

Internet services market across Europe during crisis: A study focused on low-income groups

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Abstract—The economical recession of the recent years has affected the economies of European countries and the welfare of their population and markets. In this paper, we focus on the northern and southern European population “at-risk-of-poverty” and study the impact of economical instability of the 2008-2015 period on their behaviour as consumers towards the offered Internet services basket. Intrigued by the contrasting profile of economies of the northern and southern countries, we have selected three representatives of each party (Germany, the Netherlands and Finland for North Europe and Spain, Portugal and Greece for South Europe) to provide a comparison analysis of the Internet services market for the poor during the economical crisis years. In order to obtain further insights, we also proceed to a comparison with the average consumer behaviour of poor population in Europe. Our findings suggest that Internet services can be either a basic need or luxury and that their demand is on the rise despite possible income reduction during crisis.

Index Terms—Internet, Europe, crisis, low-income, poverty.

I. INTRODUCTION

During the past decade, European countries faced a prolonged economical crisis, which has influenced the income stability and average welfare of European people [1]. A first wave of the economical recession appeared on a global level in 2008, compelling governments of even the wealthiest countries to come up with rescue packages to bail out their financial systems. Two years later, European countries entered a second crisis that erupted in the Euro area.

With economies of northern and southern European countries being already of different scales, the gap between them was further widened due to the economical recession. Southern countries, like Greece, were put under the supervision of financial institutions, e.g. International Monetary Fund (IMF), so as to follow indicated austerity policies. On the contrary, countries of healthy economies, such as Germany, enforced the financial support to the southern countries for the sake of European Union (EU).

Despite the adopted rescue measures, the economic downturn in Europe increased the income dispersion within its society, altering consumer behaviours in various market categories, including the one of Internet services. Internet services have been assessed in the past as a public good for the humanity [2], thanks to utilities that are believed to make a difference in the daily life. Indicative examples are cheap long-distance

communication, immediate access to emergency call numbers and job seeking. During the 2008-2015 period though, the percentage of the population living “at-risk-of-poverty”, i.e., the population living on a total equivalenced income below 60% of the median national equivalenced household income [3], fluctuated intensely. This in turn changed the perception of consumers towards basic and luxurious goods, as Internet services are. Thus, the *willingness to pay* for a good changed depending on the individual or family income.

Given the economical situation in Europe, the phenomenon raises questions about the extend that *willingness to pay* for having access to Internet of people “at-risk-of-poverty” changed within each European country. The noticed inequalities between the northern and southern European economies, raise even more questions on the different standards that may have been set for both people and market of Internet services. Thus, a necessity to make a solid estimation of the overall situation arises.

Relevant research works, referring to the ability to pay for Internet services by different consumer group categories, have been implemented in the past. However, their content was not on a European level [4] or was referring to a global scale [5], [6]. Focusing on works for the European area, [7] provides a detailed survey on the affordability of both mobile and fixed telecommunication by low-income people, but only for the United Kingdom (UK). Also, [8] refers to policy making and tariffing of mobile communications only to improve their affordability in specific European countries. Work of [9] is more general than the aforementioned ones, presenting results on the affordability of basic goods, such as water, transport and telecommunications, for various social groups of the European countries, including the low-income one. However, it proceeds to a comparison between EU of 15 (EU15) and 28 (EU28) countries so as to make its conclusions. Thus, no mention is made on the economy gap between northern and southern economies and the effects of crisis on the various socio-economic groups in relation to their access to Internet.

In our work, we aim to go beyond the state-of-the-art works by shedding light on the consumer behaviour of the “at-risk-of-poverty” population of north and south European countries towards Internet services. More specifically, in selected representative countries of north and south Europe, we

consider a basic basket of Internet services and proceed to a detailed analysis of the market for the 2008-2015 crisis period. Moreover, we provide a comparison of results between the two geographical groups and the average European situation.

The remainder of this paper is organized as follows: Section II and Section III present a general estimation of the European economies and the Internet services market, respectively. Our methodology of analysis is presented in Section IV, while the implementation of our analysis is presented in Section V. Finally, Section VI concludes our paper.

II. EUROPEAN ECONOMIES IN THE YEARS OF CRISIS

During the years 2008-2015 of the economical crisis, the scenery of European economies changed substantially, with intense differences arising between northern and southern European economies. We select and explain three representative cases from each party: (i) Greece (GR), Portugal (PT) and Spain (ES) for South Europe and (ii) Germany (DE), the Netherlands (NL) and Finland (FI) for North Europe.

South countries of GR, PT and ES were among those that were unable to refinance their debts and needed external financial aid to avoid a possible bail out and regain their financial stability [10], [11]. Despite being placed high enough in economic ranking of Europe before 2008 [12], governmental deficits and structural weaknesses led GR to (i) accept help from IMF, European Commission (EC) and European Central Bank (ECB) and (ii) apply extremely harsh austerity measures to deal with the situation. In the case of PT, bad strategies of Portuguese banks obliged the national economy to enter a serious financial crisis. Thus, the Portuguese government requested and eventually received support from EC and IMF. Finally, despite the fact that ES was one of the largest economies of the EU, a phenomenon of *housing bubble* was the main cause that brought Spanish banks in a financial situation of great losses [13]. With Spanish banks being unable to recover their losses, ES applied harsh measures to confront the situation and accepted support mainly from the EU.

With reference to the northern countries, DE, NL and FI are among the strongest and healthiest economies of Eurozone [6], [12]. From the part of EU, DE was one of the greatest supporters to the financial aid that was provided to the countries of need and continues having a strong economy. The economy of NL, even though it was slightly affected by the economical crisis due to a collapse in foreign trade and fixed investment, it is recovering to growth [14]. Finally, FI is a stable economy and has been able to recover from financial difficulties and provide support to fellow countries of EU.

III. INTERNET SERVICES AS A GOOD

Access to Internet has been characterised in the past as a public good thanks to its numerous utilities [2]. Personal well-being is its simplest and most common use. Transfer of knowledge, psychological entertainment, long-distance communication at a low-price are only some indicative examples. Other utilities are linked to information of vital importance, such as emergency or hospital call numbers. In addition, Internet services have been proved to be a tool of pivotal importance

for job seeking and employment. Companies and organisations may make on-line announcements for job vacancies, while job seekers can keep up with the demands and expectations set by employees. Moreover, unemployed individuals can remain updated with trading and customer demands in the case they aim at self-employment.

However, consumer behaviour towards a good, as Internet services are, is mostly affected by a variety of other factors, rather than its utilities. Focusing on Internet services market, the welfare of national economies is among the most important factors, since it affects not only the individual income, but also the welfare of telecommunication industry. When national economy is on well state, incomes are higher and industry is more active. Thus, consumers are in a better economical state as well and tend to demand having Internet access more. In addition, when the price of a good is lower, consumers tend to buy it more, since they devote to it a smaller part of their income. Lastly, the prices of substitute products, e.g., mobile Internet service, and the need for more basic goods, such as food and water, play also their role in changing the demand.

Based on the above, the vast socio-economical differences that appeared between the southern and northern economies of Europe changed to a different extend the perception of Internet services as a good. In the following section we will present the metrics we chose so as to obtain an holistic perception of the situation in the European area of the economical crisis era.

IV. METHODOLOGY OF ANALYSIS

In order to obtain further insights on the economical gap among the selected countries, we collected data that portray their economic situation during the period of our interest. Our data are based on the two following indicators:

- Gross National Income (GNI) per capita [15]: It is defined as the value of a country's total produced income in a year, counted in purchasing power parities (PPP)¹, divided by the total of its population. GNI per capita reflects the average income of a country's citizens for the studied year, including those who may own firms abroad. Consequently, it enables a better understanding of the strengths and needs of the studied economy, as well as the average welfare of a country's citizen.
- "At-risk-of-poverty" rate [3]: It is defined as the percentage of a country's population whose equivalenced disposable income is below the "at-risk-of-poverty" threshold. The latter is set at 60% of the national median equivalenced disposable income, according to European regulations. It is clarified that the "at-risk-of-poverty" rate is not an indicator of the wealth or poverty of the country's people, but a comparison among them based on their equivalenced disposable income. The magnitude of their wealth, which defines the standards of their living, is better expressed by the GNI per capita of the country.

In order to assess the changes in the Internet services market for the target socio-economical group, we collected data based on the following two indicators:

¹We used PPP as monetary value for the financial data of our study. PPP are currency conversion rates that equalize the purchasing power of different currencies by eliminating the price levels fluctuations among countries [16].

- Monthly Internet Price (MIP): It is the price (PPP) at the cost of which a basket of Internet services, i.e., a basic packet of Internet services, is offered by telecommunication industry. The content and MIP of such a basket may be different among countries. MIP is a criterion for telecommunication companies to plan their strategy so as to appeal low-income groups of people.
- Home Internet Access Rate (HIAR): It is the percentage of a country's population that has access to Internet at home via any type of device or connection. The individual income, the price of an offered packet and the national economical welfare critically determine the percentage of people who will eventually obtain access to Internet.

In order to evaluate the perception of Internet services as a good from people “at-risk-of-poverty”, we chose the two following well-known economic metrics [17]:

- Price elasticity of demand, E_P : It is the responsiveness of demanded quantity of a good to a change in its price, *ceteris paribus*. E_P is defined as

$$E_P = \frac{\Delta Q}{\Delta P}, \quad (1)$$

where ΔQ is the percentage of change in people's demand Q to obtain the offered good and ΔP is the noticed percentage of change in its price P . E_P represents the importance of the change of the price of a good for consumers. A good can be categorised differently depending on its value of E_P . In more detail, if

- $E_P = 0$: The quantity demanded Q is unchanged, regardless of price P , being thus *perfectly inelastic*.
- $0 < |E_P| < 1$: Q moves proportionately less than P , being thus *inelastic*.
- $|E_P| = 1$: Q moves the same amount proportionately as P , being thus *unit elastic*.
- $|E_P| > 1$: Q moves proportionately more than P , being thus *elastic*.
- $|E_P| \gg 1$: Q changes dramatically for very small changes in P , being thus *perfectly elastic*.
- Income elasticity of demand, E_Y : It measures how the quantity demanded changes as consumer income changes, *ceteris paribus*. E_Y is defined as

$$E_Y = \frac{\Delta Q}{\Delta I}, \quad (2)$$

where ΔI represents the respective percentage of change in income I . It is noted that there are three categories where a good can be filed in, depending on the E_Y value:

- $E_Y < 0$: A decrease or increase in I is associated with a rise or fall of Q of the good, respectively. In this case, the good is considered an *inferior good*.
- $E_Y = 0$: A decrease or increase in I is not associated with any change of Q . Thus, the good is considered a *sticky good*.
- $E_Y > 0$: A decrease or increase in I is associated with a fall or rise of Q , respectively. In this case, the good is considered a *normal good*.

A good can obtain a further characterization, depending on the magnitude of change in I . Thus, if:

- * $0 < E_Y < 1$: When I increases, Q rises conservatively. Thus, the good tends to be characterised as a *necessity good*.
- * $1 < E_Y$: When I increases, Q rises considerably. Thus, the good tends to be characterised as a *luxury good*.

It is noted that often elasticities between two points, e.g. A and B, can provide results with some divergence, depending on whether results are extracted from A to B or from B to A. A way to avoid such incidents is the midpoint method [17].

V. ANALYSIS STUDY

In the present section, we discuss the relation between European economies and Internet services market, based on the metrics described in Section IV. More specifically, Section V-A presents the assumptions of our study, while Section V-B provides our obtained results, along with a detailed evaluation.

A. Analysis Assumptions

For the implementation of our study, we selected three representative countries for North and South Europe, as described in Section II. For each of these countries, we consider an individual income I equal to GNI per capita. Moreover, we consider an “at-risk-of-poverty” threshold, η , equal to 60% of the national equivalenced disposable income, according to the European regulations [3]. In addition, given that we focus our study on the population “at-risk-of-poverty” that has access to Internet, the households observed in our study for HIAR are within the lowest income quartile, i.e., among the 25% of the lowest income observed in the studied country.

In order to study the Internet services market, we assume a basket that includes a standalone service of fixed broadband connection at the speed of 12 – 30 *Mbps*. We consider that an Internet services basket comes at a price P , equal to MIP and we study the market on an annual basis ($t = 12$ months).

Data for the indicators of GNI per capita, MIP and $HIAR$ for each country were extracted from the World Bank² and EC³. It is also clarified that for the extraction of the elasticity values, the midpoint method is used.

B. Analysis Evaluation

Fig. 1 portrays the the total change of indicators of GNI per capita and “at-risk-of-poverty” rate between 2008 and 2015 for all studied European countries and the average EU situation. As can be noticed, all studied cases indicate an increase in their GNI per capita, with the exception of GR. In the meantime, poverty levels in most cases were increased as well, especially for the southern countries. In detail, GR not only displayed *decrease* in its GNI , equal to 11.4%, but also the largest increase in the “at-risk-of-poverty” rates, equal to 27%. The combination of the two indicators indicate inefficiency of the applied austerity measures and project the necessity for a radical change in the strategy taken against crisis in GR. The remaining southern countries though, ES and PT, displayed an increase in both GNI per capita, 7.1%

²<http://data.worldbank.org/>

³<http://digital-agenda-data.eu/>

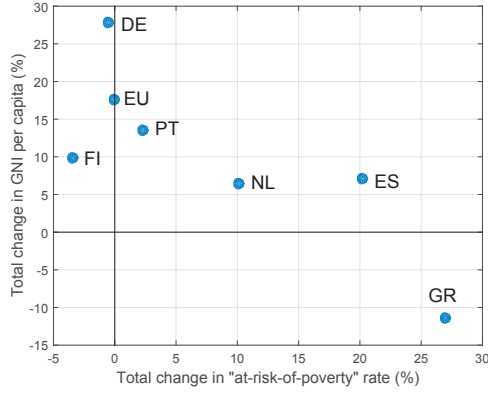


Figure 1. Changes in GNI and poverty rate.

and 13.6% respectively, and “at-risk-of-poverty” rates, 20.2% and 2.3% respectively. Even though both countries applied measures to deal with the crisis, PT responded better and increased its *GNI* more than ES. This was done also at the expense of only a small increase of poverty rate. Economy of ES seems to require a different approach against the crisis. On the other hand, the respective numbers of the northern countries are in a better overall position. DE had the highest change in its *GNI* per capita, 27.8% and a decrease of 0.5% in its “at-risk-of-poverty” rate. Thus, it is placed in the strongest position. Such an achievement can be attributed to an effective pay-off of the applied policies and a fairer distribution of the national income. In the case of FI, an increase of 9.8% in *GNI* per capita was achieved. Moreover, along with DE, they were the only countries that managed a decrease in their “at-risk-of-poverty” rates. FI even achieved a higher decrease, equal to 3.4%. Finnish numbers indicate foundations of a healthy economy. NL had a total increase of 6.4% and 10.1% in its *GNI* per capita and “at-risk-of-poverty” rate, respectively. NL had the smallest increase in *GNI* per capita among the northern countries. Finally, the EU average value for the *GNI* per capita is 17.6%. Interestingly, no change is noticed for its “at-risk-of-poverty” rates. This means that EU returns to pre-crisis numbers. However, this happened at the expense of an extended gap of “at-risk-of-poverty” rates between the northern and southern countries. Nevertheless, given that EU population is increasing, in real numbers, “at-risk-of-poverty” rates should be higher than the pre-crisis levels. Based on the above, it can be supported that northern economies benefited from the economical crisis and that the surplus of income was not equally distributed around Europe. The fact that northern countries entered the crisis with more developed economies is a factor that helped them have a high *GNI* per capita and maintain it during the crisis.

The relation of changes between *HIAR*-*GNI* per capita and *HIAR*-*MIP*, are expressed via the income elasticity E_Y and price elasticity of demand E_P , respectively, and can be observed in Fig. 2. More specifically, Fig. 2(a) shows the initial levels of *HIAR* in each studied case in 2008, Fig. 2(b) portrays the results of E_Y , whereas Fig. 2(c) corresponds to E_P .

In both elasticity figures, interesting is the case of GR, since it is the only country with a negative E_Y , equal to -14.22 , in

Fig. 2(b), while it has the second highest E_P , equal to 13.14, in Fig. 2(c). The negative E_Y is attributed to the decrease in the Greek *GNI* per capita, while it implies a simultaneous considerable increase in *HIAR* as well. Theoretically, this is in accordance with the fact that Internet services are classified as an inferior good for GR, according to Section IV. The value of E_P though, which classifies Internet services for Greek people as a good with a perfectly elastic demand in changes of price, explains the phenomenon as well. A considerable increase in *HIAR* could not co-exist with a decrease in *GNI* per capita, unless a decrease, of similar levels as the one of *GNI*, in *MIP* had taken place. Based on the above thus, Greek people continued buying Internet services despite the economical difficulties, because they considered it a necessity to their lives. Furthermore, it was facilitated by adjustment of prices and the low initial levels of *HIAR* at the beginning of the economical recession (Fig. 2(a)).

Similar are the results for ES and PT. In detail, they have high E_Y , equal to 13.49 and 9.68, respectively, while their E_P is equal to 1.63 and 3.18, respectively. Based on their E_Y and E_P , Internet services are characterised as a normal good for them with elastic demand on changes of price. Given the increase of their *GNI* per capita during the studied period (Fig. 1), *HIAR* of both countries was increased considerably. The high values of *HIAR* in combination with those of E_P for the two countries, indicate a significant improvement of prices as well. Based on the above, improvement of *HIAR* is linked to both changes of prices and income, which allows the classification of Internet services as a good of luxury for them. In explanation, Internet services are an element of comfort for them. Moreover, in both cases of ES and PT, initial levels of *HIAR* for their poor population in Fig. 2(a) are low. Thus, there was room for improvement of *HIAR* values.

Of the northern countries, interesting is the case of NL, which has $E_Y = 4.46$ and $E_P = 26.94$. In accordance with Section IV, Internet services are thus characterised as a normal luxury good with a perfectly elastic demand to changes of price for NL. The characterisation is justifiable though. To begin with, similarly to the other northern countries, NL had high *HIAR* to poor population in 2008 (Fig. 2(a)). Consequently, a small part of the poor population remained to be reached with Internet access. Given the value of E_Y and that NL had a conservative increase of *GNI* per capita, the smallest of northern countries (Fig.1), it is understood that increase in *HIAR* of NL was higher than the one of its *GNI*. The high value of E_P though implies only a tiny change (increase) in *MIP*. With NL having reached the majority of poor population and with an income on the increase, change of *HIAR* in NL is affected by changes of price. For this reason, it is concluded that Internet services in NL obtained a perfectly elastic demand to changes of price and reached the poor population mostly thanks to increase of income.

Finally, northern countries, DE and FI, have similarities as cases. More specifically, DE and FI have E_Y equal to 1.53 and 4.52 according to Fig. 2(b), respectively and E_P equal to 1.63 and 0.56 according to Fig. 2(c), respectively. The values of E_Y , make Internet services for them a normal luxury good. However, the values of E_P , make demand of Internet

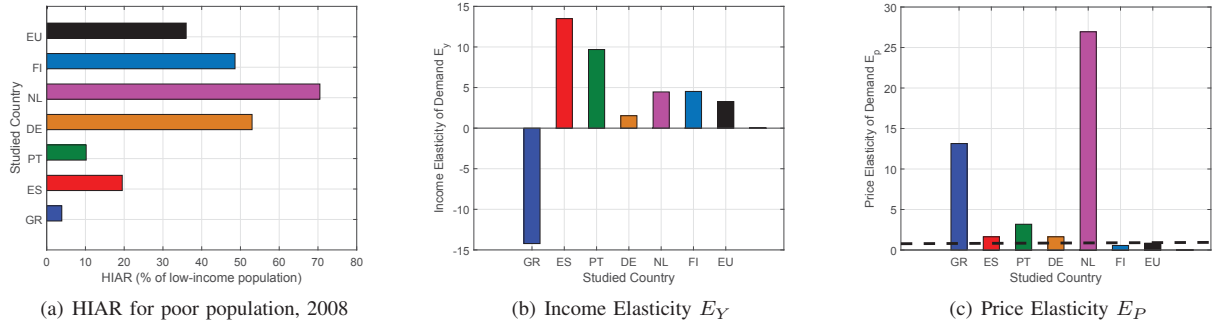


Figure 2. HIAR at the beginning of economical crisis vs. income and price elasticity of demand for the studied cases during the 2008-2014 period of crisis.

services elastic to changes of price for DE and inelastic for FI. On the one hand, such a value of E_Y for DE is justified, since (i) *HIAR* in 2008 was already high enough and (ii) DE had the greatest increase of *GNI* per capita (Fig.1). Thus, a respectable increase of *HIAR* was facilitated. The value of E_P indicates that *HIAR* increase was also accompanied by simultaneous change (drop) of prices. Consequently, poor German people embraced Internet services as an element of luxury, rather than an element of necessity. On the other hand, FI had similar *HIAR* in 2008 to DE, while its increase of *GNI* was considerably lower (Fig.1) than the one of DE. Thus, the difference of E_Y values between the two countries is justified. Also, an increase in *HIAR* is implied for FI, which still classifies Internet services as a good of luxury. The inelastic demand of FI is an outcome of a more considerable change of prices than the change of *HIAR*. Thus, poor Finnish people were mostly affected by changes of income.

The described conclusions on elasticities link the consideration of Internet services as normal good of luxury for most cases mainly thanks to improved income. This also coincides with the average EU values, $E_Y = 3.27$ and $E_P = 0.84$, which identify Internet services as normal luxury good with an inelastic relation of demand and *MIP*. The inelastic relation of demand and *MIP* though is mostly attributed to the vast gap of economies in European countries, that in turn differentiate the price of their Internet services basket.

VI. CONCLUSIONS

The economical recession of the past decade put the welfare of European economies put into question, widened a pre-crisis existing gap between southern and northern European economies and affected negatively multiple markets, as the one of Internet services. In our study, we chose three representative countries of northern and southern Europe to study the effects of economical recession on the perception of Internet services as a good by the population living “at-risk-of-poverty”. According to our findings, the individual income and the offered price of Internet services baskets differently define the Internet access levels, depending on the national economies. It was found that, during the studied crisis era, the average income was increased for all studied cases, except from Greece, which saw a dramatic drop of *GNI* per capita equal to 14.22%. Income increase was higher in northern countries, indicating an uneven distribution of income in Europe.

Moreover, telecommunication companies adjusted the price of their offers to people’s necessities, especially in southern countries. Internet services were thus mainly considered as a luxurious good with an elastic price of demand. Interestingly, in some cases, *HIAR* increased despite income and price fluctuations, due to the vitality of its characteristics for all social classes.

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REFERENCES

- [1] “Flash consumer confidence indicator for EU and euro area,” *European Commission*, Aug. 2016.
- [2] I. Kaul, I. Grunberg, and M. Stern, *Global Public Goods: International Cooperation in the 21st Century*. Oxford University Press, 1999.
- [3] A. B. Atkinson and E. Marlier, *Income and living conditions in Europe*. Eurostat European Commission, 2010.
- [4] R. Barrantes and H. Galperin, “Can the poor afford mobile telephony? Evidence from Latin America,” *Telecommunications Policy*, vol. 32, no. 8, pp. 521 – 530, 2008.
- [5] C. Milne, “Improving affordability of telecommunications: Cross-fertilisation between the developed and the developing world,” in *TPRC 2016*, Aug. 2006. [Online]. Available: <http://ssrn.com/abstract=2104397>
- [6] “Measuring the information society report 2015,” *International Telecommunication Union*, 2016.
- [7] FutureSight for Ofcom, “Affordability of essential communications services; A qualitative research study,” *European Parliamentary Research Service*, Jul. 2014.
- [8] L.-F. Pau, P. Puga, H. Chen, and Z. Kirtava, *Mobile Communications of the Needy and Poor: Affordability Indicators, European Data, Social Tariffs*. Springer Berlin Heidelberg, 2012, pp. 44–55.
- [9] D. Deller and C. Waddams, “Affordability of utilities services: extent, practice, policy; Research Paper 2: Utility Affordability in the EU; Based on Eurostat and ITU Data,” *European Parliamentary Research Service*, Oct. 2015.
- [10] International Monetary Fund (IMF), “The IMF and Europe,” Mar. 2016.
- [11] European Commission. [Online]. Available: http://ec.europa.eu/economy_finance/assistance_eu_ms/index_en.htm
- [12] Eurostat. [Online]. Available: http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_and_GDP
- [13] O. Akin, J. G. Montalvo, J. G. Villar, J.-L. Peydró, and J. M. Raya, “The real estate and credit bubble: evidence from Spain,” *SERIEs, Journal of the Spanish economic association*, Jul. 2014.
- [14] M. Masselink and P. van den Noord, “The global financial crisis and its effects on the Netherlands,” *European Parliamentary Research Service*, Dec. 2009.
- [15] *Measuring the real size of the world economy: The framework, methodology and results of the International Comparison Program (ICP)*. The World Bank, 2013.
- [16] R. Dornbusch, “Purchasing power parity,” *National Bureau of Economic Research Cambridge, Mass., USA*, 1985.
- [17] N. G. Mankiw, *Principles of microeconomics (fifth edition)*. South-Western, a part of Cengage Learning, 2009.