Contemporary Macroeconomics
Homework assignment

From 2004 to 2010, Brazil's economy grew at an average of 4.2 percent annually, or more than twice as fast as it had grown from 1999-2003; or for that matter, more than twice as fast as its annual growth from 1980-2000. This was despite the impact of the world recession of 2009, which left Brazil with no growth for that year. What were the sources of this amazing economic growth dynamics? Compare the economic growth determinants of Brazilian economy with the factors that allowed to grow the Polish economy even during the global financial crisis. What are the similarities and differences?

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Introduction

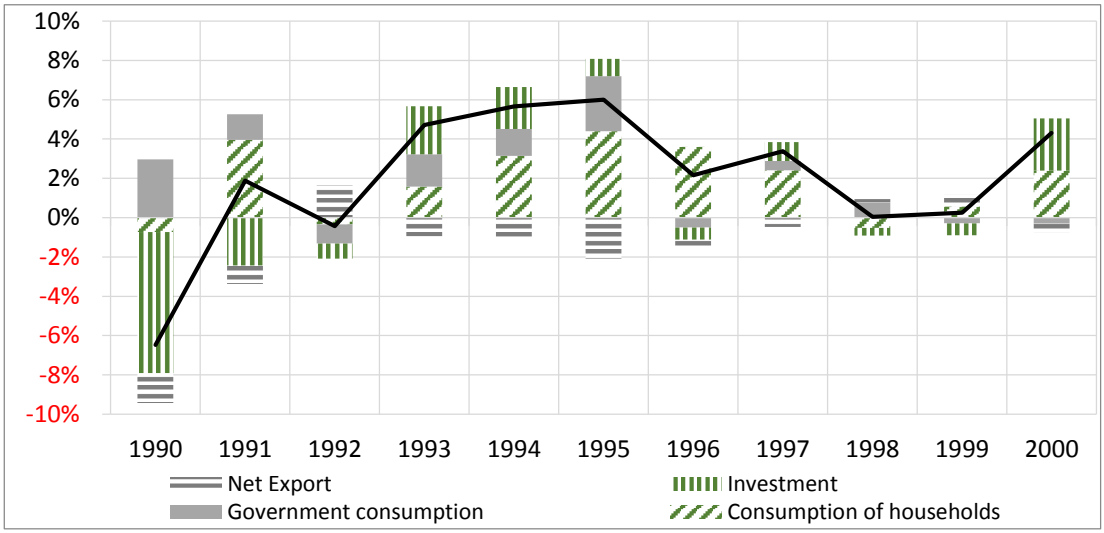
Nowadays Brazil is the largest country in South America and the 7th largest economy in the world (World Development Indicators. World Bank.2014). It has population more than 200m people and territory 8.5m sq.km, 5th largest in the world. It is thought to be one of new world GDP drivers along with such countries as Russia, India, and China (BRIC countries). Brazil has shown significant growth from 2004 till 2010 at average 4.47% annually, despite the world crisis of 2008. So it was till 2010, when Brazil reduced growth rate.

For understanding of the excellent growth dynamics of Brazilian GDP, within this project it will be obtained following practical results: determinants of real GDP growth in short and long term, and comparing of Brazil and Poland growth determinants. Even though the most part of the project is connected with practical questions and interprets data and time series from different sources, the conclusion should match theoretical and practical results (Burda and Wyplolsz, 2013). Therefore, first decomposition of GDP by final expenditures will be used for finding the short run growth contributors, IS-LM and AS-AD models will be used for interpretation of data and time series in the connection to short and medium run policy, and Solow decomposition will be used for finding the long run growth contributors.

Chapter 1 – pre-sequences of economic growth

Brazil had a period of economic growth during 1993-1997. In average positive GDP change in that period was 4.38% with a maximum in 1995 at 6%. In 1998, GDP growth decreased to 0.04%, which have caused by world economic crisis. For example, in Argentina in 1998 GDP changed to 3.85% from 8.1% previous year, in 1999 country slipped into recession with negative GDP 3.3%.

Source: the United Nations Statistics Division; author's calculations

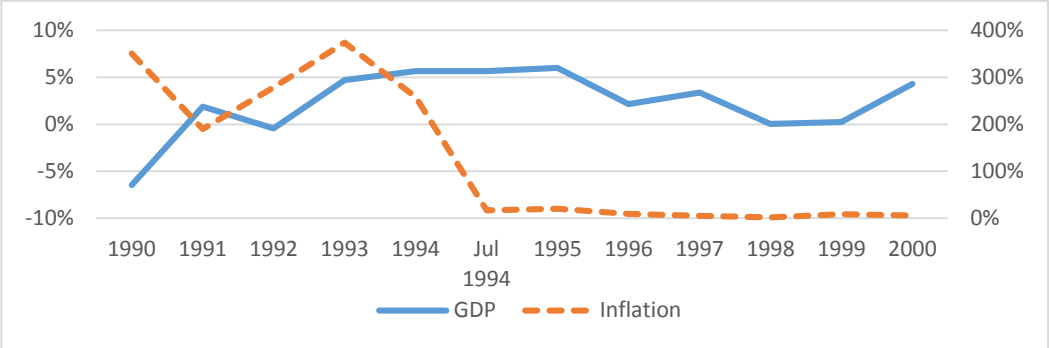


Graph 1.1 GDP decomposition by expenditures in Brazil 1990-2000

To find out the reason of economic growth in Brazil, decomposition of GDP by expenditure will be used. GDP growth divided into basic components gives the answer and almost full picture of economic processes. Fig. 1.1 is used to demonstrate values of GDP components for each year of economic growth in Brazil from 1990 until 2000. First significant driver of growth during 1993-1997 was consumption, in average 3% increase annually. Consumption of households in this period contributes about 70% of economic growth. Most interesting year, in terms of growing factors, was 1996 when three of them summary, have reduced to -1.45% and GDP was fueled only by consumption, which was 3.6%. Second and third factors of economic growth by contribution: investment and government consumption, are not so valuable, and have average 1.15% increase annually. The only factor that heavily reduced Brazilian economic growth was net export, that in average has -1% in that period. This factor has very strong negative correlation with GDP in given period -85%. The biggest slowdown in GDP growth was in 1995 in amount of -2%, which is two times more than average. In addition, this year has significant growth of other factors: consumption 4.4%, government consumption 2.8%, and investments 0.89%.

Some history facts could explain the reasons of economic growth that started in 1991. First fact: Brazil was under military dictatorship from 1964 until 1985. Seventh Constitution was proclaimed in 1988, it defined Brazilian government form as federal republic. Other significant event for economy happened in 1994, when new currency was introduced, cruzeiro real. It helped reduce inflation to 66% in 1995 from 2076% previous year, and in 1997, it was 7%, normal lever for developing country. In addition, the most important thing to remember is that new currency had 1:1 ratio to USD, and it did not change much until 1999 when slipped to 2:1 ratio.

Source: Central Bank of Brazil



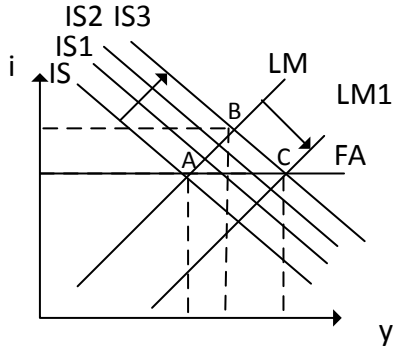
Graph 1.2 GDP growth and inflation in Brazil 1990-2000

In short-term perspective, Brazilian economy in 1993-1997 can be characterized with growing fiscal and reduction of monetary stimulation. Growing budget expenditures concerned with establishment of government. Parliament system of Brazil is quite similar to one that US have, consist of Chamber of Deputies (513 seats) and Federal Senate (81 seats). Moreover, each of deputies can have up to 25 advisors. Moreover, payrolls for government workers are several times more than average salary. In Brazil big amount of social problems concerned with high level of poverty, so they decided to make more government programs with social benefits for people. Pension system is also oriented on supporting people. For example pensions that could be inherited by family members almost in full. This factors result in quick growth in government expenditures. Monetary policy of government during 1993-1997 was affected by two factors: introduction of new currency and fixed exchange rate. Both of them give little possibility of efficient influence on economic growth.

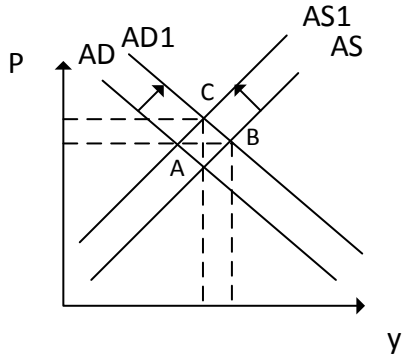
Brazilian economy showed explosive growth in 1993-1997 period, which is well explained by short-term model. In order to apply middle-term model correctly later periods should be used, for example 1999-2003. In is not possible to rely on 1998-year data in full, because it was influenced by crisis the most. On the other hand, in 1999 Brazilian economy did some policy adjustments: floating exchange rate and inflation targeting. In average during 1999-2003 GDP growth rate was 1.94%, which is more than twice less than during 1993-1997. The division of economy drivers also changed: highest contribution was net export, that gave in average near 0.98% comparing to -0.96% in previous period; contribution of consumption decreased to 0.74% from 3.02%; summary contribution from government consumption and investment in average decreased to 0.21% from 2.31% previous period. Brazilian economy growth returned to growth rates and contributions of factors that match better to developing economies with rich natural resources.

In middle term macroeconomic model GDP, growth always returns to natural level in contradiction to short-term model. In terms of Brazilian economy, we have multiple fiscal stimulations that gave huge shift from natural level each year. Fig. 1.3 can describe increase, where each IS line movement represent 1993-1997 increase in consumption, government consumption, and investment. This movement also result in changes of AS-AD model on graph 1.4, AD line shifts to AD1 position. That represents boost in GDP growth and affects price growth, inflation in Brazil during that period was in average 13% annually. Second shift represents reaction on previous price growth, which gives increase in price expectations, and results in a change of AS line position. This second shift represents the main idea of middle-terms analysis that eventually GDP growth returns to natural level, which can be observed during 1999-2003 period, when GDP growth

dropped two times from previous period. Further increase in price level also took place, in average annually inflation during 1999-2003 period was 8.54%. This is less than previous period but still about four times more than natural inflation rate, that is generally considered about 2% annually. AS-AD model describes processes in Brazilian economy quite precise, if AD line shift belongs to 1993-1997 period and second line movement to 1999-2003 period, when economy returned to near natural levels.



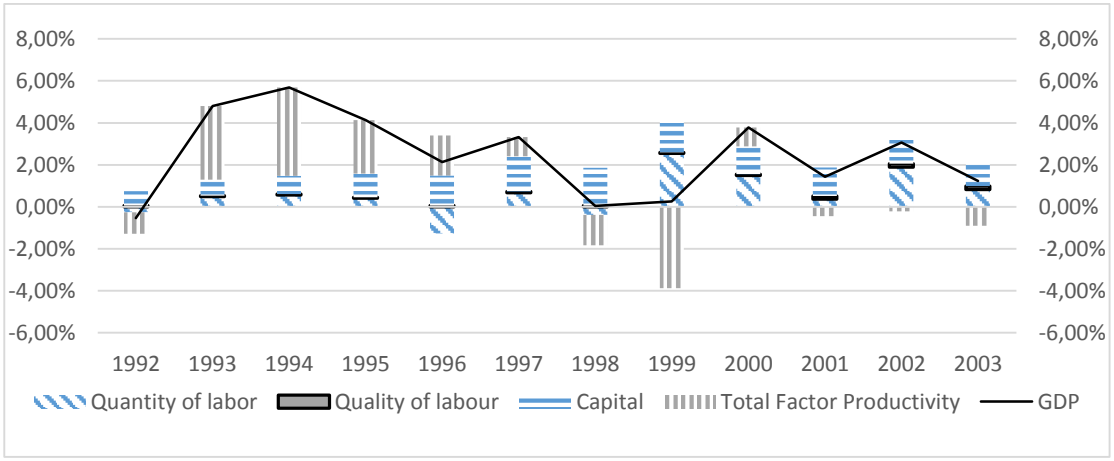
Graph 1.3 IS-LM model for Brazilian economy 1993-1997



Graph 1.4 AS-AD model for Brazilian economy 1993-2003

Long-term component analysis may give more information about nature of Brazilian growth during 1993-2004. Solow's decomposition shows that mostly GDP growth during 1993-2004 was fueled by capital, in average 1.32% annually. Second by contribution was quantity of labor 0.83% in average. On the other hand, factors that represent increase in quality did not show much growth: contribution of total factor productivity was 0.71% annually; the same indicator for labor quality was 0.09%. Summary factors that represent quantities increase contribute more than two times more than quality factors.

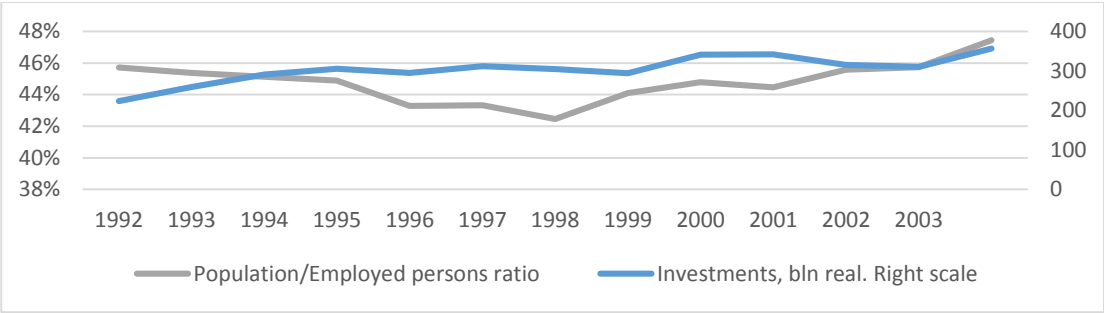
Source: The Conference Board



Graph 1.5 Solow's decomposition of GDP growth of Brazil 1992-2003

Because of above mentioned data, assumption that working population and investments have significant influence on Brazilian economy can be done. To make some additional conclusions additional data will be used: total population to employed people ratio and total investments. Graph 1.6 shows changes of these indicators have very strong relation, correlation coefficient since 1990 is 80%, it means that they increase and decrease together. Assumption that at some point there would not be enough people that can work or capital inflow, which will result in drop of GDP.

Source: The Conference Board, the United Nations Statistics Division; author's calculations



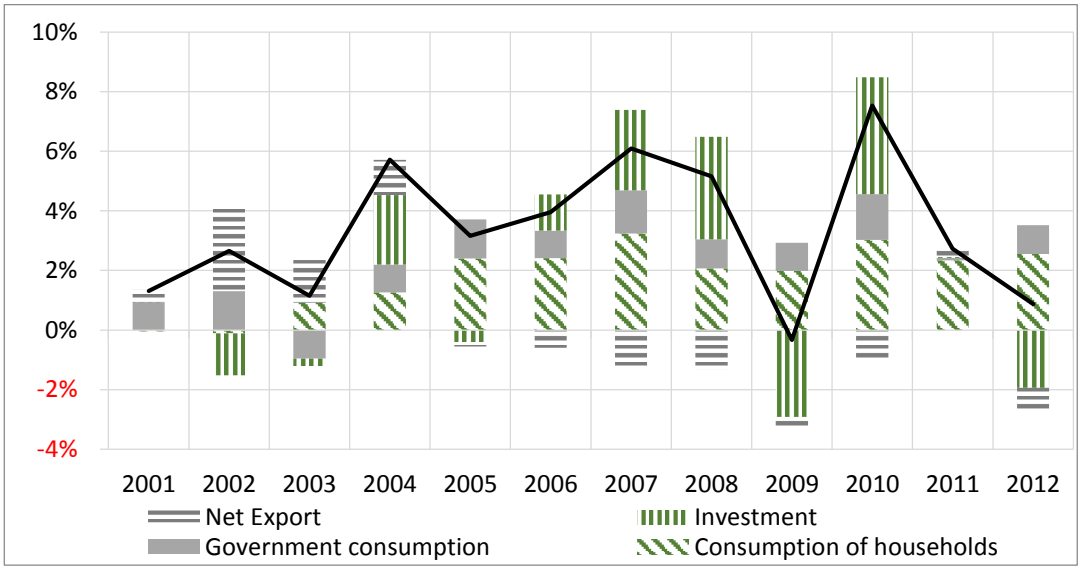
Graph 1.6 Population to employed people ratio and Investment in Brazil 1992-2003

In conclusion, first chapter of this project was devoted to 1993-2003 period in Brazilian economy. Main contribution during 1993-1997 in GDP growth was household's consumption. Than during 1999-2003, main contribution was net export. Main policy changes and events that effected Brazilian economy were mentioned: new currency introduction in 1994, world economic crisis in 1998, changing to floating exchange rate and inflation targeting in 1999. Macroeconomic models that describe Brazilian economy were built. Short-term models shown that capital mobility in Brazil was probably closer to perfect than to none, and described nature of GDP growth in 1993-1997 period. Middle-term model showed that economy of Brazil was near natural levels during 1999-2003. Long-term factors, represented by Solow's decomposition, showed that quantitative development in Brazilian economy is more than quality. Next step showed that GDP growth relies on employment growth and capital inflow. This analysis will help in understanding changes that appear in further periods, like structure changes or policymaking.

Chapter 2 – "economic miracle"

During 2004-2010 economy of Brazil showed significant growth in average 4.47% annually. This is more than in previous growth period during 1993-1997. Previous period also does not include years of world heavy economic crisis, which started in the end of 2008, and it makes huge difference. Moreover, maximum growth in this period was shown in 2010, increase of Brazilian GDP was 7.53%. Growth economy showed in 2009 was 5.43% less than previous year; it is very similar to GDP fall in 1997-1998. In conclusion, during 2004-2010 Brazilian economy showed impressive growth despite world economic crisis in 2008.

Source: the United Nations Statistics Division; author's calculations



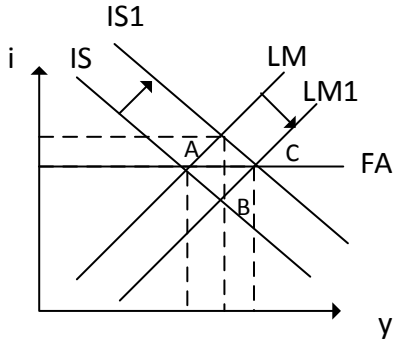
Graph 2.1 GDP growth decomposition by expenditures in Brazil 2001-2012

Decomposition of GDP to basic factors will help in understanding driving powers of Brazilian GDP growth during 2004-2010. In the given time period the biggest contribution in GDP have consumption of households, in average 2.34% annually. Investments take second place with average annual contribution 1.47%, government consumption is third factor with average yearly growth 1.15%. Net export reduced GDP growth in average by 0.5% annually.

In general, contributions are very similar to previous period of growth in Brazil 1993-1997. Consumption of households is still the main driver but contribution decreased to 2.34% from 3.02% in average. Government spending average contribution did not change, but standard deviation of contributions changed from 1.25% in previous period to 0.27%, which shows that contribution goes in amounts, that are nearly equal. Investment has increased contribution by 0.3% in average. In 2009, GDP growth reduced by 5.49% and the largest negative contribution was investment -2.92%. In 1998, reduction in consumption of households from 2.4% to -0.52% was the main reason of GDP drop. The last but not least important change is that negative contribution of net export during 2004-2010 was two times less that previous period. GDP factors changed their values during 2004-2010 comparing to 1993-1997, main differences was as follows: consumption is not the only driver of GDP and it did not reduce greatly in 2009; government spending is the most stable contributor; investments contribute more but change a lot in values, have strong negative effect on GDP in 2009.

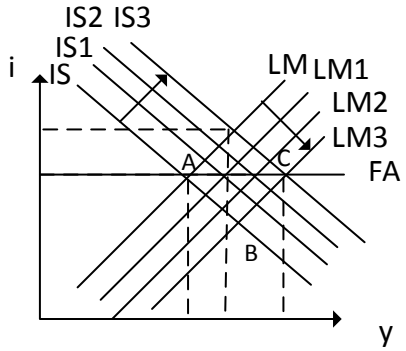
Standard macroeconomic model for short run IS-LM will help in understanding macroeconomic processes of Brazilian economy in 2004-2010. Since 1999 Brazil has floating exchange rate, also capital mobility is assumed as perfect. Possibility that Brazilian government used instruments of fiscal stimulation is rather low. If this kind of economic policy were chosen, at first there would be an increase in GDP and interest rate. This changes lead to increase in money

demand, it causes appreciation of currency. Strong currency stimulates import, eventually GDP growth and interest rate returns to initial position. Short-term macroeconomic model shows that fiscal stimulation is ineffective in given situation. On the other hand, monetary policy may give some benefits, as it is shown of graph 2.2. Initial increase in money supply increases GDP and decreases interest rate, LM line shifts to the right. It causes decrease in money demand that result in currency depreciation. Weak currency reduces import and makes export more competitive, it causes IS curve shift. Final shift shows that monetary policy gives GDP increase and stable interest rate. This model describes Brazilian economy precise enough.

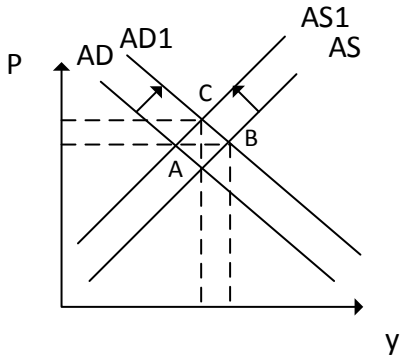


Graph 2.2 IS-LM model for Brazilian economy 2004-2010

Middle-term model is based on assumption that eventually GDP returns to natural level, Brazil economy growth slipped in 2011 to 2.73%, and decreased to 0.87% in 2012. Figures of Brazilian growth during 1999-2003 was very similar. Using the information assumption that Brazilian economy already tries to return to natural levels can be made. Middle-term model show that in Brazilian economy during 2004-2010 grew thanks to several monetary stimulations, as it shown on graph 2.3. This changes influence AD-AS model, AD line shifts right, that results in price growth. Changes in AS position represent period after 2010 in Brazilian economy, GDP returns to natural level and growth in price expectations results in further price increase. Middle term model shows processes in Brazilian economy precise enough.



Graph 2.3 IS-LM model for Brazilian economy 2004-2010



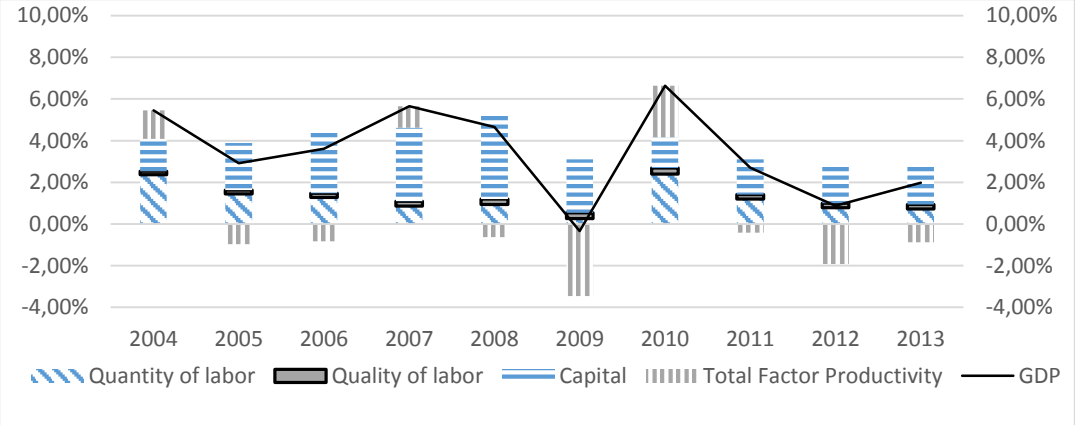
Graph 2.4 AS-AD model for Brazilian economy 2004-2010

Despite economic crisis of 2008, economic growth in Brazil during 2004-2010 was higher than in 1993-1997, decomposition GDP by expenditures shows that net export contribution changed a lot. To find the reason of such changes some features of Brazilian economy and world trends should be mentioned. First thing to know about Brazilian export, that this is one of biggest agricultural producer. It is in top-3 exporter for almost all widely traded crops. This is caused by Brazilian climate that allows 2-3 times a year harvesting and increase in total area under cultivation, agricultural production grew from about 100m tonnes in 2000 to almost 150m tonnes in 2010 (The

economist,2013). Increasing production of crops in Brazil found its consumer in growing world consumption. Increased exports and government stimulation explain increased GDP growth during 2004-2010 comparing to 1993-1997 period.

Long-term factor analysis of 2004-2010 period and comparing it with 1993-2004 period may give more information about structure changes in Brazilian economy. Solow's decomposition shows that main driver of GDP growth was Capital, which contributed in average 2.63% annually. Second by value was Quantity of labor; its contribution was in average 1.36% annually. Summary average contribution of Quality of labor and Total Factor Productivity was 0.09%. Comparison with previous period shows that only period when Total Factor Productivity contributed much in GDP was 1993-1997. Quantitative factors continued fueling Brazilian economy since then. It shows that in general there were no huge structure changes or modernization of economy towards quality factors. Such growth also resulted in very low investment in infrastructure. Mc Kinsley Global Institute estimates showed that the total value of Brazil's infrastructure was 16% of GDP, it is very low comparing to developed countries like Italy or Germany, that have more than 70%. Brazil may achieve such indicator in 20 years, if multiply contribution in infrastructure more than three times. (McKinsey, 2013).

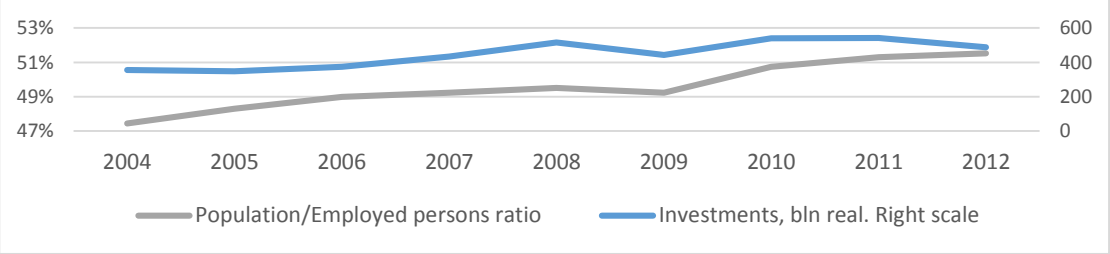
Source: The Conference Board



Graph 2.5 Solow's decomposition for Brazilian economy 2004-2013

Graph 2.6 shows that growth of investment in Brazil dropped after 2010, number of employed people dropped simultaneously. It shows that available labor is nearly maximum value and lack of investments will cause future drop in employment. Long-term determinants says that Capital limits Labor usage. Moreover, because both of these indicators represent quantitative factors of Brazilian growth drop in capital results in employment reduction and eventually will result in GDP drop.

Source: The Conference Board, the United Nations Statistics Division; author's calculations



Graph 2.6 Population to employed people ratio and investments

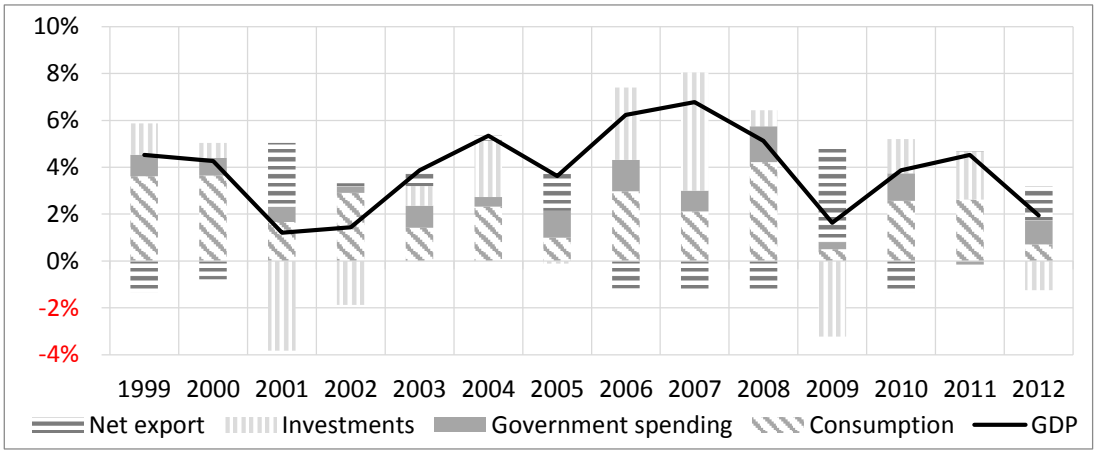
In conclusion, Brazilian economy did not change much since 1993-2003. Growth during 2004-2010 was fueled by government stimulations. This type of growth was enabled by capital

inflow. Solow's decomposition showed that no quality background was made previous periods, which resulted in low contribution of Total Factor Productivity and Labor quality. Figures also showed that Brazilians did not make any steppes to change this situation, and all GDP growth they had during 2004-2010 was spent on creating middle class. In other words, they increased consumption instead of maximize contribution in infrastructure or labor quality. Further capital inflow reduction will lead to higher unemployment rate, and because country does not have enough internal resources. This government policy results in GDP growth rate drop, because there are no quality changes that could fuel economy during crisis.

Chapter 3 – comparing GDP growth in Brazil with Poland

Decomposition of GDP by expenditure in Poland during 2004-2010 can be compared with Brazilian. During this period GDP growth in Poland was 4.66% in average annually, which is similar to Brazilian. Most valuable contribution was consumption, which during 2004-2010 gave 2.24% in average annually. Investments and government spending contributed accordingly 1.34% and 0.97% in average annually. So far, it is almost Brazilian growth, but there is some difference in the last contributor. Net export in the same period reduced Brazilian GDP by 0.5% in average annually; at the same time in Poland, it contributed 0.11%, moreover it helped economy to grow during crisis: in 2009, net export gave 4.05% in GDP, so GDP increased 1.63% that year. Polish and Brazilian economic growth during 2004-2010 is very similar in terms of short run components; the only difference was contribution of net export, but it does not give full picture of difference between this countries.

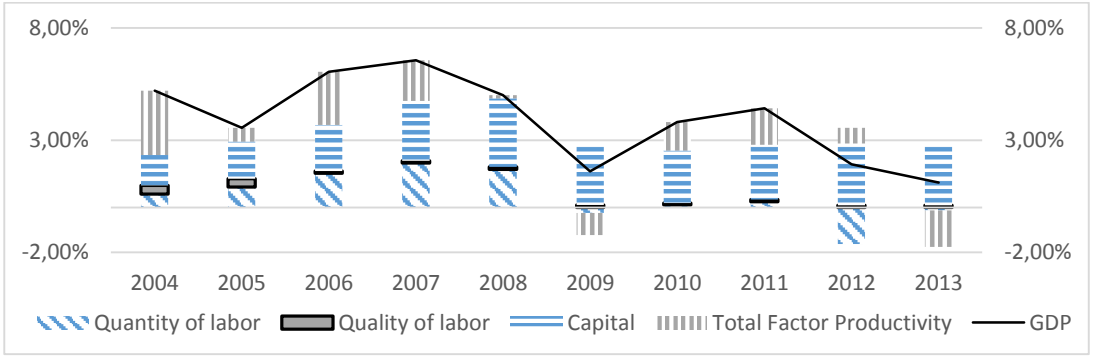
Source: the United Nations Statistics Division; author's calculations



Graph 3.1 GDP decomposition by expenditures for Polish economy 1999-2012

GDP growth structure of long-term factors in Poland during 2004-2010 differs from Brazilian. Solow's decomposition of GDP shows that main contribution was capital 2.27% in average annually; Total Factor Productivity and quantity of labor contributed 1.15% and 0.94% in average annually. Poland has both quantitative and quality factors of growth. In the same period in Brazil Total Factor Productivity contributed -0.14% in average annually, it is the main difference between these two countries long run growth determinants. Similarity is in influence of capital inflow that boosts GDP, with the only feature: Poland acquire capital mainly from EU. Polish growth is a result of investment in production efficiency and infrastructure, which is more that 75% of GDP (McKinsey, 2013).

Source: The Conference Board



Graph 3.2 Solow's decomposition for Polish economy 2004-2013

Conclusion

In the last 25 years, Brazilian economy grew rapidly during 1993-1997 and 2004-2010. These periods were analyzed using the short-term determinants from GDP decomposition by expenditures; it showed that there is not much difference between main contributors, except net export. GDP growth was mainly fueled by consumption of households and government expenditures. Relying on short-term growth determinants resulted in average annual growth 1.85% during after 2010. Long-term analysis, using Solow's decomposition, showed that growth factors during last 20 years did not change much in Brazilian economy. Moreover, there was no significant modernization of economy during all the period, which resulted in GDP growth rate reduction. In addition, other long-term factors showed that economy increase depends on capital inflow very much, and reduced greatly when capital inflow almost depleted.

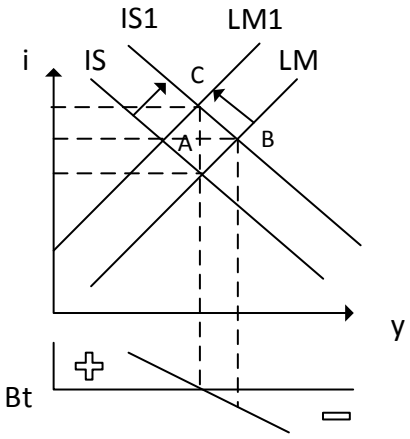
Comparing Brazilian economy with Polish showed that despite they grow similarly in terms of short-term analysis; there is a great difference when using long-term factors. Economy of Poland contributed more in production efficiency and infrastructure, on the other hand Brazilian growth was fueled by government stimulation through social programs. Polish approach proved its worth in 2009, during economic crisis, and gave 1.63% GDP growth, when Brazilian economy contracted only 0.33%. After economic crisis, during 2011-2013 economy of Poland grew relatively faster 2.48% in average annually comparing to 1.85% yearly increase in Brazil. If nothing changes this difference would increase more. Brazil need to improve its policy in order to make more contribution in quality factors, which will result in internal growth power.

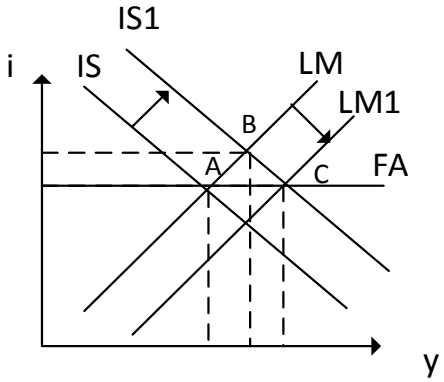
Bibliography

1. Burda and Wyplosz (2013), *Macroeconomics 6th edition*
2. Joyce, H (2013) *Special report on Brazil*, The Economist.
3. McKinsey Global Institute & McKinsey Infrastructure Practice (2013), *Infrastructure productivity: How to save $1 trillion a year*
4. The Economist (2007), *Special report on Brazil*

Appendix 1. IS-LM model for 1993-1997 period in Brazilian economy.

Standard macroeconomic model for short run IS-LM will help in understanding macroeconomic processes of Brazilian economy in 1993-1997. At first, level of economic openness should be determined for building correct model: in the given period Brazil had fixed exchange rate to USD at ratio near 1.3:1; there were no significant capital inflow in that period, therefore it is possible to suggest that capital mobility was closer to zero than to perfect. With the given options, standard model can be built as on graph 1.3. It shows that increase of government spending gives increase in GDP, interest rate, and import. Then, because of fixed exchange rate, central bank has to decrease money supply that result in decrease of GDP and further increase of interest rate. This model does not fully describe Brazilian economic situation because there it does not show GDP growth. In that time size of Brazilian economy was relatively small, it means that any serious capital inflow could influence economy strongly. That is why, even if there were hard capital movement restrictions, several inflows could force economy to behave like there were no restrictions. Changing capital mobility to perfect in model may provide more results that are precise. Exchange rate did not change much until 1999 that is why changing exchange rate in model is not appropriate option. That is the reason to move from zero capital mobility to perfect capital mobility, it can give macroeconomic model that describe Brazilian economy better. Graph 1.4 shows that fiscal stimulation: it gives GDP and interest rate growth; that leads to capital inflow; therefore, central bank has incentive to increase money supply. In the end interest rate, returns to starting level and GDP increased further. This model shows economic situation in Brazil more precise than previous one, because it shows growth of GDP.





Appendix 2. Sources of data

1. Nominal GDP and Deflator for Brazil and Poland for decomposition of GDP by expenditures is taken from United Nations Statistics Division: http://unstats.un.org/unsd/snaama/selbasicFast.asp
2. Solow's decomposition of GDP for Brazil and Poland is taken from The Conference Board: https://www.conference-board.org/data/economydatabase/index.cfm
3. Broad National Consumer Price Index (IPCA) of Brazil is taken from Central bank of Brazil: https://www3.bcb.gov.br/sgspub/localizarseries/localizarSeries.do?method=prepararTelaLocalizarSeries