how these events jointly with dynamics of intermediate and capital goods imports affects the Belarusian GDP growth using dummy variables for appreciations and depreciations and ARDL bounds testing approach. Next, causal relationship between considered variables will be evaluated using TY Granger causality approach. Finally, the forecast error variance decompositions will be analyzed in order to identify what proportion of the variation in economic growth, growth in imports of intermediate and capital goods can be explained due to changes in their underlying determinants.

The rest of the paper is organized as follows. Section 2 contains the literature review. Section 3 shows the description of the considered variables. Section 4 describes used methodology. Section 5 presents the empirical results. Comments and conclusions are given in Section 6.

2. Literature Review

2.1 Theory

The earliest trade models studied static (changes in the level of welfare) gains from trade, which resulted from resource allocation to more efficient sectors. However, they did not explain how trade influences long-term growth. For example, according to Ricardian trade theory export-oriented strategy enable countries to participate in competitive production of goods and then trade for goods that other countries produce with relatively lower cost (Golub and Chang, 2000). As a result, products are sold to consumers at a competitive price and countries are escaped from autarky. Nevertheless, introduction of export-oriented economic development is only a means for attaining sustained and rapid economic growth but not a main goal by itself. Therefore, if country is opened to trade, these theories are unable to clarify its future economic performance. The problem was solved in particular by the neoclassical growth theory, which helped to link trade with growth through its effects on technology and productivity. Models from this theoretical direction studied so-called dynamic gains from trade (changes in the growth rate), which were considered to be much more significant than static gains from trade. The neoclassical economists indicate a strong relationship between expansion of trade and economic growth, stating that export growth is the main factor for economic growth.

The endogenous growth theory introduced since the 1980s opened new direction for the research on this topic (see Helpman and Krugman, 1985; Grossman and Helpman, 1994; and Romer, 1990). In comparison with the neoclassical growth models, where exogenously determined rate of technical progress defines growth, the objective of the endogenous growth theory is to find the explanation of long-term growth within the model. The main attention here is paid to human capital and technology as key drivers of productivity and, thus economic growth.

Models that link trade and endogenous growth have determined two main channels through which trade affects growth:

- The introduction of outward oriented trade policies encourages the achievement of fast economic growth – the, so-called, Export-Led Growth (ELG) hypothesis. Formulating this hypothesis, Helpman and Krugman (1985) argued that export growth stimulates economic growth through economies of scale including diffusion of technical knowledge and specialization in production. Bhagwati (1988) showed that export growth stimulates economic growth, which in turn facilitates development of skills and promotes technological progress. Consequently, the productive efficiency increases creating a comparative advantage for the country. Easterly (2007) stated that exports facilitate access to the international market and industrial expansion. Furthermore, export enhances economic efficiency through better allocation of resources and stimulates economic growth in the long run.
- Greater availability of imports, particularly intermediate and capital goods, allows domestic producers to gain access to innovations and technologies that contain imported goods, increasing competition and efficient resource allocation – the, so-called, Import-Led Growth

hypothesis. There are two ways through which the ILG hypothesis is explained: technological transfers (direct effect on the productivity level) or import of productive inputs (indirect effect). In the first case imports influence the transmission of foreign R&D knowledge through learning-by-doing processes (Lawrence and Weinstein, 1999; Mazumdar, 2001; Grossman and Helpman, 1991; Coe and Helpman, 1995; Keller, 2000). This idea is based on the observation that countries import new goods before making them themselves, and only after that finally exports them. Basant and Fikkert (1996) and Hasan (2002) showed that imported technology has a positive impact on firm productivity. In the second case a country opened up to trade can benefit from the available range of foreign intermediate and capital goods in two ways: through more varieties (complementarity mechanism) (Romer, 1987) or products of better quality (Aghion and Howitt, 1992). Thus, producers using information about new technologies that contained in the imported goods may use or improve them even further. All these lead to productivity gains that can be enhanced if additional technical assistance or attached product support come with imports. Mody and Yilmaz (2002) demonstrated that increase in export competitiveness is followed by imports of machinery, whereas Coe, Helpman, and Hoffmaister (1997) and Xu and Wang (1999) found that imports of capital goods promote international transfer of technical innovations. Grossman and Helpman (1991), Lee (1995) and Mazumdar (2001) showed that imports of intermediate and capital goods from technologically more advanced countries turn into a form of technology transfer which became a source of competition that encourages the development of the domestic industry – innovations continuously improves quality of intermediate goods leading to increase in aggregate productivity of final production. However, technological benefits and distribution of know-how depend very much on the assumptions about the nature of the technology, that is, models often assume that technology can be easily copied and transmitted. But in developing countries the potentials of production capacities and the level of human capital often are too low to take advantage from the technological transfer. Mazumdar (2001) pointed out that the indirect effect from imports can arise also from the opportunity to purchase intermediate and capital goods at a lower price, or to buy these goods at the same price but with higher quality showing that countries with a higher share of imported capital goods experience higher growth. This notion focuses on the importance of relative prices and more precisely on the importance of the effective price that takes into account the quality effect.

Additionally, Post-Keynesian and structuralist foundations also accentuated the importance of imports for economic growth. They underline that through imports trade openness improves the access to less expensive and/or qualitatively better intermediate and capital goods increasing productivity and capacity utilization and stimulating investments in low cost-effective activities. As a result, the lower production costs make investment more profitable encouraging firms to invest more in physical and human capital, thus, enhancing competitiveness and promoting modernization

and export development which in turn generates foreign exchange that is necessary to import further intermediate and capital goods (UNCTAD, 2004).

However, post-Keynesian and structuralist schools emphasized that in order to balance the growing demand for imports exports should grow steadily and fast enough, in other case external debt will accumulate and eventually become unsustainable as often happens for highly import-sensitive developing countries. Correspondingly, one of the main subjects of the early structuralism, so-called Prebisch-Singer thesis, is associated with a possible worsening in the terms of trade of developing countries that can contribute to a further deterioration of their trade balance. So, these theories accentuated the importance of balance-of-payments constraint on economic growth.

Thus, taking all together recent economic literature focuses heavily on the direct and indirect links between exchange rates and trade, and their joint influence on economic growth. This issue became one of the central questions in academic research when exchange rate volatility increased after the end of the gold exchange standard (IMF, 1984).

Considering direct effects economists agree that avoiding large exchange rate fluctuations (appreciations and depreciations) is a significant factor that determines country's economic performance (Rodrik, 2008). However, despite the large literature that deals with exchange rates and trade dynamics, there is small number of studies that specifically analyzed the economic consequences of appreciation events (Goldfajn and Valdes, 1999; Eichengreen and Hatase, 2007). Generally the exchange rate appreciation is considered as negative macroeconomic shock that can harm trade performance increasing domestic cost of producing tradable goods in case of absence of change in the relative prices for trading partners. Additionally, it slows down the aggregate demand which negatively affects exports and in turn economic growth (Collins, 1999; Gala, 2008). Also, Dollar (1992) showed that overvalued currency leads to slowdown of economic growth in the developing countries. At the same time Williamson (2008) argued that a small undervaluation has a positive effect on growth. However, Barbosa et al. (2010) showed that real appreciations have negative effects on economic growth in Brazil for the period 1996-2009.

The next question is whether the depreciation (devaluation) of the currency positively influences country's performance. A several authors including Hausman et al. (2005), Eichengreen (2007), Korinek and Serven (2010) show that depreciation can play an important role in enhancing economic performance of developing countries. Depreciation has a positive effect on growth, because it decreases the economic costs of market disbalances stimulating expansion of tradable activities, that is, it leads to growth in the domestic currency price of domestic export motivating local companies to expand production for export (Rodrik, 2008 and Berg and Miao, 2010). As a result, demand for intermediate and capital inputs increases resulting in so-called the derived demand effect.

However, according to Haddad and Pancaro (2010) an economic argument can also be made that depreciation of national currency can hinder growth giving an incorrect signal to economic agents that in turn may result in factor misallocation. Haddad and Pancaro (2010) using a panel of 187

countries for the period 1950-2004 found that a small real depreciation positively influences economic growth of low income countries in the short-run, but has a negative effect in the long-run. Additionally, depreciation generally increases profits in the export and import-competing sectors, other sectors which mostly rely on imported inputs experience decline in investment, which in turn may affect future productivity growth (Porter, 1990; Martin and Porter, 2001). All these happens due to the fact that depreciation increases the domestic currency price of imported goods and decreases the quantity of imports leading to so-called the direct cost effect. Thus, the direct cost effect and derived demand effect have opposite signs, if the depreciation occurs both to import source and export destination countries the marginal effects will have the comparable magnitude, leading to almost insignificant effect on overall imports of intermediate and capital goods. Therefore, to avoid such a situation it is important that a nominal depreciation of the currency leads to its real depreciation as well, which can happen at least in the short and medium term (Donovan, 1981; Morgan and Davis, 1982).

The exclusion in most cases of long-term from economic analysis is explained by the definition of the long-run as a period of time in which all prices are fully flexible. In other words, prices in the long-run have time to adjust to any policy change or other macroeconomic shock. That is why in the case of no distortions to the markets an exchange rate misalignment does not affect trade flows or real economic activity in the long-run, because it does not change relative prices. On the other hand, the short-run is considered in a different way, that is, if some prices in the economy take time to adjust (i.e. are "sticky"), movements in nominal exchange rates can change relative prices influencing mutually the international trade flows and the allocation of resources between non-tradable and tradable sectors.

However, the short-run trade effects of exchange rate imbalances are also unclear (see Staiger and Sykes (2010)). Macroeconomic studies indicate that these effects depend, besides other factors, on the currency in which domestic producers goods sell their products. For example, if producers set their prices in domestic currency, then depreciation decreases the price of domestic goods in comparison with goods of foreign competitors. Nevertheless, the trade effect of depreciation would be different if domestic producers set their price in the buyers' currency or in a vehicle currency (US Dollar or Euro). In the second case, according to theory depreciation would still have real effects, but possible outcomes are not linked to export development, but most likely to imposing restrictions on imports (see Staiger and Sykes, 2010). These authors made a conclusion that understanding the short-run effects of depreciation on trade dynamics is a more complicated task than it is supposed.

Indirect evidence indicates that the response to change in exchange rate may vary by type of import. For example, the estimated response differs considerably by industry for import prices (Mann, 1986), investment good prices (Landon and Smith, 2007), capital demand (Forbes, 2002) and labor demand (Burgess and Knetter, 1998; Revenga, 1992). These results indicate that in order to understand the effect of changes in exchange rate on the imports of intermediate and investment goods, the focus should be exactly on imports of these groups of goods, but not aggregate imports.

However, there are no previous studies of the effect of the exchange rate on imports of intermediate and capital goods and identification of the derived demand and direct cost effects of the exchange rate on imports. Additionally, there are small numbers of studies that analyze the influence of exchange rate changes on imports of intermediate inputs. For example, Blonigen (2001) showed that U.S. manufacturing firms reshape the source structure of the imported intermediate inputs in the situation of changing foreign prices and exchange rates.

2.2 Empirical research

The existence and direction of causality between trade and growth depend heavily on particular conditions and assumptions. That is why there are a large number of empirical studies that are trying to confirm or question the existing theories. On the whole, there are four main research methodologies used to analyze the trade-growth relationships:

1. *Spearman's-rank correlation tests*. This approach was used to explain economic growth specifically in terms of export expansion (see Heller and Porter, 1978; Kravis, 1970; Maizels, 1963; Rana, 1986; Tyler, 1981). The tests give the possibility to estimate the strength of correlation between two variables, for example, growth in exports or imports and growth in GDP. Overly, the obtained results establish a positive link between export growth and economic development. However, since correlation is not causality these tests can only help with a first examination of the relationship, but say nothing about the direction of causation between the two variables and about the role of other variables, which may influence growth or trade.

2. *Firm and industry-level research* (see Table 1). In addition to evaluating the strength of correlation, there were also studies that concentrated mainly on industry and firm-level effects, because this is a primary place for such dynamic gains as increase in productivity, technology transfer and learning effects. Industry-level studies have generally assessed the growth rates of Total Factor Productivity (TFP). The results are also unconvincing, that is, many studies do not distinguish between the effects of changes in trade volumes, trade policy by itself and other factors influencing productivity growth. Firm-level studies examine, for example, the effectiveness of exporting firms in comparison to firms that sell their goods only at a domestic market, that is, the presence or absence of learning effects related to the interaction with foreign companies (buyers). The studies often found changes in efficiency levels, which correspond to static benefits, whereas the dynamic gains associated with technological improvement are found much less. The main results of such studies showed that the magnitude by which foreign technology can enhance domestic innovation or adaptation of foreign technology generally is contingent on the skills and practical knowledge that is presented in the domestic companies and the characteristics of the domestic industries. However, the issue of direction of causality addressed in the studies using first methodology appears again, but has often not been discussed in firm and industry-level studies. Are exporting companies tend to be more efficient or more efficient companies start to export (Clerides et al., 1998)?

Table 1. Selected empirical firm and industry-level studies

Authors	Methodology	Country & period	Findings
Muendler (2004)	OLS	Brazil, 1986-1998	Competition increases productivity immediately. The influence of access to foreign inputs (intermediates and capital goods) is insignificant for productivity.
Kasahara and Rodrigue (2008)	OLS	Chile, 1979-1996	Changing from being a non-importer to being an importer of foreign intermediate goods can increase productivity by 3.4 to 22.5 percent
Pavcnik (2002)	OLS	Chile, 1979-1986	Trade liberalization increases productivity by 3 to 10 percent especially for the firms in import-competing industries.
Fernandes (2007)	OLS	Colombia, 1977-1991	Imports of intermediate and capital goods have a strong positive impact on productivity due to access to inputs (within-plants productivity) and reallocation of output.
Smeets and Warzynski (2010)	OLS	Denmark, 1998-2005	Imports of intermediate a capital goods increase productivity.
Bas and Strauss-Khan (2011)	GMM estimation	France, 1995-2005	Increase in imported inputs increases average firm's productivity by 1.5 percent.
Halpern et al. (2005)	OLS, GMM estimation	Hungary, 1992-2001	Imports explain 30 percent of the growth in aggregate total factor productivity.
Lawrence and Weinstein (1999)	OLS	Japan,1964-1973	Lower tariffs and higher import volumes of intermediate inputs increase productivity.
Augier et al. (2013)	Probit regression	Spain,1991-2002	10 percentage points increase in imports of intermediate and capital goods increases productivity by 1.5 percent.

3. *Cross-section country-level studies* (see Table 2). These studies included such variables as export and import volumes, growth in exports and imports, trade shares (exports and imports divided by GDP), levels of or changes in tariffs, openness indices in the production function and considered their role together with other variables (physical and human capital, investment rates, etc.) in the economic development of different countries (see Alam, 1991; Amirkhalkhali and Dar, 1995; Balassa, 1985; Coppin, 1994; De Gregorio, 1992; Dodaro, 1991; Fosu, 1996; Mbaku, 1989; McNab and Moore, 1998; Otani and Villaneuva, 1990; Ram, 1985; Rana, 1986; Salvatore, 1983; Sheehey, 1992; Singer and Gray, 1988; Sprout and Weaver, 1993; Tyler, 1981; Yaghmaian and Ghorashi, 1995). Large number of earlier studies noted a positive relationship between exports and growth in developing countries, for example, Balassa (1978) and Berg and Krueger (2003) found significant and positive relationship between level of output per capita and trade openness across studied sample of countries. Additionally, Sachs et al. (1995) showed that open economies have, on average, 2.45 percent higher annual growth rates than closed economies. Overly, the results from most of the studies indicate that the effect of trade on growth is complex and controversial – some demonstrate increase in growth, others a decline. The gain ranges from 2 percent to improbable 46 percent (Deraniyagala and Fine, 2001). All these indicate the limitations of assessing growth effects using cross-country regressions. The obtained results are not country-specific, do not consider any changes in other variables, and hold only at the average of all countries included in the sample. It is

also supposed that the specification of the production function is the same for all countries in the sample. There is apparently a high level of heterogeneity, even if the sample is only consists of developing countries. A third and very important issue is a problem of reverse causality when trade variable not only influences the dependent variable growth, but if growth also affects trade. For example, countries that grow faster usually invest more in trade infrastructure; higher income levels may change preferences for traded goods. As a result, the level of economic development as well as its growth rate most probably influences trade. Therefore, all these indicate that even if the results of cross-country analysis are interesting from research point of view, it would be difficult to use them by policy-makers.

Table 2. Selected empirical cross-section country-level studies

Authors	Methodology	Country & period	Findings
Esfahani (1991)	OLS	31 developing countries, 1960-1986	Positive and significant relations between imports of intermediate goods and economic growth.
Coe and Helpman (1995)	OLS	21 OECD countries + Israel, 1971-1990	Both foreign R&D (through imports) and domestic R&D improve TFP.
Coe et al. (1997)	OLS	77 developing countries,1971-1990	Productivity in developing countries is positively and significantly related to R&D in their industrial trade partners and to their imports of capital goods from developed countries.
Keller (2000)	OLS	8 OECD countries,1970-1991	Both domestic and foreign (through imports) R&D stocks have a positive and significant impact on productivity.
Keller (2002)	OLS	8 OECD countries,1970-1991	20 percent of the effect of R&D on productivity is due to foreign R&D accessed through imports
Xu and Wang (1999)	OLS	21 OECD countries,1983-1990	Capital goods imports are an important channel for transfers of technology.

4. *Time series and panel country-level studies* (see Table 3). The attention to this type of research has increased since the 1990s focusing on one country over time or panels (see Shan and Sun, 1998; Ramos, 2001; Narayan and Smyth, 2004; Mah, 2005; Awokuse, 2005, 2007; Tang, 2006; Herrerias and Orts, 2009; Katircioglu et al., 2010; Hye and Siddiqui, 2010; Dar et al., 2013). This is because time series allow capturing country-specific effects and can model dynamics – the dependent variable (growth in year *t*) can be described by lagged variables (e.g. one, two, three years back in time (*t*-1, *t*-2, etc.)). Most of crossection studies showed a positive relationship between trade and growth, however, the empirical results from time series and panel country-level studies indicate a much more unclear picture. Results differ very much depending on the particular country and studied time periods. Several authors revealed a so-called *J*-curve in the case of trade liberalization, that is, the growth-enhancing effects do not appear immediately, but only after time. The short-term effects are considered to be negative. In the long run, growth reverses to its pre-liberalization level Greenaway et al. (2002).

Although time series and panel analysis propose definite advantages in comparison to cross-section studies, there are several econometric problems concerning this econometric methodology including autocorrelation, the specification of the model and non-stationarity of the data.

Table 3. Selected empirical time series and panel country-level studies

Authors	Methodology	Country & period	Findings
Jiranyakul (2012)	ARDL bounds testing approach	Thailand, 2000-2011	Positive relationship between the growth rate of imports of capital goods and the growth rate of manufacturing exports as the main source of foreign exchange to finance imports of capital goods. An increase in imports of capital goods will rise manufacturing exports and increase economic growth.
Yusoff and Febrina (2014)	Johansen co-integration test and Granger causality test	Indonesia, 1970-2009	Positive influence of domestic investment, real exchange rate and trade openness on the long term economic growth of Indonesia. A 1 percent increase in trade openness leads to about 26.5 percent increase in Indonesian real GDP, a 1 percent depreciation of the Indonesia's national currency increases real GDP by about 6.4 percent.
Baharumshah and Rashid (1999)	Johansen and VEC (vector-error correction) model	Malaysia	The most crucial determinant of long-term rapid economic growth of Malaysia was imports of foreign technology.
Ramos (2001)	Multivariate Johansen–Juselius (JJ) approach	Portugal, 1865-1998	Found bidirectional causality relation between GDP and export, GDP and import, import and export growth.
Tang (2006)	ARDL bounds testing and JJ approaches	China	No co-integration between exports, imports, and real GDP.
Awokuse (2008)	Granger's causality test and impulse-response functions	Argentina, Colombia, and Peru	The impact of imports is higher than the impact of exports on GNP growth.

3. Data

The study employs monthly time series data for Belarus from November 2005 to June 2015. The variables used are real GDP (*GDP*), real exports (*Exports*), real imports of intermediate goods (excluding imports of energy goods) (*ImpInter*), real imports of capital goods (*ImpCap*), domestic capital investments (*DomCap*), labor (the number of economically active population – *L*), the monthly changes in nominal and real effective exchange rates (*NEER* and *REER* respectively). All the variables (excluding *L*, *NEER* and *REER*) were calculated by using constant prices (2000=100) and were seasonally adjusted (excluding *NEER* and *REER*) by the author. For consistent and efficient results, and in order to take into account influence of import-substituting policy *ImpCap*, *ImpInter*, *DomCap* variables were calculated as a percentage of GDP. The *GDP*, *Exports*, *L*, *Investment* variables were transformed into natural logarithms (Ln) to reduce the heteroscedasticity problem and to obtain the growth rates (Chen et al., 1986). The data for *NEER* and *REER* were obtained from the National Bank of the Republic of Belarus (NBRB). The rest of the data comes from the National Statistical Committee of the Republic of Belarus (Belstat). The study uses Eviews 9.0 statistical package for analysis.

The use of effective exchange rates (nominal and real) is appropriate, because their fluctuations capture market-driven or pegged-induced movements in the bilateral exchange rates for major trading partners of Belarus regardless of the exchange rate system.

The approach of considering shares of intermediate and capital goods imports and domestic capital investments in GDP rather than the stock of imported intermediaries and domestic investments incorporates the hypothesis that a continuous stream of advanced technology embodied in imported intermediate and capital goods is required to generate persistent externalities (Dulleck and Foster, 2008). Following the standard procedure in growth regressions the growth of imported equipment capital stock and the growth of domestic capital stock are replaced with the shares of intermediate and capital goods imports and domestic capital investments in GDP respectively. To construct the measures of investments in imported equipment and domestic capital investments the following approach is adopted. Given that total investment includes that portion of investment that is imported, the value of imported equipment in a given year is subtracted from the value of total investment in a given year to obtain the measures of investment in imported equipment and domestic capital investments.

Finally, a summary of the descriptive statistics of the data and their sources are reported in Table 4.

Table 4. Summary of the descriptive statistics and the data sources

Variables	Mean	Min	Max	Std. dev.	Obs.	Data source
Ln*GDP*	6.859	6.472	7.387	0.186	116	Belstat
Ln*Exports*	6.254	5.644	6.823	0.248	116	Belstat
Ln*Labor*	8.435	8.407	8.460	0.016	116	Belstat
Share of intermediate goods imports in GDP (*IMPINTER_TO_GDP*)	0.238	0.118	0.467	0.052	116	Belstat
Share of capital goods imports in GDP (*IMPCAP_TO_GDP*)	0.069	0.035	0.165	0.019	116	Belstat
Share of domestic capital investments in GDP (*DOMCAP_TO_GDP*)	0.217	0.101	0.428	0.059	116	Belstat
NEER	1.366	-10.918	40.137	6.148	116	NBRB
REER	0.064	-14.247	12.917	4.474	116	NBRB

Additionally, Tables 5 and 6 lists the resulting large appreciation and depreciation periods in Belarus.

Table 5. Large appreciation events

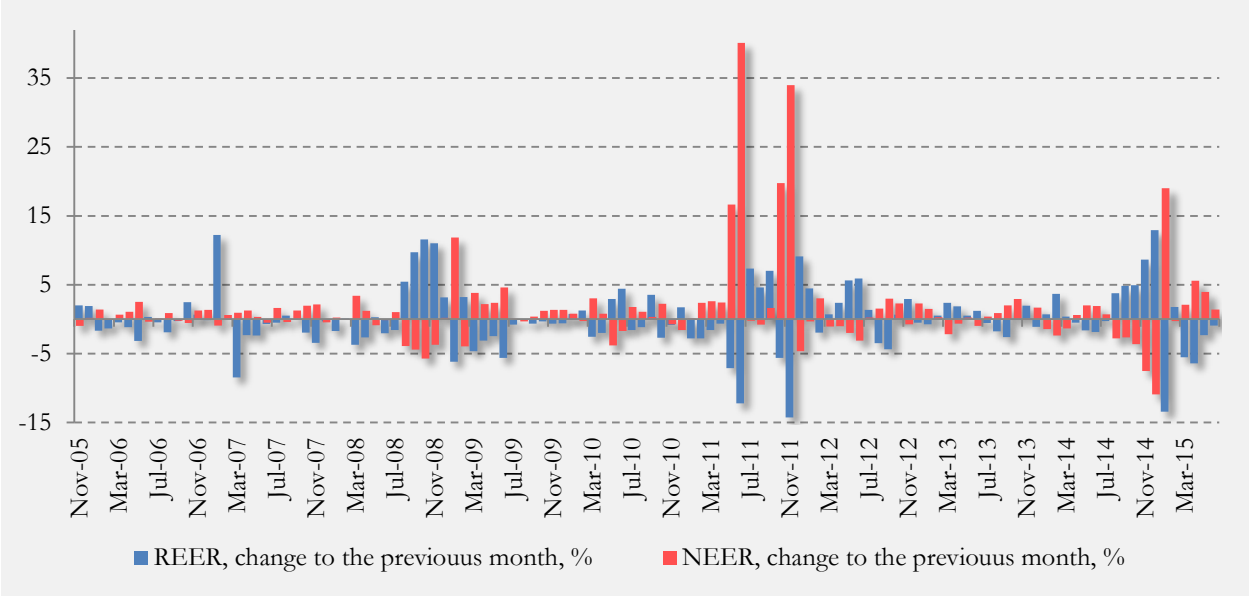
Period	ΔNEER	ΔREER
January 2007	-0,9%	+12,24%
August 2008	-3,9%	+5,43%
September 2008	-4,4%	+9,73%
October 2008	-5,7%	+11,61%
November 2008	-3,7%	+11,05%
July 2011	-0,2%	+7,37%
September 2011	+1,6%	+7,02%
December 2011	-4,6%	+9,14%
May 2012	-2,0%	5,62%
June 2012	-3,1%	+5,93%
November 2014	-7,5%	+8,68%
December 2014	-10,9%	+12,92%

Table 6. Large depreciation events

Period	ΔNEER	ΔREER
March 2007	+1,0%	-8,43%
January 2008	+0,2%	-6,16%
June 2009	+4,6%	-5,61%
May 2011	+16,7%	-7,08%
June 2011	+40,1%	-12,11%
October 2011	+19,7%	-5,62%
November 2011	+34,0%	-14,25%
January 2015	+19,0%	-13,40%
March 2015	+2,1%	-5,50%
April 2015	+5,6%	-6,40%

Figure 2 represents changes in nominal real effective exchange rate of Belarusian Ruble for the period 2005-2015.

Figure 2. REER and NEER changes to the previous month, 2005-2015



In order to account for anticipated (consecutive) and unanticipated appreciations and depreciations (devaluations) next dummy variables will be constructed:

For anticipated joint real and nominal appreciations and depreciations:

1. For appreciation: *D1REER_D1NEER=D1REER*D1NEER*, where *D1REER* takes value 1 in three consecutive months with real appreciation of Belarusian ruble, else 0; *D1NEER* takes value 1 in three or more consecutive months with nominal appreciation of Belarusian ruble, else 0.

2. For depreciation: *D2REER_D2NEER=D2REER*D2NEER*, where *D2REER* takes value 1 in three consecutive months with real depreciations of the Belarusian ruble, else 0; *D2NEER* takes value 1 in three or more consecutive months with nominal depreciations of the Belarusian ruble, else 0.

For unanticipated joint real and nominal appreciations and depreciations (devaluations) (*D1REER_D1NEER*):

1. For appreciations: *D3REER_D3NEER=D3REER*D3NEER*, where *D3REER* takes value 1 if $\ln(REER)_t - \ln(REER)_{t-1} \geq 0.05$, else 0; D3NEER takes value 1 if $\ln(NEER)_t - \ln(NEER)_{t-1} \leq -0.05$, else 0.
2. For depreciations: *D4REER_D4NEER=D4REER*D4NEER*, where *D4REER* takes value 1 if $\ln(REER)_t - \ln(REER)_{t-1} \leq -0.05$, else 0; *D3NEER* takes value 1 if $\ln(NEER)_t - \ln(NEER)_{t-1} \geq 0.05$, else 0.

These dummy variables will be taken into account when constructing and evaluating ARDL models considered in the research.

4. Methodology

Econometric literature proposes a number of efficient techniques for evaluating the cointegrating relationship. For example, Phillips and Hansen (1990) developed an asymptotically unbiased estimator called the FMOLS that uses chi-square statistical inference. Similarly, Park (1992) proposed the CCR estimator that follows a mixture of normal distributions and also allows for asymptotic chi-square testing. The DOLS estimation technique suggested by Saikkonen (1992) and Stock and Watson (1993), the VECM approach (Inder, 1993; Montalvo, 1995) and the ARDL bounds testing approach (Pesaran et al. (2001)).

The present paper uses the autoregressive distributed lag (ARDL) model, introduced by Pesaran et al. (2001), because it can exercised regardless of whether the underlying variables are *I*(0), *I*(1) or a combination of both generating consistent results (see Pesaran and Pesaran (1997)). Further, the OLS estimation of an ARDL model obtains unbiased coefficient estimates (see Pesaran and Shin (1999)). In comparison with standard cointegration methods this advantage helps to avoid the pre-testing problems. Moreover, in ARDL procedure the estimation of results is even possible if the explanatory variables are endogenous Pesaran et al. (2001). Additionally, using a simple linear transformation the error correction model (ECM) can be derived from ARDL model. ECM relates short-run adjustments with long-run equilibrium without losing long-run information (Pesaran and Shin (1999)). Finally, small sample properties of the ARDL approach are better than sample properties of the Johansen and Juselius cointegration technique (Pesaran and Shin (1999)).

The ARDL approach is a multiple-step procedure. In the first step, unit-root tests are used to verify that the underlying data are non-stationary at level and/or become stationary at their first differences or *I*(1). Nonstationarity in a variable reflects a permanent effect due to any shock on the time series variable. Three of the most widely used unit-root tests are the Augmented Dicky-Fuller (ADF) (see Dickey and Fuller, 1979), Phillips Perron (PP) (see Phillips and Perron, 1988) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (see Kwiatkowski et al., 1992) tests. All these tests are employed in the paper.

In the second step, the ARDL model is constructed. Using model selection criterions (Akaike Information Criteria (AIC), Schwarz Bayesian Criteria (SBC)) the ARDL procedure defines the optimal lag structure of the model.

In this paper three ARDL models are developed for estimations as follows:

$$\begin{aligned}
&\Delta LnGDP_t = \beta_1 + \sum_{i=1}^{p} \beta_i \Delta LnGDP_{t-i} + \sum_{j=0}^{q} \beta_j \Delta LnEXP_{t-j} + \sum_{r=0}^{f} \beta_j \Delta LnL_{t-r} + \\
&+ \sum_{k=0}^{r} \beta_k \Delta LnIMPINTER_TO_GDP_{t-k} + \sum_{l=0}^{s} \beta_l \Delta LnIMPCAP_TO_GDP_{t-l} + \\
&+ \sum_{m=0}^{h} \beta_m \Delta LnDOMCAP_TO_GDP_{t-m} + \beta_{GDP} LnGDP_{t-1} + \beta_{EXP} LnEXP_{t-1} + \beta_L LnL_{t-1} + \\
&\beta_{IMPINTER} LnIMPINTER_TO_GDP_{t-1} + + \beta_{IMPCAP} LnIMPCAP_TO_GDP_{t-1} + \\
&+ \beta_{DOMCAP} LnDOMCAP_TO_GDP_{t-1} + \beta_1 D1REER_D1NEER + \beta_2 D2REER_D2NEER + \\
&\beta_3 D3REER_D3NEER + \beta_4 D4REER_D4NEER + \beta_5 D2011 + \pi_t .
\end{aligned} \tag{1}$$

$$\begin{aligned}
&\Delta LnIMPINTER_t = \gamma_1 + \sum_{j=0}^{q} \gamma_j \Delta LnEXP_{t-j} + \sum_{r=0}^{f} \gamma_j \Delta LnL_{t-r} + \\
&+ \sum_{l=0}^{s} \gamma_l \Delta LnIMPCAP_TO_GDP_{t-l} + \sum_{m=0}^{h} \gamma_m \Delta LnDOMCAP_TO_GDP_{t-m} + \\
&+ \gamma_{EXP} LnEXP_{t-1} + \gamma_L LnL_{t-1} + \gamma_{IMPCAP} LnIMPCAP_TO_GDP_{t-1} + \\
&+ \gamma_{DOMCAP} LnDOMCAP_TO_GDP_{t-1} + \gamma_1 D1REER_D1NEER + \gamma_2 D2REER_D2NEER + \\
&\gamma_3 D3REER_D3NEER + \gamma_4 D4REER_D4NEER + \gamma_5 D2011 + \pi_t .
\end{aligned} \tag{2}$$

$$\begin{aligned}
&\Delta LnIMPCAP_t = \theta_1 + \sum_{j=0}^{q} \theta_j \Delta LnGDP_{t-j} + \sum_{r=0}^{f} \theta_j \Delta LnL_{t-r} + \\
&+ \sum_{m=0}^{h} \theta_m \Delta LnIMPINTER_TO_GDP_{t-m} + \theta_{EXP} LnGDP_{t-1} + \\
&+ \theta_L LnL_{t-1} + \theta_{IMPCAP} LnIMPINTER_TO_GDP_{t-1} + \theta_1 D1REER_D1NEER + \\
&+ \theta_2 D2REER_D2NEER + \theta_3 D3REER_D3NEER + \theta_4 D4REER_D4NEER + \theta_5 D2011 + \pi_t .
\end{aligned} \tag{3}$$

where Δ are the first difference operator; $D2011$ – dummy variable (constructed to take into account for possible structural break in the data), that takes value 1 for observations in 2011 and 0 for the rest of observations.

The null hypotheses of no long-run relationship between variables (H_{01}: $\beta_{GDP}=\beta_{EXP}=\beta_L=\beta_{IMPINER}=\beta_{IMPCAP}=\beta_{DOMCAP}=0$; H_{02}: $\gamma_{IMPINER}=\gamma_{EXP}=\gamma_L=\gamma_{MPCAP}=\gamma_{DOMCAP}=0$; H_{03}: $\theta_{IMPCAP}=\theta_L=\theta_{IMPINER}=\theta_{GDP}=0$) are tested against alternative hypotheses (H_{11}: $\beta_{GDP}\neq\beta_{EXP}\neq\beta_L\neq\beta_{IMPINER}\neq\beta_{IMPCAP}\neq\beta_{DOMCAP}\neq0$; H_{12}: $\gamma_{IMPINER}\neq\gamma_{EXP}\neq\gamma_L\neq\gamma_{MPCAP}\neq\gamma_{DOMCAP}\neq0$; H_{13}: $\theta_{IMPCAP}\neq\theta_L\neq\theta_{IMPINER}\neq\theta_{GDP}\neq0$) having cointegration between variables.

In the third step the bounds-testing technique is used to check the existence of cointegration between studied series. Under bounds-testing procedure the compound *F*-statistics of the lagged levels of the variables in the underlying ARDL model is compared with the upper critical values so-called upper critical bound (UCB) and lower critical values so-called lower critical bound (LCB)

(Pesaran et al., 2001). The first set supposes that all the series are $I(1)$, and the second supposes that they are all $I(0)$. Therefore, if some of the series are $I(1)$ and others are $I(0)$, then the computed F-statistics are compared with the upper and lower critical bounds. The null hypothesis H_0: $\sigma_i = \ldots \sigma_{i+n} = 0$ of no cointegration is tested against alternative H_1: $\sigma_i \neq \ldots \sigma_{i+n} \neq 0$ of cointegration. The variables are supposed to be cointegrated if the estimated F-statistics lies above the UCB; and not cointegrated if the calculated F-statistics is below the LCB; while if the estimated F-statistics is between UCB and LCB, the test is uncertain. In the first case the significant F-statistics will show that the studied variables have a long-run relation – the independent variables are the long-run forcing variables for the explanation of the dependent variable.

In the fourth step, the long-run coefficients are calculated for the relation with significant F-statistics from the first step. The following models will be used to estimate the long-run coefficients:

$$\begin{aligned} LnGDP_t &= \varphi_0 + \varphi_1 LnEXP_t + \varphi_2 LnL_t + \varphi_3 LnIMPINTER\_TO\_GDP_t + \\ &+ \varphi_4 LnIMPCAP\_TO\_GDP_t + \varphi_5 LnDOMCAP\_TO\_GDP_t + \varphi_6 D1REER\_D1NEER + \\ &+ \varphi_7 D2REER\_D2NEER + \varphi_8 D3REER\_D3NEER + \varphi_9 D4REER\_D4NEER + \varphi_{10} D2011 + \mu_t . \end{aligned} \tag{4}$$

$$\begin{aligned} LnIMPINTER_t &= \phi_0 + \phi_1 LnEXP_t + \phi_1 LnL_t + \phi_2 LnIMPCAP\_TO\_GDP_t + \\ &+ \phi_3 LnDOMCAP\_TO\_GDP_t + \phi_4 D1REER\_D1NEER + \phi_5 D2REER\_D2NEER + \\ &+ \phi_6 D3REER\_D3NEER + \phi_7 D4REER\_D4NEER + \phi_8 D2011 + \mu_t . \end{aligned} \tag{5}$$

$$\begin{aligned} LnIMPCAP_t &= \varpi_0 + \varpi_1 LnGDP_t + \varpi_2 LnL_t + \varpi_3 LnIMPINTER\_TO\_GDP_t + \\ &+ \varpi_4 D1REER\_D1NEER + \varpi_5 D2REER\_D2NEER + \varpi_6 D3REER\_D3NEER + \\ &+ \varpi_7 D4REER\_D4NEER + \varpi_8 D2011 + \mu_t . \end{aligned} \tag{6}$$

In the fifth step, if the long-run relationship between variables in the studied models is significant, then the short-run coefficients are calculated using next error-correction model (ECM) associated with each of the long-run estimates:

$$\begin{aligned} \Delta LnGDP_t &= \vartheta_0 + \sum_{i=1}^{p} \vartheta_i \Delta LnGDP_{t-i} + \sum_{j=0}^{q} \vartheta_j \Delta LnEXP_{t-j} + \sum_{r=0}^{f} \vartheta_j \Delta LnL_{t-r} + \\ &+ \sum_{k=0}^{r} \vartheta_k \Delta LnIMPINTER\_TO\_GDP_{t-k} + \sum_{l=0}^{s} \vartheta_l \Delta LnIMPCAP\_TO\_GDP_{t-l} + \\ &+ \sum_{m=0}^{h} \vartheta_m \Delta LnDOMCAP\_TO\_GDP_{t-m} + n_1 ECM_{t-1} + \pi_t . \end{aligned} \tag{7}$$

$$\begin{aligned} \Delta LnIMPINTER_t &= \rho_0 + \sum_{j=0}^{q} \rho_j \Delta LnEXP_{t-j} + \sum_{r=0}^{f} \rho_j \Delta LnL_{t-r} + \\ &+ \sum_{l=0}^{s} \rho_l \Delta LnIMPCAP\_TO\_GDP_{t-l} + \sum_{m=0}^{h} \rho_m \Delta LnDOMCAP\_TO\_GDP_{t-m} + n_2 ECM_{t-1} + \pi_t . \end{aligned} \tag{8}$$

$$\begin{aligned} \Delta LnIMPCAP_t &= \tau_0 + \sum_{j=0}^{q} \tau_j \Delta LnGDP_{t-j} + \sum_{r=0}^{f} \tau_j \Delta LnL_{t-r} + \sum_{l=0}^{s} \tau_l \Delta LnIMPINTER\_TO\_GDP_{t-l} + . \\ &+ n_3 ECM_{t-1} + \pi_t . \end{aligned} \tag{9}$$

The ECM shows the speed of adjustment that is required to restore the long-run equilibrium following a short-run shock. The n is the coefficient of error correction term in the model that shows the speed of adjustment.

Next, Toda Yamamoto Granger causality tests are applied to each of the selected models. Toda and Yamamoto (1995) developed a modified Wald test (MWALD) in testing causality. It was applied in the research, because the TY approach avoids the problem related to the power and small sample size problems involved with conventional unit root and cointegration tests. Additionally, this approach can be used for any order of integration of the series, because it fits a standard vector autoregressive (VAR) model in the levels instead of first differences that does standard Granger causality tests.

Toda Yamamoto causality tests suggest which variables in the system have significant influence on the future values of each of the variables in the system, but do not show how long these effects will stay effective and which of them has stronger effect. Variance decomposition provides this information. Therefore, in the final step, the forecast error variance decompositions are analyzed for each model to identify what proportion of the variation in economic growth, growth in imports of intermediate and capital goods can be explained due to changes in their underlying determinants. Variance decomposition approach (VDA) was established by Shan (2005) under the Innovative Accounting Approach (IAA). It is used to determine the exact magnitude of feedback from one variable to another variable due to innovative shocks occurring in another variable out of the sample period over the various time horizons. Thus, the variance decomposition determines the relative significance of each random innovation in influencing the variables in the studied models.

5. Empirical analysis

Time series properties of the data

Augmented Dickey–Fuller (ADF), Phillips Perron (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) (see Kwiatkowski et al. (1992)) unit root tests are used to study the stationarity of underlying time-series data. In Table 7-9, combined results from these three tests show that all of the series under consideration are integrated at levels, $I(0)$, or of order 1, $I(1)$ – difference-stationary. Thus, the ARDL methodology can be used to study short-run and long-run relationship among underlying variables.

Table 7. ADF unit root test results

Variable	Statistical level			Statistics (1st difference)		
	τ_μ(ADF)	τ_τ(ADF)	τ(ADF)	τ_μ(ADF)	τ_τ(ADF)	τ(ADF)
Ln*GDP*	-2.593*	-9.111***	1.363	-8.301***	-8.259***	-8.150***
Ln*Exports*	-2.108	-2.311	0.373	-12.038***	-11.980***	-12.074***
Ln*L*	-1.331	-1.695	0.016	-4.698***	-8.530***	-4.715***
DOMCAP_TO_GDP	-5.255***	-5.320***	-0.067	-8.281***	-7.861***	-8.322***
Ln*IMPINTER*	-2.640*	-2.489	0.157	-12.950***	-12.978***	-13.003***
IMPINTER_TO_GDP	-2.433	-2.529	-0.611	-12.143***	-12.120***	-12.194***
Ln*IMPCAP*	-2.235	-2.298	0.128	-12.472***	-12.474***	-12.523***
IMPCAP_TO_GDP	-3.212**	-3.171*	-0.630	-13.557***	-13.518***	-13.617***

Note: τ_τ presents the model with a drift and trend; τ_μ the model with drift but without trend, while τ is the model without drift and trend. Schwarz information criterion (BIC) was used to determine the lag length while testing the stationarity of all variables. The ***, ** and * sign indicates the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% significant level respectively

Table 8. PP unit root test results

Variable	Statistical level			Statistics (1st difference)		
	τ_μ(PP)	τ_τ(PP)	τ(PP)	τ_μ(PP)	τ_τ(PP)	τ(PP)
Ln*GDP*	-5.618***	-9.144***	1.669	-62.226***	-58.360***	-36.86***
Ln*Exports*	-2.084	-2.308	0.399	-12.029***	-11.972***	-12.065***
Ln*L*	-1.282	-1.581	0.170	-8.551***	-9.120***	-8.569***
DOMCAP_TO_GDP	-5.103***	-5.205***	-0.652	-28.106***	-52.876***	-28.335***
Ln*IMPINTER*	-2.523	-2.378	0.248	-12.991***	-13.060***	-13.043***
IMPINTER_TO_GDP	-5.192***	-5.268***	-0.686	-35.262***	-48.365***	-34.560***
Ln*IMPCAP*	-4.836***	-6.492***	0.170	-22.354***	-22.859***	-22.429***
IMPCAP_TO_GDP	-7.831***	-7.907***	-1.080	-59.904***	-72.709***	-60.414***

Note: τ_τ presents the model with a drift and trend; τ_μ the model with drift but without trend, while τ is the model without drift and trend. Schwarz information criterion (BIC) was used to determine the lag length while testing the stationarity of all variables. The ***, ** and * sign indicates the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% significant level respectively

Table 9. KPSS unit root test results

Variable	Statistical level		Statistics (1st difference)	
	τ_μ(KPSS)	τ_τ(KPSS)	τ_μ(KPSS)	τ_τ(KPSS)
Ln*GDP*	1.160***	0.145*	0.280	0.254***
Ln*Exports*	0.479**	0.103	0.056	0.051
Ln*L*	0.337	0.307***	0.608**	0.118
DOMCAP_TO_GDP	0.429*	0.314***	0.321	0.177**
Ln*IMPINTER*	0.415*	0.155**	0.151	0.054
IMPINTER_TO_GDP	0.192	0.179**	0.500**	0.500***
Ln*IMPCAP*	0.703**	0.094	0.066	0.058
IMPCAP_TO_GDP	0.221	0.132*	0.161	0.160*

Note: τ_τ presents the model with a drift and trend; τ_μ the model with drift but without trend, while τ is the model without drift and trend. Schwarz information criterion (BIC) was used to determine the lag length while testing the stationarity of all variables. The ***, ** and * sign indicates the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% significant level respectively

Co-integration analysis

The results of the bounds testing for cointegration in Table 10 indicate a significant cointegration among the variables in each presented models. The H_0 of no-cointegration in the LnGDP_t and Ln$IMCAP_t$ models are rejected at 1 percent significance level, while it rejecter among the variables in Ln$IMPINTER_t$ model at 5 percent significance level. Moreover, the assumptions of no serial correlation and no heteroscedasticity in the error terms are satisfied for all three models, the

assumption of normally distributed error terms is accepted for the LnGDP_t and Ln$IMPINTER_t$ models. The result of the Ramsey RESET test does not reject the null hypothesis that specification of all studied models is incorrect.

In general, the results of bounds testing confirm that the relationships among GDP, imports of intermediate and capital goods and their determinants are co-integrated indicating that the series included in the models share long-run relationships among themselves.

Table 10. The ARDL cointegration test results

Bounds testing for cointegration				Diagnostic tests			
Estimated models	Optimal lag length	*F*-statistics	*t*-statistics	χ^2NORMAL	χ^2BPG	χ^2SERIAL	χ^2RESET
F_{GDP}(Ln*GDP*|Ln*Exports*, Ln*L*, *IMPINTER_TO_GDP, IMPCAP_TO_GDP, DOMCAP_TO_GDP*)	(1, 5, 1, 1, 0, 1)	4.410[a***]	-4.450[a***]	2.911 (0.233)	18.541 (0.293)	7.344 (0.196)	0.361 (0.718)
$F_{IMPINTER}$(Ln*IMPINTER* | Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP*, *DOMCAP_TO_GDP*)	(10, 3, 0, 0, 0)	5.483[a**]	-3.473[a*]	0.573 (0.751)	27.409 (0.100)	1.593 (0.247)	0.154 (0.877)
F_{IMPCAP}(Ln*IMPCAP*| Ln*GDP*, Ln*L* , *IMPINTER_TO_GDP*)	(4, 0, 0, 0)	6.000[a***]	-3.978[a***]	53.337 (0.000)	1.359 (0.182)	0.009 (0.992)	3.087 (0.543)

Note: Optimal lag length is determined by BIC. NORMAL denotes Jarque-Bera residual normality test. BPG denotes Breusch-Pagan-Godfrey heteroscedasticity test. RESET denotes Ramsey RESET test. SERIAL denotes Breusch-Pagan-Godfrey serial correlation LM test. () are used for *p*-values. Critical values are taken from Pesaran et al. (2001). [a] Indicates that the statistic value lies above the upper bound, [b] that it falls within the lower and upper bounds and, [c] that it lies below the lower bound. * Denote statistical significance at 10%. ** Denote statistical significance at 5%. *** Denote statistical significance at 1%.

Short-run and long-run estimates

Table 11 presents the estimation of the long-run and-short-run coefficients for the variables in the models of the study. It shows significant short- and long-term relationship almost for all estimated coefficients. Furthermore, the coefficients for the error correction mechanism (ECM) are significant and negative in all ARDL models.

In the first model, export, labor supply and domestic capital investments coefficients are statistically significant and positive in both the short- and long-run. Ceteris paribus, a 1 percent increase in exports from Belarus increases output by 0.66 percent in the long-run and by 0.16 percent in the short-run; a 1 percent rise in labour supply will add 0.39 percent to GDP in the long-run and 5.05 percent in the short-run; expansion of the domestic capital investments will increase real output by 1.07 percent in the long-run. The exchange rate coefficients and coefficients that state for imports of capital goods and imports of intermediate goods are negative and only statistically significant for intermediate goods imports and variable that indicates large nominal and real devaluation of Belarusian ruble (*D4REER_D4NEER*). Thus, a 1 percent increase in the share of intermediate goods imports in Belarusian GDP will decrease output by 2.72 percent in the long-run and by 2.68 percent in the short-run. Ceteris paribus, the presence of both large nominal and real devaluation in the

same period decreases the GDP by 19.3 percent in the long-run. Additionally, the influence of consecutive (anticipated) appreciation (both nominal and real) periods of Belarusian ruble (*D2REER_D2NEER*) on GDP growth in Belarus is negative, but statistically insignificant. In general, short-run estimates are lower for all studied independent variables except for labor supply. The error correction term, ECM_{t-1} is also negative and significant and the speed of adjustment towards long-run equilibrium is quick. Any shock to the real output takes only 3.5 months to adjust.

Table 11. ARDL Long-Run and Short-Run Findings

Series	F_{GDP}(Ln*GDP*|Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP*, *DOMCAP_TO_GDP*, *IMPINTER_TO_GDP*)	$F_{IMPINTER}$(Ln*IMPINTER* | Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP*, *DOMCAP_TO_GDP*)	F_{IMPCAP}(Ln*IMPCAP*| Ln*GDP*, Ln*L* , *IMPINTER_TO_GDP*)
	(1)	(2)	(3)
Long-run analysis			
Ln*GDP*			1.497***
Ln*Exports*	0.663***	0.484***	
IMPINTER_TO_GDP	-2.719***		6.545***
Ln*L*	0.391***	0.224***	-0.901***
IMPCAP_TO_GDP	-2.033	2.457***	
DOMCAP_TO_GDP	1.073**	0.773***	
D2REER_D2NEER	-0.093	-0.072**	
D4REER_D4NEER	-0.193**	-0.101**	
D2011			-0.357**
Short-run analysis			
ΔLn*GDP*			0.553***
ΔLn*Exports*	0.163***	0.290***	
Δ*IMPINTER_TO_GDP*	-2.684***		2.420***
ΔLn*Investments*			
ΔLn*L*	5.052*	0.122***	-0.333***
Δ*IMPCAP_TO_GDP*	-0.572	1.227***	
Δ*DOMCAP_TO_GDP*	-0.113	0.386***	
ECM_{t-1}	-0.281***	-0.499***	-0.369***
R^2	0.904	0.904	0.682
D.W.	2.263	2.021	2.016

Note: * Denotes statistical significance at 10%. ** Denotes statistical significance at 5%. *** Denotes statistical significance at 1%.

In the second model, the long-run and short-run estimates for export growth, share of capital goods imports and share of domestic capital investments in GDP are positive and significant. Ceteris paribus, a 1 percent increase in exports from Belarus increases imports of intermediate goods by 0.48 percent in the long-run and by 0.29 percent in the short-run; a 1 percent increase in the share of capital goods imports in GDP increases imports of intermediate goods by 2.46 percent in the long-run and by 1.23 percent in the short-run; a 1 percent increase in the share of domestic capital investments in GDP increases imports of intermediate goods in the long-run and short-run by 0,77 percent and by 0.39 percent, respectively. Additionally, the influence of consecutive appreciation (both nominal and real) periods of Belarusian ruble on imports of intermediate goods is significant statistically and also from empirical point of view. Ceteris paribus, the presence of consecutive appreciation (both nominal and real) periods decreases in the long-run the growth of intermediate

goods imports by 7.2 percent. The large depreciation events (both nominal and real) have also negative and statistically significant effect on imports of intermediate goods in Belarus. The presence of both large nominal and real devaluation in the same period will reduce the imports of intermediate goods in the long-run by 10.1 percent. The error correction term, ECM_{t-1} is negative and significant. Thus, any shock to the real imports of intermediate goods takes only two months to adjust.

In the third model, the long-run estimates for GDP growth, share of intermediate goods imports in GDP are positive and significant both in the long-run and in the short-run. Ceteris paribus, a 1 percent increase in real output increases imports of capital goods by 1.49 percent in the long-run and by the 0.55 percent in the short-run; a 1 percent increase in the share of intermediate goods imports in GDP increases imports of capital goods in the long-run and in the short-run by 6.54 percent and by 2.42 percent, respectively. But for the growth of labor supply in Belarus the situation is different. The estimate is negative, but significant, meaning that a 1 percent increase in the labor supply in Belarus will decrease imports of capital goods in Belarus by 0.9 percent in the long-run and 0.33 percent in the short-run. Additionally, the influence of structural break (occurred in 2011 and included in the model) for imports of capital goods in Belarus has significant negative long-term effect, i.e. -35.7 percent. The error correction term, ECM_{t-1} is negative and significant. Any shock to the real imports of capital goods takes 2.7 months to adjust.

Thus, the results of short-run and long-run analysis from ARDL models indicate that relative increase in imports of intermediate goods (both in the short and long run) and unanticipated large nominal and real devaluations of Belarusian ruble have negative effect on GDP growth in Belarus for studied time period. The influence of imports of capital goods on economic growth is statistically insignificant. However, domestic capital investments have positively influenced output, but only in in the long run. The relative increase in imports of capital goods and domestic investments increase imports of intermediate goods. Additionally, both anticipated appreciations and unanticipated depreciations will decrease intermediate goods imports. Finally, increase in the share of intermediate goods imports in GDP will have positive effect on imports of capital goods.

These findings contradict the import-led growth hypothesis, the causality running in one direction from imports to growth, but are consistent with investment-led growth hypothesis where the causality runs from investment to economic growth. Domestic capital investments affect economic growth, which in turn affects imports of capital goods in the country showing the complementarity between investments and imports, as the main factors of long-run growth in Belarus. These results supports the arguments stated by Rodrik (1995), who promoted the hypothesis that trade is more a consequence of the rapid economic growth (in case of Asian countries) than a cause.

So, according to the findings, the Belarusian economic policy based on obtaining foreign advanced technology seems reducing its efficiency in recent years. The majority of Belarusian imports are machinery, equipment and intermediate goods, which are relatively cheaper and easier to implement in the production process. In turn this helps to improve efficiency and productivity. Taking into

account that Belarus has no comparative advantage in the production of capital-intensive goods, incorporation and adaptation of advanced technologies integrated in cheaper imported intermediate and capital goods are supposed to develop domestic technological capabilities. It seems that the degree of adaptation of the imported technologies in the Belarusian economy is low, mainly due to decreasing skills and the ability to imitate and innovate using foreign technologies. Thus, in order to guarantee the success of this growth strategy Belarus should make considerable improvements on these aspects.

Causality test: Toda and Yamamoto (TY)

Table 12 reports the findings of the TY causality test. For the first model strong unidirectional causality is established from growth in domestic capital investments to GDP growth, to imports of intermediate goods and to exports; from GDP growth to exports, imports of capital and intermediate goods; and weak unidirectionality between growth in labor supply and domestic capital investments. So, in the period 2005-2015 there is a strong evidence for GLI instead of ILG hypotheses in Belarus, that is GDP growth causes growth in imports of intermediate and capital goods. In turn, GDP growth is driven mainly by growth in domestic investments, and the later causes growth in imports of intermediate goods indicating presence of investment driven growth hypothesis in the economy.

Table 12 – Toda Yamamoto Granger Causality (Modified WALD) Test

Estimated models	Causality direction	χ^2	*p*-value
F_{GDP}(Ln*GDP*|Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP*, *DOMCAP_TO_GDP*, *IMPINTER_TO_GDP*)	Ln*Exports* → Ln*GDP*	3.499	0.744
	Ln*L* → Ln*GDP*	4.933	0.552
	DOMCAP_TO_GDP → Ln*GDP*	16.685***	0.010
	IMPINTER_TO_GDP → Ln*GDP*	6.567	0.362
	IMPCAP_TO_GDP → Ln*GDP*	4.647	0.589
	Ln*GDP* → Ln*Exports*	17.236***	0.008
	Ln*L* → Ln*Exports*	1.099	0.981
	DOMCAP_TO_GDP → Ln*Exports*	20.428***	0.002
	IMPINTER_TO_GDP → Ln*Exports*	8.103	0.230
	IMPCAP_TO_GDP → Ln*Exports*	3.118	0.793
	Ln*GDP* → Ln*L*	6.261	0.394
	Ln*Exports* → Ln*L*	1.329	0.970
	DOMCAP_TO_GDP → Ln*L*	3.825	0.700
	IMPINTER_TO_GDP → Ln*L*	4.234	0.644
	IMPCAP_TO_GDP → Ln*L*	2.709	0.844
	Ln*GDP* → *IMPCAP_TO_GDP*	13.712**	0.033
	Ln*L* → *IMPCAP_TO_GDP*	7.555	0.272
	Ln*Exports* → *IMPCAP_TO_GDP*	4.866	0.561
	IMPINTER_TO_GDP → *IMPCAP_TO_GDP*	6.664	0.353
	DOMCAP_TO_GDP → *IMPCAP_TO_GDP*	9.170	0.164
	Ln*GDP* → *DOMCAP_TO_GDP*	7.134	0.308
	Ln*L* → *DOMCAP_TO_GDP*	12.178*	0.058
	Ln*Exports* → *DOMCAP_TO_GDP*	4.842	0.564
	IMPINTER_TO_GDP → *DOMCAP_TO_GDP*	6.573	0.362
	IMPCAP_TO_GDP → *DOMCAP_TO_GDP*	8.256	0.219
	Ln*GDP* → *IMPINTER_TO_GDP*	14.751**	0.022
	Ln*Exports* → *IMPINTER_TO_GDP*	8.331	0.214

	IMPCAP_TO_GDP → *IMPINTER_TO_GDP*	5.942	0.429
	DOMCAP_TO_GDP → *IMPINTER_TO_GDP*	16.042**	0.013
	Ln*L* → *IMPINTER_TO_GDP*	3.444	0.751
$F_{IMPINTER}$(Ln*IMPINTER*| Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP*, *DOMCAP_TO_GDP*)	Ln*Exports* → Ln*IMPINTER*	17.850***	0.001
	Ln*L* → Ln*IMPINTER*	4.463	0.346
	IMPCAP_TO_GDP → Ln*IMPINTER*	1.415	0.841
	DOMCAP_TO_GDP → Ln*IMPINTER*	0.669	0.955
	Ln*IMPINTER* → Ln*Exports*	4.645	0.325
	Ln*L* → Ln*Exports*	1.392	0.845
	IMPCAP_TO_GDP → Ln*Exports*	2.810	0.590
	DOMCAP_TO_GDP → Ln*Exports*	7.402	0.116
	Ln*IMPINTER* → Ln*L*	1.718	0.787
	Ln*Exports* → Ln*L*	1.321	0.857
	IMPCAP_TO_GDP → Ln*L*	0.344	0.986
	DOMCAP_TO_GDP → Ln*L*	1.922	0.750
	Ln*IMPINTER* → *IMPCAP_TO_GDP*	3.893	0.420
	Ln*Exports* → *IMPCAP_TO_GDP*	5.566	0.233
	Ln*L* → *IMPCAP_TO_GDP*	84.493***	0.000
	DOMCAP_TO_GDP → *IMPCAP_TO_GDP*	7.453	0.113
	Ln*IMPINTER* → *DOMCAP_TO_GDP*	0.482	0.975
	Ln*Exports* → *DOMCAP_TO_GDP*	6.163	0.187
	Ln*L* → *DOMCAP_TO_GDP*	10.358**	0.034
	IMPCAP_TO_GDP → *DOMCAP_TO_GDP*	4.452	0.348
F_{IMPCAP}(Ln*IMPCAP*|Ln*GDP*, Ln*L* , *IMPINTER_TO_GDP*)	Ln*GDP* → Ln*IMPCAP*	7.675	0.104
	Ln*L* → Ln*IMPCAP*	3.039	0.551
	IMPINTER_TO_GDP → Ln*IMPCAP*	10.351**	0.034
	Ln*IMPCAP* → Ln*GDP*	2.176	0.703
	Ln*L* → Ln*GDP*	89.749***	0.000
	IMPINTER_TO_GDP → Ln*GDP*	4.425	0.351
	Ln*IMPCAP* → Ln*L*	3.613	0.460
	Ln*GDP* → Ln*L*	4.140	0.387
	IMPINTER_TO_GDP → Ln*L*	3.330	0.504
	Ln*IMPCAP* → *IMPINTER_TO_GDP*	0.825	0.935
	Ln*GDP* → *IMPINTER_TO_GDP*	89.332***	0.000
	Ln*L* → *IMPINTER_TO_GDP*	2.538	0.637

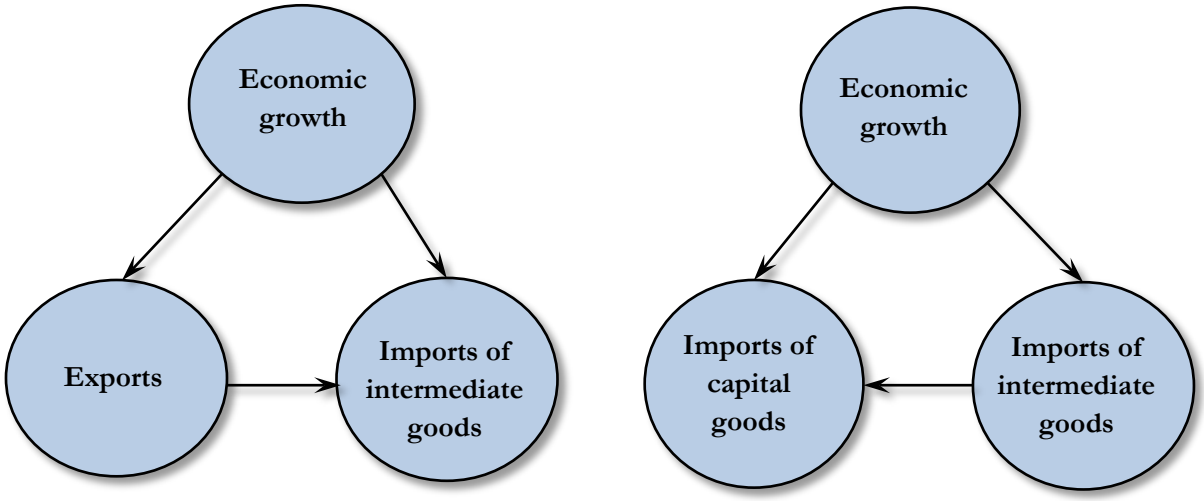
Note: Maximum lag length is selected based on SIC. * 10% level of significance; ** 5% level of significance; *** 1% level of significance.

For the second model statistically significant unidirectional causality runs from export growth to growth in imports of intermediate goods; from growth in labor supply to growth in imports of capital goods and growth in domestic capital investments. Therefore, in the period 2005-2015 there is strong evidence that export growth causes growth in imports of intermediate goods in Belarus.

For the third model strong unidirectional causality is established from growth in imports of intermediate goods to growth in imports of capital goods, from growth in labor supply to GDP growth; from GDP growth to growth in imports of intermediate goods. Hence, the results indicate that growth in imports of intermediate goods leads to growth in imports of capital goods.

So, results of TY causality test indicate that ILG and ELG models are not relevant, while GLI and GLE models are relevant for Belarus (see Figure 3). Additionally, the findings show the GDP growth is mainly driven by growth in labor supply and growth in domestic capital investments.

Figure 3. Imports of capital and intermediate goods and economic growth in Belarus



Variance decomposition

Forecast error variance decomposition (VDC) is used to analyze the strength of the causal relationship between studied variables, that is, to define how much of the forecast error variance for any variable in a system is explained by innovations to each explanatory variable over a series of time horizons. Tables 13 demonstrate findings from VDC for a period of 24 months ahead in estimating and analyzing the influence of random shocks in Belarusian trade and growth variables.

The results reveal that in the short-run a 63.1 percent portion of economic growth is contributed by its own innovative shocks, one standard deviation shock in exports growth explains economic growth by minimal 0.5 percent, the support of increase in imports of intermediate and capital goods to economic growth is equal to 1.2 and 0.1 percent, respectively. The largest contribution to explain economic growth in the short-run comes from growth in domestic capital investments with 30.6 percent and growth in labor supply with 4.4 percent. On the other hand, in the long-run the fluctuation of GDP growth is accounted by GDP growth itself with 52.5 percent. Shock to exports and to labor supply can cause up to 0.9 and 11.5 percent fluctuation in real GDP, respectively. The contribution of intermediate and capital goods imports increased in the long-run and is equal 11.4 percent for intermediate goods and 5.4 percent for capital goods. However, the role of domestic capital investments in the long-run decreases and is equal only 19 percent.

Further, in the short-run the innovative shocks stem in imports of capital goods explain itself by 44.8 percent. The share of exports growth and economic growth in the variation of imports of capital goods is equal 0.7 percent and 39.1 percent, respectively. One standard deviation shock in labor supply explains growth in imports of capital goods in the short-run by minimal 0.1 percent Shock to imports of intermediate goods and exports growth can cause 8.5 percent and 0.7 percent fluctuation in imports of capital goods, respectively. In the long-run, the role of labor supply increases up to 4.5 percent. However, only 23.7 percent and 4.3 percent of changes in imports of capital goods can be attributed to GDP growth and domestic capital investments by the end of 2-year forecasting period. The contribution of exports growth increased up to 34.5 percent. The

impact of shock in labour supply growth and growth in imports of intermediate goods can cause 4.5 percent and 8 percent fluctuation in imports of capital goods in the long-run, respectively.

Additionally, in the short-run the variation in imports of intermediate goods is explained by 23.2 percent by its own initial shock and by 41.1 percent with shock to GDP growth. Shock to exports and to labor supply can cause 11.3 percent and 0.8 percent fluctuation in imports of intermediate goods, respectively. The support of growth in imports of capital goods and domestic capital investments to growth in imports of intermediate goods range from 0.1 percent for capital goods imports to 23.3 percent for domestic capital investments. In the long run, the forecast for a 2-year time horizon indicates that influence of own shock on the variation in imports of intermediate goods decreases substantially up to 4.2 percent only. The impact of shock in GDP growth can cause 36.5 percent fluctuation in imports of intermediate goods in the long-run. One standard deviation shock in labor supply and exports growth explains growth in intermediate goods imports by minimal 1.3 percent for labor supply and substantial 45.9 percent for exports growth. The contribution of capital goods imports and domestic capital investments in the long-run is equal 7.8 percent and 4.2 percent, respectively.

Finally, the fluctuations in exports growth are mainly driven by its own shock (85.3 percent in the short-run and 79.1 percent in the long-run) and by shock in GDP growth (7.7 percent in the short-run and 14.7 percent in the long-run).

Therefore, the results from forecast error variance decomposition confirm findings obtained from TY causality test (see Table 12 and Figure 3). The changes in imports of intermediate and capital goods in Belarus are mainly driven by changes in GDP growth and exports growth. However the impact of exports growth increases substantially in the long-run. Additionally, the findings also show that the main contributor to GDP growth fluctuations is growth in domestic capital investments, but with decreasing influence in long-run.

Table 13 – Error forecast variance decomposition

Series/estimated models	Horizon	Ln*GDP*	Ln*Exports*	Ln*L*	*IMPINTER_TO_GDP*	*IMPCAP _TO_GDP*	*DOMCAP _TO_GDP*
(a) F_{GDP}(Ln*GDP*|Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP, IMPINTER_TO_GDP, DOMCAP_TO_GDP*)	3	63.16	0.50	4.40	1.20	0.12	30.59
	6	55.96	1.25	10.56	6.44	3.57	22.19
	9	54.12	1.14	10.36	7.04	4.02	23.30
	12	54.13	1.01	11.46	8.28	4.45	20.64
	15	53.17	0.88	11.24	9.46	4.79	20.44
	18	53.00	0.83	11.23	10.18	5.09	19.64
	21	52.68	0.79	11.03	10.93	5.23	19.31
	24	52.47	0.77	10.82	11.52	5.44	18.95
	Horizon	*IMPCAP _TO_GDP*	Ln*Exports*	Ln*L*	*IMPINTER_TO_GDP*	Ln*GDP*	*DOMCAP _TO_GDP*
(b) F_{GDP}(Ln*GDP*|Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP, IMPINTER_TO_GDP, DOMCAP_TO_GDP*)	3	44.84	0.74	0.09	8.47	39.09	6.74
	6	43.77	2.38	2.08	10.14	34.22	7.38
	9	40.26	9.15	3.25	9.79	30.83	6.69
	12	35.94	15.94	4.26	9.29	28.16	6.38
	15	31.96	22.98	4.48	8.37	26.59	5.59
	18	29.19	27.89	4.52	7.84	25.42	5.11
	21	27.24	31.57	4.53	7.44	24.50	4.68
	24	25.75	34.52	4.46	7.19	23.70	4.35
	Horizon	*IMPINTER_TO_ GDP*	Ln*Exports*	Ln*L*	Ln*GDP*	*IMPCAP _TO_GDP*	*DOMCAP _TO_GDP*
(c) F_{GDP}(Ln*GDP*|Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP, IMPINTER_TO_GDP, DOMCAP_TO_GDP*)	3	23.25	11.30	0.83	41.11	0.13	23.35
	6	16.63	20.86	2.45	39.27	3.77	17.00
	9	11.64	34.21	1.91	34.64	5.92	11.65
	12	8.47	39.06	1.43	35.49	6.95	8.57
	15	6.59	42.59	1.25	35.59	7.27	6.69
	18	5.53	44.15	1.17	35.99	7.59	5.55
	21	4.78	45.22	1.18	36.33	7.69	4.78
	24	4.24	45.93	1.26	36.49	7.85	4.21

The end of Table 13

	Horizon	Ln*Exports*	Ln*GDP*	Ln*L*	*IMPINTER_TO_GDP*	*IMPCAP _TO_GDP*	*DOMCAP _TO_GDP*
(d) F_{GDP}(Ln*GDP*|Ln*Exports*, Ln*L*, *IMPCAP_TO_GDP, IMPINTER_TO_GDP, DOMCAP_TO_GDP*)	3	85.31	7.69	5.16	1.64	0.03	0.15
	6	81.52	12.91	3.01	1.85	0.07	0.62
	9	80.56	14.38	2.52	1.96	0.15	0.40
	12	79.85	14.86	2.43	2.20	0.33	0.30
	15	79.43	14.95	2.36	2.52	0.48	0.24
	18	79.22	14.84	2.29	2.81	0.61	0.20
	21	79.12	14.76	2.21	3.02	0.70	0.17
	24	79.09	14.68	2.12	3.18	0.76	0.15

Note: Schwarz Information Criterion (SIC) is used to select lag length. Factorization is performed using Cholesky decomposition.

6. Conclusions

In the empirical literature, capital accumulation and export promotion policy are considered as the main driving forces for rapid economic growth. Nevertheless, the endogenous growth theory underlines that imports also play a substantial role in the process of economic development. Although the relationship between imports and economic growth is proven in theory, there is no empirical evidence for the case of Belarus. This study is applied in order to cover this gap.

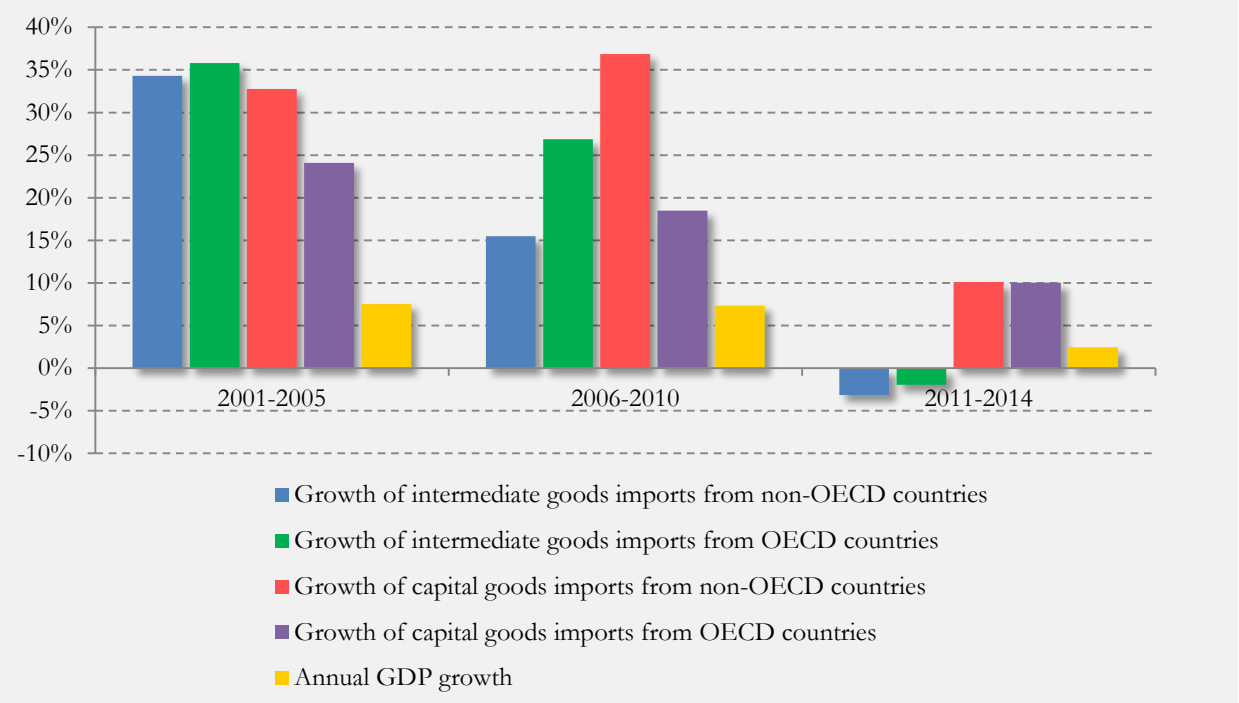
The paper analyzes the short-run and long-run effects of imports of intermediate and capital goods on Belarusian economic growth for the period 2005 to 2015 taking into account large upward and downward exchange rate adjustments of Belarusian ruble. The results from ARDL models show that imports of intermediate goods has negatively influenced output in the short- and long run. The influence of imports of capital goods on economic growth is statistically insignificant. Thus, these findings reject import-led growth hypothesis and establishes presence of growth-led imports hypothesis for Belarus.

Further, the results of TY causality test indicate that GDP growth Granger cause growth in imports of intermediate and capital goods and exports growth. In turn growth in exports Granger causes growth in imports of intermediate goods and growth in imports of intermediate goods Granger causes growth in imports of capital goods. Therefore, these findings also contradict ILG hypothesis and indicate relevance of GLI model (and additionally GLE model) for Belarus, the causality running in one direction from imports to growth, and supports the arguments stated by Rodrik (1995), who promoted the hypothesis that trade is more a consequence of the rapid economic growth (in case of Asian countries) than a cause.

The findings from forecast error variance decomposition confirm results obtained from TY causality test. The changes in imports of intermediate and capital goods in Belarus are mainly driven by changes in GDP growth and exports growth. However the impact of exports growth increases substantially in the long-run. Additionally, the findings also show that the main contributor to GDP growth fluctuations is growth in domestic capital investments, but with decreasing influence in long-run.

Therefore, the Belarusian economic policy based on obtaining foreign advanced technology seems reducing its efficiency in recent years (see Figure 4). The majority of Belarusian imports are machinery, equipment and intermediate goods, which are relatively cheaper and easier to implement in the production process. In turn this helps to improve efficiency and productivity. Taking into account that Belarus has no comparative advantage in the production of capital-intensive goods, assimilation and adaptation of advanced technologies incorporated in cheaper imported intermediate and capital goods are supposed to develop domestic technological capabilities. It seems that the degree of adaptation of the imported technologies in the Belarusian economy is low, supposedly due to decreasing skills and the ability to imitate and innovate using foreign technologies. Thus, in order to guarantee the success of this growth strategy Belarus should make considerable improvements on these aspects.

Figure 4. Average growth rates of intermediate and capital goods imports from OECD and non-OECD countries, 2001-2014



Additionally, this paper investigates the influence of exchange rate movements on the growth of imports of intermediate and capital goods. The results show that it is not possible to obtain a general conclusion concerning whether a depreciation has a positive or negative impact on imports of capital goods in Belarus due to insignificance of calculated coefficients. Such results may be explained due to the fact that in many cases the machinery and equipment were imported in accordance with the government's plans which were realized in many cases irrelevant to current macroeconomic situation in Belarus, that is to import just for importing (to accomplish the plan).

However, the influence of depreciation on growth of intermediate goods is negative both in case of a rapid or continuous devaluation. The explanation of such results is that devaluation of Belarusian ruble leads to growth in the domestic currency price of domestic export, thus, motivates Belarusian companies to expand production for export (first of all to Russia) – the derived demand effect. However, devaluation of Belarusian ruble increases also the domestic currency price of imported intermediate inputs and decreases the quantity of intermediate imports by Belarusian companies leading to direct cost effect. The direct cost effect and derived demand effect have opposite signs.

Additionally, devaluations in Belarus occur both to import source and export destination countries (first of all Russia). In case of imports of capital goods the marginal impacts of direct cost effect and derived demand effect have comparable magnitude leading to insignificant effect on overall imports of capital goods and from this channel on Belarusian economic growth. However, in case of imports of intermediate goods the impact of direct cost effect is greater than the impact of derived demand effect leading to negative effect on overall imports of intermediate goods and from this channel on GDP growth in Belarus.

Therefore, the results presented in the paper are valuable to the extent that intermediate and capital imports may enhance Belarusian economy future development. While devaluation in the exchange rate is predicted to have relatively neutral effect on capital imports, the influence of currency devaluation could have a negative effect on imports of intermediate goods generating a decrease in economic growth in Belarus. For this reason, it may be important for policy makers in Belarus to refine the country's export strategy in the next direction: firstly, the export destinations should be different relative to imports source destinations of intermediate goods that are used for export production; secondly, the imports of capital goods should be linked with previous proposition - this type of imports should contribute to the development of new export markets.

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