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Productivity Performance of the Service Sectors in European Union Countries

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Abstract

Economic development has resulted in structural transformation towards economies based on services, which has raised some concerns about the limited opportunities for sustaining productivity growth. The aim of this paper is to examine total factor productivity (TFP) growth in the service sector in comparison with total industries and the manufacturing sector, as well as within the service sector. The study is based on the data from the EU-KLEMS database (2017), and it covers the years 1995–2015. It refers to EU countries, making it possible to carry out a comparative analysis between countries, in particular between the 'old' and 'new' member states. The study demonstrates that productivity growth in services was significantly lower than in manufacturing, but compared with total industries, the disparity was not significant. Productivity growth was usually higher in the 'new' EU countries than in the 'old' ones, except for information and communications services, which, on the whole, were the main driving force behind the productivity growth in services.

Keywords: productivity, TFP, services, EU

JEL: O14, O47

Introduction

Each economy has a three-sector structure that undergoes transformations along with its economic development. The agricultural sector dominates in the first stage of economic development, the industrial sector dominates in the second stage, and the service sector dominates in the third stage. The process of sectoral transformation that can be observed since the second half of the 20th century can be characterized by the growth of the service sector. This has drawn much attention not only due to qualitative changes reflected in the growing share of the service sector in output and employment but also due to its dynamics in favor of the service sector. The growing importance of the service sector has also raised some concerns within the economic environment, because according to the three-sector model, technological progress and the resulting productivity growth in the service sector is low, compared to industry and even agriculture (Fourastie 1954), which limits the possibilities of productivity growth in economies based on services (Baumol 1967; Baumol et al. 1985, 1989). Moreover, there is a threat of the cost disease, defined as a relative increase in service prices as a result of growing wages in service industries (which do not experience productivity growth) in response to growing wages in other industries (experiencing productivity growth). This, in turn, could reduce the demand for services and economic growth, as well.

One should note, however, that in the light of this model, the growing consumer demand for services, along with their growing income, is the main driving force behind the structural transformation towards the development of the service economy. Moreover, due to the fact that consumer services consist mainly of traditional services with limited possibilities for productivity improvement, this threat seems to be justified. A significant disadvantage of this model is that it does not take into account the producers' demand for services, which also increases with technical progress and economic development. Increased interest in the role of producer services[1] has been visible only since the 1980s (a review of the literature in this field can be found in Wyszkowska-Kuna 2016). Producer services also consist of diversified activities; among them one can mention traditional services (i.e., labor-intensive services, which use new technologies to a small extent, generally low-paid, with poor social status, e.g., cleaning, security, catering), as well as those related to new technologies and knowledge (Wyszkowska-Kuna 2016). The second category can be characterized by higher possibilities for efficiency growth and the growing use by different industries along with the structural transformation towards economies based on knowledge and innovation. What is also worth mentioning is that these services contribute to higher productivity performance in other industries using them (Wyszkowska-Kuna 2016), which removes the threat of the stagnation of overall productivity growth in the economy. Some new

1 'Producer services', including financial services, insurance, real estate and business services, are a sub-category of intermediate services that also comprise 'distributive services', i.e.,: transport and storage, communications, retail and wholesale services (Browning and Singelman 1978).

opportunities for productivity growth in services also resulted from the development of ICTs that have been widely introduced into industries such as banking, communications, telecommunications, transport, insurance, education, science, and healthcare (Szukalski 2001; Skórska 2012; Wyszkowska-Kuna 2016). Finally, one should note that the creation of the EU KLEMS and WIOD databases has made it possible to study the productivity performance of services in developed countries, including EU countries, as well as to work on more complete and comparable data between countries.

The study tries to answer the question of whether the opportunities for productivity growth in services have increased along with the information and communications technology (ICT) revolution, the growing role of the knowledge-intensive business services (KIBS) sector, and the improved availability of relevant data for service industries. The study is based on data derived from the EU KLEMS database (2017) and it refers to nineteen EU countries for which it is possible to calculate TFP growth (because of the lack of data on capital input for Belgium, Ireland, Portugal, Bulgaria, Latvia, Croatia, Cyprus, Malta, and Romania, these countries are excluded from the study). The analyzed period covers the years 1995–2015, and it is divided into three sub-periods: 1995–2007 (the pre-crisis period), 2008–2010 (the crisis period), and 2011–2015 (the post-crisis period). In the case of some countries, this period is shorter because of the lack of data. To compare the results for the 'old' and 'new' EU member states, weighted averages for EU–12 and EU–6/7[2] are calculated.

The paper is organized as follows. Section 2 reviews the related studies. Section 3 describes the methodology and the data source. Section 4 presents and discusses the empirical results. Section 5 concludes.

Literature review

Since the 1990s, the number of papers on productivity growth in services has increased, but they generally proved that productivity improvement in services is harder to be achieved than in goods-producing industries (Baumol 1967, 2002; Mairesse & Kremp 1993; Licht & Moch 1999; Ark et al. 1999; Triplett & Bosworth 2001, 2003; Wolff 2002; Grönroos & Ojasalo 2004; Baláž 2004; Sahay 2005; Djellal & Gallouj 2008; Savona & Steinmueller 2013; Biege et al. 2013; Grassano & Savona 2014; Growiec et al. 2014).

While discussing the subject literature, studies indicating the problems with productivity measurement in services should be mentioned. Productivity measurement concepts have been deeply rooted in the context of mass manufacturing. They are based on contrasting input and output. Measuring service input and output raises new challenges due to the peculiarities of services, such as intangibility, heterogeneity, inseparability, and perishability. The customer is always a part of the service, and hence,

2 In case of the two first periods, the study refers to six of the 'new' member states due to the lack of data for Hungary.

customer actions need to be considered on the input side. Consequently, quantifying customer co-operation is necessary (Blois 1985; Grönroos 1990). Furthermore, service readiness, which is the major prerequisite of service delivery, also needs to be incorporated into measuring productivity. Finally, the problem of how to include quality in the analysis of the productivity of service operations arises (Vuorinen et al. 1998; Sahay 2005).

There are even more challenges if we intend to incorporate innovativeness and knowledge intensity of services into an adequate productivity measurement. Traditional productivity measurement concepts, as well as service-oriented concepts, will privilege less innovative products and services due to their steady-state of production and delivery. Hence, controlling merely by operating figures derived from existing productivity measurement concepts will mislead entrepreneurial decisions. The same statement can be made for knowledge-intensity, as one of the major input factors of productivity is employee, customer and third party knowledge, which is hard to quantify in existing productivity measurement concepts (Biege et al. 2013).

Finally, Hershey and Blanchard (1980) warn that problems can result from concentrating on increased productivity defined as output. They suggest the effectiveness of the firm is a better productivity measurement, with effectiveness individualized by an organizational decision as to goals and objectives. This is similar to a value-added measurement schema. The value-added concept provides an index for monitoring the effectiveness of the effort put in by the employees in achieving market position (Vrat et al. 1998). In line with such an approach, in the present study, TFP is calculated based on value-added.

Due to the above-mentioned problems, there is a high probability that the productivity changes in services will be underestimated. On the other hand, with the improvement of measurement methods, more adequate results for productivity growth in service industries can be expected. As we can find out from the study by Triplet and Bosworth (2003) in the U.S.A., the post–1973 productivity slowdown was greater in the tertiary sector than in manufacturing, while during the mid–1990s, service industries on average did about as well as the rest of the economy, both in their average rate of labor productivity growth and in their post–1995 acceleration. They concluded that perhaps the services industries were never sick, it was just that the measuring thermometer was wrong. The recently developed databases (EU KLEMS and WIOD) have created some new opportunities to verify this hypothesis. One should note, however, that the problems with measuring service output are also mentioned in the methodological explanations to these new databases (O'Mahony & Timmer 2009). They are still visible in areas such as financial or business services, real estate activities,[3] and in particular, in public services (such as public administration, health care, education, etc.), where there are no market prices that are necessary to aggregate the output/value-added coming from different divisions. Finally, the risk of lower reliability of data on service industries than

3 Data for the division Real estate should be interpreted with caution, because the majority of output in this area constitutes rent assigned to the owners of rented apartments.

on manufacturing industries should be mentioned. This is due to the fact that when constructing these databases, a variety of additional data sources were used, which are generally less numerous and often more incomplete in the case of service industries.

Data and methodology

In the present paper, the growth accounting framework is used to calculate changes in total factor productivity (TFP). The methodology of the decomposition of output or value-added volume growth was theoretically motivated by Jorgenson and Griliches (1967) and put in a more general input-output framework by Jorgenson et al. (1987). The advantage of this methodology is the ability to assess the contribution of all inputs to aggregate economic growth and changes in TFP. The starting point for the analysis is production possibility frontiers, where industry value-added (VA) is a function of capital and labor inputs and technology, which is indexed by time (*T*). Each industry (indexed by *j*) purchases a number of distinct capital and labor inputs to create its value-added. The production function is given by:

$$VA_j = f_j\left(L_j, K_j, T\right), \tag{1}$$

where: *VA* – is value-added; *L* – is an index of labor service flows; *K* – is an index of capital service flows.

Value-added is expressed in producer prices, and the costs – in purchaser prices. Under the assumptions of competitive factor markets, full input utilization, and constant returns to scale, the growth of value-added in the period between any two discrete points, say *t* and *t* –1, can be expressed as the cost-share weighted growth of inputs and technological change A^Y (Jorgenson et al. 1987, pp. 32–40; O'Mahony & Timmer 2009, p. 376):

$$\Delta lnVA_j = \overline{v}_j^L \Delta lnL_j + \overline{v}_j^K \Delta lnK_j + \Delta lnA_j^Y, \tag{2}$$

where v^i denotes the two period average share of input *i* in nominal output, defined as follows:

$$\overline{v}_j^L = \frac{1}{2}\left[\frac{P_{jt}^L L_{jt}}{P_{jt}^{VA} VA_{jt}} + \frac{P_{jt-1}^L L_{jt-1}}{P_{jt-1}^{VA} VA_{jt-1}}\right], \tag{3}$$

$$\overline{v}_j^K = \frac{1}{2}\left[\frac{P_{jt}^K K_{jt}}{P_{jt}^{VA} VA_{jt}} + \frac{P_{jt-1}^K K_{jt-1}}{P_{jt-1}^{VA} VA_{jt-1}}\right], \tag{4}$$

and: j = (1, 2, …, n), and $\overline{v}^L + \overline{v}^K = 1$.

Each element on the right side of equation (2) indicates the proportion of value-added growth accounted for by growth in capital services, labor services, and technical change. Technical change is measured by TFP.[4]

This method can be applied to the decomposition of value-added growth, not only in each industry but also with respect to total industries.

To assign VA volume growth in the EU countries (EU KLEMS 2017) to the contributions of labor input, capital input, and TFP, average annual growth rates of each input volume should first be calculated, and then they should be weighed by average shares of their costs in VA value.

Labor input is the number of hours worked by the people engaged (EU KLEMS 2017). The category "people engaged" is broader than the category "employees", because it includes, in addition to employees, self-employed workers (Timmer et al. 2007, p. 25).

Capital input is the value of real fixed capital assets in 2010 prices multiplied by the number of hours worked per person engaged (EU KLEMS 2017). The number of hours worked per person engaged is used as an indicator that shows the shift-factor, i.e., the degree to which capital assets are used in the analyzed period, depending on the economic situation.

Labor compensation is the compensation of all people engaged, while capital compensation (EU KLEMS 2017) is derived as gross value added minus labor compensation (O'Mahony & Timmer 2009, p. 380).

The data needed for the decomposition of VA volume growth are available in two databases, i.e., the EU KLEMS and the WIOD, both developed by the European Commission as a part of the EU 7th Framework Programme. In the present study, data from the EU KLEMS database are used due to the availability of data on capital investments for the analyzed period.

Empirical results

The TFP growth rates presented in this section are calculated for the whole service sector (services – S), as well as for individual service industries, i.e., wholesale and retail trade; the repair of motor vehicles and motorcycles (G); transportation and storage (H); accommodation and food service activities (I); information and communications (J), including publishing, audiovisual and broadcasting activities (J58–60), telecommunications (J61), and IT and other information services (J62–63); financial and insurance activities (K); real estate activities (L); professional, scientific, technical, administrative and support service activities (M–N); public administration and defence; compulsory social security (O); education (P); health and social work (Q); and arts, entertainment, recreation, and other service activities (R–S). The TFP growth rates for

4 Jorgenson et al. (1987) used the term "changes in productivity," whereas O'Mahony and Timmer (2009) used "multifactor productivity," but they both mean the same as "total factor productivity."

services are compared with the TFP growth rates for the following groups of industries: total industries (TOT); agriculture (A); mining and quarrying (B); manufacturing (C); and construction (F). The TFP growth rates are also calculated for two other groups of services, i.e., MS (market services) – excluding public services, i.e., without O, P, and Q; and KIBS – including J62–63 and M–N.[5] The data for MS are presented due to the above-mentioned problems with measuring service output in public services, whereas for KIBS, it is due to their growing importance in modern economies (Wyszkowska-Kuna 2016).

The values of the average annual TFP growth rates in the EU–12 and EU–6/7 presented in Graphs 1–2 show that productivity growth in the service sector was lower than in the total economy. In the EU–12 the disparity was not high, as the TFP growth rate in services accounted for about 75% of the TFP growth rate in total industries. One should note, however, that while taking into account only MS, the disparities were even smaller, because the TFP growth rate in MS was higher than in services, as well as higher than in total industries. The crisis period was an exception as, at the time, the negative growth rate of TFP in MS was twice as high as in services, and at a similar level as in total industries. In the EU–6/7 countries, the situation was slightly different. In the pre-crisis period, the TFP growth rate in MS was higher than in services and accounted for 82% (in services 75%) of the TFP growth rate in total industries. During the crisis period, productivity decreased both in services and MS (in MS to a larger extent), while in total industries, it was still on the increase. In the post-crisis period, a slight decline prevailed only in services, and the disparity slightly increased in comparison with the pre-crisis level.

A more significant gap is visible while comparing TFP changes in services and manufacturing. In the pre-crisis period, productivity in manufacturing increased much faster than in services: in the EU–12 countries, it was 4-times faster (in comparison with MS, 2.5-times), and in the EU–6, 3-times faster. In the EU–12 countries, there was a tendency to decrease this gap. As a result, in the post-crisis period, the TFP growth rate in services was 78% lower than in manufacturing (in the case of MS, only by 20%). In contrast, in the EU–6/7 countries, the tendency was the reverse, and as a result, the TFP growth rate in manufacturing became nearly six times higher than in MS (in comparison with services, the gap was even bigger).

The study of the TFP changes in the three subsequent periods shows the negative impact of the recent financial crisis on productivity in services – in the EU–12, the negative TFP growth rate in services occurred only in the crisis period, and in the last period, it nearly recovered to the pre-crisis level. In turn, in the EU–6/7, the decline of TFP persisted throughout both periods after the outbreak of the crisis, but with a downward trend (a positive growth rate of TFP returned only in MS). The situation was different

5 KIBS should only include the following divisions: legal and accounting activities; activities of head offices; management consultancy activities (M69–70); architectural and engineering activities; technical testing and analysis (M71); scientific research and development (M72); advertising and market research (M73), but the relevant data is available only for the whole category M–N.

in manufacturing, where a positive growth rate of TFP sustained throughout the entire period, although after the outbreak of the crisis, it was much lower than before the crisis. These results differ from the findings of the study by Ark and Jäger (2017), which show that productivity growth in manufacturing was particularly hard hit by the recent financial crisis. The difference probably derives from the fact that in the present study, the shift factor (described in section 3) was taken into account when calculating capital input. In the EU–6/7, the downward trend also persisted in the post-crisis period, but on the whole, the post-crisis growth rates were much below their pre-crisis levels in both groups, which is in line with the findings by Ark and Jäger (2017).

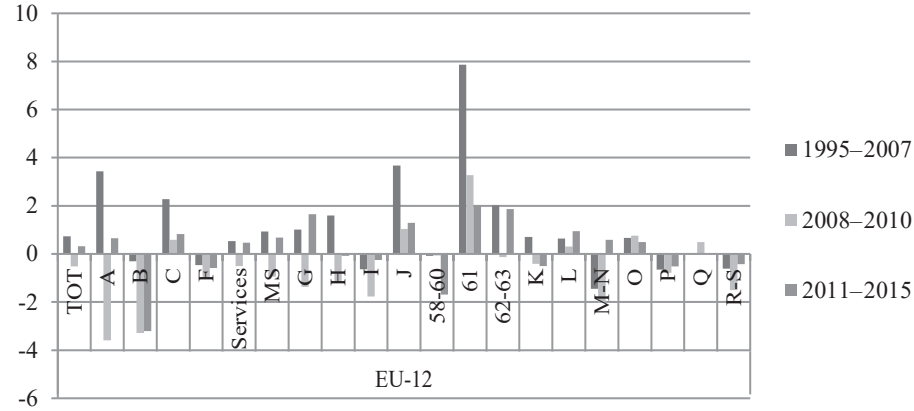

Figure 1. Average annual TFP growth rates in the EU–12 in the period 1995–2015 (in pp)
Source: own calculations based on data derived from EU KLEMS 2017.

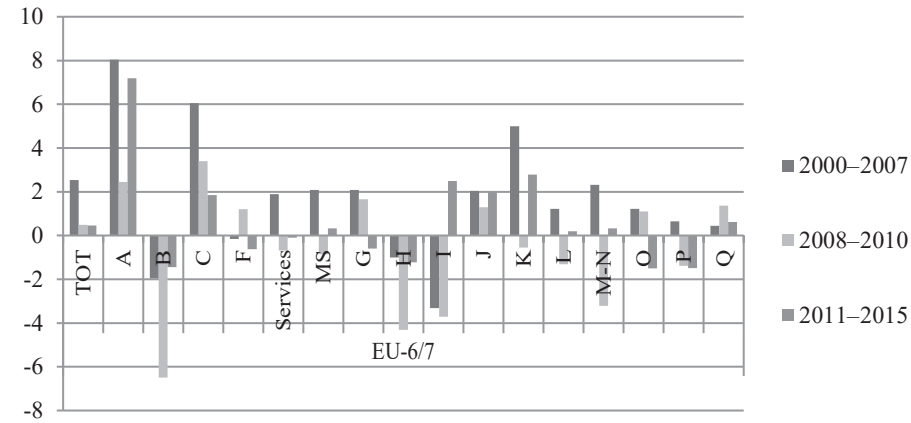

Figure 2. Average annual TFP growth rates in the EU–6/7 in the period 2000–2015 (in pp)
Source: own calculations based on data derived from EU KLEMS 2017.

A strong tendency to increase productivity was visible in agriculture. In the EU–6/7 countries, the agricultural sector recorded the largest increase in productivity, which

sustained throughout the entire period. In the EU–12 countries, agriculture also recorded the strongest increase in productivity, but only in the pre-crisis period, while during the crisis it suffered from the highest decline of productivity. The mining sector recorded a significant drop in productivity throughout the whole analyzed period, and a downward trend also prevailed in construction (except for the crisis period in the EU–6/7 countries).

Generally, higher productivity growth rates could be observed in the EU–6/7 rather than the EU–12 countries, which is in line with the process of the less developed EU countries catching up with the more developed ones, and the resulting higher growth rates of output/value added and productivity in the less developed EU countries.

Within the service sector, information and communications services (J) deserve particular attention, as they experienced impressive productivity growth throughout the whole analyzed period, although with a downward trend. This means a continuation of productivity growth in this area since the 1980s (Maroto-Sanches and Cuadrado-Roura 2011). What is more, in the EU–12 countries, the productivity growth in this section was higher than in manufacturing (in the EU–6/7, such a situation took place only in the last period), as well as higher than in the earlier period (not covered by the present study). The EU–12 countries recorded a higher productivity growth rate in this field than the EU–6/7, but there was a tendency to decrease this disparity. In the case of the EU–12 countries, the data are available for individual divisions within section J, which shows that, division 61 was the main driving force behind the productivity growth in this area – the TFP growth in this division reached the highest value in the whole economy, and it persisted even during the crisis period. Divisions 62–63 also recorded relatively high productivity growth, although they did not avoid a slight decline during the crisis period. The general trend of productivity growth is also visible in the following sections: Q, O, G, and L, while downward trends prevailed in sections I, H, P, J58–60, and R–S. When compared with the results of previous studies in this field (Breitenfellner and Hildebrandt 2006; Maroto-Sanches and Cuadrado-Roura 2011), one can notice that productivity was still on the increase in distributive services (G). The situation was the reverse in transportation and storage (H), as a positive TFP growth rate was sustained only in the EU–12 during the pre-crisis period, whereas it declined significantly in the EU–6/7. One should also note that real estate services (L) managed to sustain productivity growth in the periods covered by the present study, but it was much lower than labor productivity growth in the years 1983–2003, particularly with respect to the 'old' EU countries. In the case of other sections, productivity growth was intertwined with its decline. In the EU–6/7, financial services (K) deserve attention as they recorded the highest productivity growth within the whole service sector (except for the crisis period). In turn, in the EU–12, a slight increase in this field is visible only in the pre-crisis period, whereas in the years 1983–2003, productivity growth in the EU–12 was among the highest.

Table 1. Average annual TFP growth rates in the EU–12 in the period 1995–2015 (in pp)

Country	AUT			DNK			FIN		
Time	95–07	08–10	11–15	95–07	08–10	11–15	95–07	08–10	11–15
TOT	1.2	–0.3	0.6	0.4	0.6	0.8	2.4	–1.6	–0.7
C	2.6	–2.4	0.7	1.3	1.4	3.1	6.4	–4.5	–0.6
S	0.6	0.8	0.3	0.2	0.4	0.8	0.8	–1.2	–0.6
MS	0.6	0.3	0.3	0.2	1.0	0.5	1.3	–1.5	–0.5
J	2.1	–1.7	–0.7	5.4	3.3	6.6	6.1	3.7	4.1
58–60	3.0	–5.3	–0.3	1.9	–0.7	6.1	2.0	–1.4	–2.8
61	1.2	–1.1	–1.9	10.7	3.7	12.8	11.7	12.7	7.3
62–63	2.3	–1.5	–0.9	5.2	6.1	2.9	2.8	0.1	3.3
M–N	–0.4	0.4	0.0	–2.6	–2.3	2.2	0.1	–3.2	–0.5
KIBS	–0.1	0.2	0.1	–1.9	–0.6	2.3	0.6	–2.7	1.1
Country	FRA			GER			GBR		
TOT	0.8	–0.6	0.6	1.3	–0.6	0.5	0.9	–0.1	–0.3
C	2.9	1.9	1.1	3.1	1.1	0.5	2.3	1.8	–0.1
S	0.6	–0.6	0.7	0.9	–1.1	0.6	0.9	0.3	0.2
MS	2.0	–1.0	0.3	1.3	–2.0	0.8	1.1	0.6	0.7
J	2.7	–1.7	1.0	4.8	1.5	2.5	5.7	2.8	0.4
58–60	1.2	–1.4	–1.0	0.6	1.7	–1.5	2.3	–1.7	1.6
61	7.0	–2.0	3.6	9.2	8.1	4.7	10.8	2.6	–3.3
62–63	0.1	–1.9	0.7	3.8	–1.0	3.9	3.6	4.5	1.3
M–N	–1.3	–1.9	–0.4	–2.6	–3.8	0.7	1.7	0.2	2.2
KIBS	–1.1	–1.9	–0.2	–2.0	–3.5	1.5	2.2	1.0	2.1
Country	GRC			ITA			LUX		
TOT	1.1	–1.8	–0.8	0.0	–0.9	0.3	0.6	–0.7	0.1
C	1.0	–4.6	1.1	0.5	0.2	1.0	1.4	–3.8	8.5
S	0.8	–2.4	–0.8	–0.1	–0.8	0.1	0.5	–0.6	–0.3
MS	0.4	–4.5	1.7	–0.2	–0.8	0.2	0.5	0.1	–0.5
J	3.7	–4.5	–6.2	2.5	1.7	–1.3	1.5	6.7	0.3
58–60	–2.4	–4.6	–12.9	–0.9	0.4	–7.0	–6.5	2.0	7.6
61	7.4	–8.9	–4.4	5.9	3.0	–2.2	5.3	11.2	–9.2
62–63	–10.1	–0.3	–5.6	0.4	0.1	1.5	–	–	–
M–N	–3.8	–13.9	–6.6	–2.7	–1.9	–0.7	–4.4	–4.7	0.1
KIBS	–4.0	–13.2	–6.5	–2.3	–1.6	–0.3	–	–	–
Country	NLD			ESP			SWE		
TOT	0.8	–0.6	0.7	–1.2	0.2	0.6	1.1	–1.4	0.1
C	2.8	–1.3	0.6	0.0	–0.6	3.0	4.0	1.3	–1.1
S	0.7	–0.2	0.8	–0.4	0.2	0.7	0.4	–1.4	1.2
MS	1.0	–0.9	0.9	–0.6	–0.7	1.1	1.1	–2.5	2.2
J	5.2	0.4	1.9	–1.4	1.8	3.6	3.1	2.2	2.5
58–60	0.8	–1.7	–1.4	–7.2	5.0	–3.8	0.8	–3.9	1.2
61	10.5	2.0	0.8	1.5	4.0	7.6	7.3	8.4	4.8
62–63	2.4	–0.8	3.3	2.1	–3.9	1.4	0.4	1.1	0.8
M–N	–0.7	–1.2	1.0	–4.6	–0.8	1.3	0.6	–0.8	1.8
KIBS	–0.3	–1.1	1.5	–3.8	–1.0	1.3	0.6	–0.4	1.8

GBR – 1997–2007 and 2011–2014; GRC, ITA, SWE – 2011–2014; NLD – 2000–2007
Source: own calculations based on data derived from EU KLEMS 2017.

As far as productivity changes in individual EU–12 countries are concerned (Table 1), Austria, Denmark, and the United Kingdom recorded productivity growth in services throughout the whole analyzed period, and these countries achieved the best results in this area. The TFP growth rates in services were generally lower than in manufacturing. The opposite situation took place only in the post-crisis period in the Netherlands and Germany, whereas in Austria and Spain (in the crisis period), as well as in Sweden and the United Kingdom (in the post-crisis period), the productivity growth in services was accompanied by its decline in manufacturing. In most countries, productivity decline occurred only during the crisis period, and more countries experienced a productivity decline in services than in manufacturing (8 and 6, respectively).

Table 2. Average annual TFP growth rates in the EU–7 in the period 1995–2015 (in pp)

Country	CZE			EST			LTU			HUN
Time	95–07	08–10	11–14	00–07	08–10	11–14	00–07	08–10	11–14	11–14
TOT	1.7	–1.1	1.1	1.8	0.5	0.9	4.5	–3.6	2	1.3
C	4.8	1.3	–0.4	0.7	3.9	3.5	5	0.9	4.4	0.3
S	0.6	–1	1.7	2.7	–1.2	0.4	2.8	–4	1.9	1
MS	0.7	–1.6	2.4	4.2	–0.5	1.1	2.9	–4.8	1.4	0.9
J	0.6	–0.6	1.7	–0.3	2.1	5.4	0.5	2.9	3.7	0.2
58–60	2.6	0.9	2.6	–	–	–	–	–	–	–
61	–1.3	–0.7	5.9	–	–	–	–	–	–	–
62–63	0.7	–3.7	–3.2	–	–	–	–	–	–	–
M–N	–0.8	–4.6	0.6	6.1	–2.0	–1.3	7.2	–11.4	0.8	–4.0
KIBS	–0.2	–4.1	0.1	–	–	–	–	–	–	–
Country	POL			SVK			SVN			–
Time	03–07	08–10	11–14	04–07	08–10	11–15	00–07	08–10	11–15	–
TOT	2.9	2.3	–0.3	5.3	–1	1.3	3.3	–2.2	0.5	–
C	8.4	5.3	2.2	8.4	6.5	5.9	5.3	–0.2	1.1	–
S	2.7	–0.2	–1.2	3.5	–1	0.3	1.5	–2.6	0.3	–
MS	3.1	0.02	–0.8	2.4	–2.2	1.2	2.1	–2.8	0.7	–
J	2.5	2.8	2.8	6.4	0.9	–0.3	3.6	–2.3	1.0	–
58–60	–	–	–	17.9	–2.2	–3.1	–	–	–	–
61	–	–	–	0.7	–6.5	–0.1	–	–	–	–
62–63	–	–	–	13.8	10.0	–4.8	–	–	–	–
M–N	2.5	–2.9	0.4	12.1	–3.3	–0.6	–2.4	–2.7	1.1	–
KIBS	–	–	–	12.4	–1.1	–1.3	–	–	–	–

Source: own calculations based on data derived from EU KLEMS 2017.

The EU–6/7 countries (Table 2) usually also suffered from productivity decline in services only during the crisis period. In the pre-crisis period (2000/03–2007) the highest TFP growth rates can be attributed to Slovakia, Lithuania, Estonia, and Poland, while in the post-crisis period – to Lithuania and the Czech Republic. During the crisis period, the highest productivity decline in services occurred in Lithuania,

while in Poland a downward trend persisted through the post-crisis period. In turn, productivity in manufacturing was on the increase throughout the whole analyzed period, and a slight decrease occurred only in the Czech Republic (in the post-crisis period) and in Slovenia (in the crisis period). On the whole, the TFP growth rates in services were much lower than in manufacturing, and there was no tendency to decrease these disparities.

If we take into account the TFP changes in MS, they were generally more considerable than in services.

In the case of section J, the periods of TFP growth clearly dominated, and in nine countries, the growing trend sustained throughout the whole analyzed period. Denmark and Finland recorded the highest TFP growth rates, as well as Poland among the EU–6/7 countries. TFP changes were generally smaller in the 'new' EU member states than in the 'old' ones. Austria and Greece were the only two countries where a downward trend continued over the last two periods.

What seems surprising is the productivity decline in the KIBS sector in most EU–12 countries. What is more, the negative growth rates in this field were quite significant, and in some countries, they occurred throughout the whole analyzed period (France, Greece – the largest drop overall, and Italy). An exception is the United Kingdom, which experienced a constant and significant increase in productivity in the KIBS sector. In most cases, productivity drops in the KIBS sector resulted from the negative TFP growth rates in sections M–N, although in several countries during the crisis period productivity also declined in divisions 62–63. With respect to the EU–6/7 countries, the TFP growth rates for the KIBS sector were calculated only for the Czech Republic and Slovakia due to the lack of relevant data for divisions 62–63. In the Czech Republic, the situation was similar to that in the EU–12. In turn, Slovakia recorded a very high TFP growth rate in both KIBS fields, much higher than in other countries, but only in the pre-crisis period (in divisions 62–63, also in the crisis period). In section M–N, a downward trend prevailed in most countries.

Conclusions

The study carried out in the present paper shows that productivity growth in services was significantly lower than in manufacturing, but compared to total industries, the disparity was not significant (in the EU–12 in the post-crisis period, the TFP growth rate in services was even higher than in total industries).

While taking into account only market services, the TFP growth rates were usually higher than in total services, which confirms more significant problems with measuring productivity in the case of public services. The TFP growth rates were generally higher in the 'new' EU member states than in the 'old' ones, which is in line with the process of the less developed EU countries catching up with the more developed ones,

and the resulting higher growth rates of output/value added and productivity in the less developed EU countries.

Information and communications services were an exception, as the 'old' EU countries achieved better results in productivity growth in this field than the 'new' ones. Information and communications services appeared to be the only category where TFP increased for all three periods in both groups of countries. The TFP growth rates in this area were among the highest, but a downward trend can already be noticed.

The situation was the reverse in professional, scientific, technical, administrative, and support service activities. The problem with this section is that we cannot exclude less knowledge-intensive services (N77–82). On the other hand, the productivity decline in this field seems to be in line with Baumol's unbalanced growth model (2002), with R&D services included to study the effects of the stagnation of labor productivity in R&D on the long-turn GDP growth. R&D services are similar to KIBS, as they combine a 'progressive' input (input characterized by higher productivity than the average in the economy) and a 'stagnation' input (in the form of intellectual work) (Desmarchelier et al. 2013). As Baumol (2002, p. 153) noted: "The act of thinking is a crucial input for the research process, but there seems to be little reason to believe that we have become more proficient at this handcraft activity than Newton, Leibnitz or Huygens." Assuming that there is an economy-wide single wage rate and that it increases at the average productivity rate, progressive input costs will decrease, while the stagnant input costs will increase, making R&D and KIBS activities more and more expensive. Thus, one should note that while R&D and KIBS services contribute to productivity growth in other industries using them (Wyszkowska-Kuna 2016), they are less likely to experience productivity growth on their own.

The recent financial crisis negatively affected productivity growth in both services and manufacturing. The productivity decline usually occurred only during the crisis period, but on the whole, the TFP growth rates have not recovered to pre-crisis levels in most EU countries. In the 'new' member states, the services sector was more significantly hurt by the crisis than the manufacturing sector.

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Streszczenie

Produktywność sektora usług w krajach Unii Europejskiej

Rozwój gospodarczy przyczynił się do transformacji strukturalnej w kierunku gospodarek usługowych, co zrodziło obawy związane z możliwościami utrzymania wzrostu produktywności. Celem niniejszej pracy jest zbadanie wzrostu łącznej produktywności czynników produkcji (TFP) w sektorze usług w porównaniu z gospodarką ogółem i sektorem przetwórczym, jak również wewnątrz sektora usług. Badanie przeprowadzono w oparciu o dane pochodzące z bazy EU-KLEMS (2017) i obejmuje ono lata 1995–2015. Badaniem objęto kraje UE, co daje możliwość analizy porównawczej między krajami, a w szczególności między krajami 'starej' i 'nowej' UE. Z badania wynika, że wzrost produktywności w usługach był znaczenie niższy niż w przetwórstwie, ale w porównaniu z gospodarką ogółem różnica nie była już znacząca. Wyższy wzrost produktywności notowały kraje nowoprzyjęte do UE niż kraje starej UE, z wyjątkiem usług informatycznych i komunikacyjnych, które ogólnie były siłą napędową wzrostu produktywności w usługach.

Słowa kluczowe: produktywność, TFP, usługi, UE

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A Gravity Model Approach towards Pakistan's Bilateral Trade with SAARC Countries

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Abstract

This research paper attempts to estimate the bilateral trade of Pakistan with SAARC countries using a gravity model of trade. This panel study covers the period from 2003 to 2016. The empirical results are obtained through pooled OLS, fixed-effects, and random-effects estimators. On the basis of Hausman test results, the paper concentrates only on the findings of the fixed-effects model. The empirical findings reveal that the GDPs of both Pakistan and the partner country have a positive impact on bilateral trade. Market size has a negative impact on trade and this is justified on the basis of the absorption effect. Similarly, distance and exchange rate also have a negative correlation with bilateral trade. The study finds that Pakistan has very low trade with India and Afghanistan, despite the common border. A common language has a positive but insignificant impact on Pakistan's bilateral trade. The Paper also attempts to calculate the trade potential of Pakistan. The findings reveal that Pakistan has high trade potential with all SAARC member countries except the Maldives and Afghanistan.

Keywords: bilateral trade, common language, exchange rate, gravity model, population

JEL: F14, F15, F31, F53

Introduction

The exchange of goods for the purpose of trade between two countries is termed bilateral trade. In bilateral trade, the partner countries try to eliminate tariffs and other trade barriers to facilitate and encourage bilateral activities. Additionally, bilateral trade agreements and their implications, mobility of labor and increasing access to foreign markets are a focus in bilateral trade. The main objective of bilateral trade is to achieve persistent economic growth and development along with poverty alleviation and jobs creation. Pakistan has established bilateral trade relations with a number of countries around the world.

The South Asian Association for Regional Cooperation (SAARC) was formed in 1985. At the initial stage it was a set of seven nations (India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan, and the Maldives), but later on, Afghanistan joined this group. Now, SAARC comprises eight countries. Since the birth of SAARC, the member countries have struggled towards regional cooperation and economic assimilation. In April 1993, the SAARC countries signed a trade agreement called the South Asian Preferential Trading Agreement (SAPTA). This agreement was a milestone for the economic assimilation of the SAARC member countries. The agreement was made operational in December 1995. Furthermore, in 2004, SAARC member countries signed another agreement, called the South Asian Free Trade Area (SAFTA). This agreement was made applicable in 2006. The main objective of this agreement was to declare South Asia a free trade area by the end of 2016 (Hassan and Rehman 2015).

Trade relations between Pakistan and South SAARC countries are not new phenomena. After independence, Pakistan established trade relations with neighboring countries as well as other countries of the region. These relations accelerated in the 1990s when the global trade scenario was changing. Since then, Pakistan has been very keen to expand its trade with countries in the region and has signed various trade agreements with the regional and neighboring countries. The outcome of these agreements is that tremendous enhancement has been seen in the trade pattern of the region and a significant increase in exports has been observed. Pakistan has been following export-based policies since 2000/01. Obviously, the achievements of these policies depend upon the access of Pakistan's products to the worldwide markets. Pakistan has made serious efforts for the improvement of global trade, but still, its import and export volume is not remarkable with SAARC countries. Politics and the interference of the armed forces in government policies are the key hurdles in the way of regional trade (Gul and Yasin 2011).

SAARC countries have faced many developmental obstacles. Large fiscal deficits were observed in Pakistan, India, and Sri Lanka. Similarly, a high degree of corruption in Bangladesh, the civil war in Sri Lanka, macroeconomic volatility in Nepal, the Maldives, and Bhutan, and the lack of tolerance and political hostility between the two neighboring countries of India and Pakistan have significantly slowed down their economic development and regional collaboration. However, these challenges were suc-

cessfully overcome. Sri Lanka brought liberalization to their trade policies. India and Sri Lanka took initiatives to liberalize trade and deregulate interest rates, and the same path was followed by Pakistan and Bangladesh. Despite these reforms, however, Pakistan's bilateral trade with the SAARC region is not encouraging. It was about 8 percent of its overall trade in 2010–11. This trading level is extremely disappointing compared to the trade activities of other regional groups like ASEAN. In 2010–2011, Pakistan's bilateral trade with India, Bangladesh, and Sri Lanka was 2.7 percent, 1.6 percent and 0.61 percent respectively (Akram 2013).

Pakistan and the other SAARC countries have realized the importance of intraregional trade. Thus, they have adopted open trade policies to achieve positive consequences of bilateral trade. The recent scenario of international trade shows that bilateral or regional grouping trade on a preferential basis can play a significant part in imports and exports of goods and services. However, SAARC countries are facing some difficulties in the regional integration process. First, there is a shortage of transparent policies for the betterment of upcoming economic integration and social wellbeing. Second, some problems happen due to tariff-related constraints that limit awareness about economic integration. Finally, structural backwardness and economic deficiencies in the region aggravate the situation.

The foremost objective of this research paper is to highlight the major determinants of Pakistan's bilateral trade with the SAARC region. The other main objectives of the study are: 1) To estimate the bilateral trade flow between Pakistan and SAARC countries. 2) To find the degree of trade integration via a Gravity Model with neighboring countries. 3) To determine the trade potential of Pakistan with the other SAARC countries.

The rest of the paper is arranged as follows. Section two contains relevant literature to the study. The third section consists of research methodology. The fourth section contains the empirical results and in the last section, conclusions are drawn.

Review of the literature

This section consists of empirical studies based on the gravity model conducted by previous researchers. It provides a roadmap for the application of the gravity model in bilateral trade for the current study.

Kaur and Nanda (2010) examined the trade relations between India and SAARC countries. In this regard, they took exports of India as the dependent variable. All seven member countries of SAARC were observed and Panel data were collected for the period 1981–2005. They ran the gravity model and estimated the results by applying three methods: random effects, fixed effects, and pool estimation. From the empirical results, they concluded that India has excellent trade opportunities with SAARC countries, especially Pakistan, Bhutan, and Nepal. Moreover, India's exports can be extended to SAARC markets if they remove mutual barriers on trade because

India borders four SAARC member countries. The geographical location of India will favor their trade.

Sherif and Fantazy (2013) analyzed the trade among the Gulf countries (Kuwait, Qatar, UAE, Oman, Bahrain and Saudi Arabia) fitting the Gravity Model to the Panel data. The results of the gravity model assigned expected signs to all the variables of the gravity model. Economic size (GDP), market size (population), and GDP per capita have a significant and positive impact on the export pattern of Saudi Arabia. Distance has a normal effect on Saudi Arabia's exports, as suggested by gravity theory. Its impact is negative on Saudi Arabia's exports. Hence, it is proved that the factors of the gravity model truly explain the volume of bilateral trade.

Shujaat (2015) examined Pakistan's bilateral trade with 140 countries by using the augmented gravity model and random effects methodology. Along with basic variables, the researcher incorporated inflation rate, common language, free trade agreements, supply capability, and demand potential as independent variables in the gravity model. The results exposed the fact that distance (transportation cost) has no effect on Pakistan's bilateral trade. Similarly, Pakistan's inflation rate and supply capabilities were also found in the critical form. The basic variable (GDP) was found to be a reliable factor in Pakistan's bilateral trade. Estimates of the gravity model suggested that free trade agreements are not in favor of Pakistan. Their impact is negative on Pakistan's bilateral trade.

Panda and Kumaran (2016) attempted to investigate the trade volume between China and India by applying the gravity model. They estimated the results through a random-effects model (Panel regression model). Their results show that the trade level between the two countries will be higher than between countries that lie far away from each other. According to their research, the trade volume between China and India will flourish because of the small distance between them. India's bilateral trade is highly predisposed by China's economic size (GDP) and language similarities, while this trade decomposed with low-income countries.

Wang (2016) researched eighty countries and used panel data for the period 2000–2013. For analysis, the gravity model of trade was fitted to the data through the PPML technique. The results fully supported the assumptions of the gravity model and suggested that economic mass and bilateral trade have a positive relationship, while distance creates negative shocks on mutual trade between two countries.

Hussain (2017) examined the factors affecting Pakistan's exports with the help of the gravity model. The researcher used panel data and selected the period from 1993–2013. For analytical estimation, the author used a relatively new technique, called the PPML estimator, which is consistently used with a gravity model to tackle the problems of panel data. The empirical findings of the study confirmed the theoretical structure of the gravity model. It was established that distance has a negative impact on Pakistan's bilateral trade with its partners. Economic size was found to be positively related to bilateral trade when Pakistan's GDP increases, its total trade with its trading partners will increase.

Though a very rich literature is available on the estimation of bilateral trade through the gravity model, very little work has been done on Pakistan's bilateral trade with SAARC countries. Bearing in mind the above literature, our research paper can contribute in several ways to the existing literature. First, we analyzed Pakistan's bilateral trade with all SAARC member countries. Previous researchers took into account only the major countries of the region and ignored small the countries. Second, we applied three different techniques for our estimation. Most researchers used a single estimation technique for analysis.

Research Methodology

The research methodology is a strategic plan through which we can reach our specified objectives. This plan is explained step by step in this chapter.

The universe of the study

The study has selected the SAARC region to estimate Pakistan's bilateral with the member countries. The area consists of eight countries: Afghanistan, Sri Lanka, Bhutan, Nepal, Bangladesh, India, the Maldives, and Pakistan. This area was chosen because the world largest market (India) lies next to Pakistan, and they share a long border. Similarly, Pakistan and Afghanistan share a long border and have historical trade relations. Other countries in the region also have close trade terms with Pakistan. Though Nepal, the Maldives, and Bhutan are small economies in the region, Pakistan has the chance to improve trade relations and extend the range of exports to these countries.

Data sources

For our estimation, a panel data set is used ranging from 2003 to 2016. All the data are taken on a yearly basis. Countries' individual and bilateral imports and exports data are taken from the International Trade Center (ITC), based on UN Comtrade statistics (2017). Data on macroeconomics variables (population, RGDP, and exchange rate) are obtained from the World Development Indicators (WDI 2017). Data on the distance between trade centers (normally capital cities) are taken and calculated from online Great Circle Distance. All the data are converted into US$ million. Data on the populations for all countries are also presented in millions.

Model specification and theoretical framework

Under this heading, the general framework of the gravity model is developed to analyze Pakistan's bilateral trade. It will facilitate the researcher in explaining the performance of *N* cross-section units (*i* and *j*= 1, 2, 3, …, N) in *T* years (*t*= 1, 2, 3…, T). The fundamental structure of the regression model is outlined below:

$$Y_{it} = \alpha + X_{it}\beta_i + \varepsilon_{it} \tag{3.1}$$

Where Y_{it} = dependent variable or regressand. i= cross-section measurement for each individual country. t =time series measurement of the data. α = intercept (indicating countries' fixed effects). β_i = slope or coefficient. X_{it} = independent variable (showing variation for country i in time period t). ε_{it} = error term. The values of the fixed intercept, time variation and the coefficients or slope (β_i) remain different for each country. The insertion of time trends and fixed-effects in the model enable the researcher to find out the role of the omitted variables in the long run (Sakyi 2011).

The gravity model of trade has become more important in recent years in international trade. It was used for the first time by Tinbergen (1962) and Pöyhönen (1963) for empirical analysis. In accordance with Newton's law of universal gravitation i.e., two items attract each other in proportion to their masses and inversely proportional to their distance, two countries will trade with each other according to their GDP sizes and proximity.

Krugman et al. (2012) are of the opinion that the gravity model is applicable in two-sided trade because high-income countries spend a huge share of their income on imports and attract other countries to purchase goods from them because they have a large variety of goods and have a vast home market. So, the larger the economy, the larger the trade. Krugman et al. (2012) also mentioned other factors that cause bilateral trade, but these factors fail to operate because of distance. Hence, when two countries are located far away from one another, their transportation cost will begin to increase, and trade volume will decrease. In such a case, both countries will lose the gains from bilateral trade.

The customized structure of Newton's law of universal gravitation is presented in the following functional shape.

$$TT_{ijt} = \gamma\left(\frac{GDP_{it}^{\beta_1} \times GDP_{jt}^{\beta_2}}{D_{ij}^{\beta_3}}\right) \tag{3.2}$$

Where γ = gravitational constant, TT_{ijt} = volume of total bilateral trade (the summation of imports and exports), *ij* = respective countries, and *t* = time period. GDPs = economic sizes of country *i* and country *j*. D_{ij} = distance between two trading countries (normally between capital cities). β_i = coefficients (β_1, β_2 and β_1) to be estimated.

Taking the natural log of both sides of equation (3.2), the gravity equation looks like:

$$lnTT_{ijt} = \alpha + \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} - \beta_3 lnD_{ij} + \varepsilon_{ijt} \tag{3.3}$$

Where ln = natural logarithm, $\alpha = \log\gamma$, and ε_{ijt} = the disturbance term or white-noise error term After applying natural log to the variables, the coefficients represent elasticities of independent variables in bilateral trade flows.

From the previously reviewed literature, it can be concluded that there are many other elements that are responsible for bilateral trade flows, but they are not plotted in the above equation. For the current study, the basic gravity model is enlarged with some other variables that hamper or promote bilateral trade.

The augmented gravity model developed for the current study is of the form:

$$\begin{aligned} lnTT_{ijt} &= \alpha + \beta_1 \ln\left(RGDP_{it} * RGDP_{JT}\right) + \beta_2 \ln\left(POP_{it} * POP_{jt}\right) + \\ &+ \beta_3 lnEXR_{ijt} + \beta_4 lnDIST_{ij} + \beta_5 lnCBOR_{ij} + \beta_6 lnCLANG_{ij} + U_{ijt} \end{aligned} \tag{3.4}$$

The same equation (3.4) can be written as:

$$\begin{aligned} lnTT_{ijt} &= \alpha + \beta_1 lnRGDP_{ijt} + \beta_2 lnPOP_{ijt} + \beta_3 lnEXR_{ijt} + \\ &+ \beta_4 lnDIST_{ij} + \beta_5 lnCBOR_{ij} + \beta_6 lnCLANG_{ij} + U_{ijt} \end{aligned} \tag{3.5}$$

where, TT_{ijt}= total trade volume between country *i* and country *j* in time period *t*. $RGDP_{ijt}$= the product of Real Gross Domestic Product of country *i* and country *j* in period *t*. POP_{ijt}= the product of the population of country *i* and country *j* in time period *t*. EXR_{ijt}= bilateral exchange rate between country *i* and country *j* in time period *t*. $DIST_{ij}$= distance between country *i* and country *j*. The dummy variables of the study are: *CBOR*= Common Border (which takes the value of '1' if the border is common, '0' otherwise) *CLANG*= Common Language (which takes the value of '1' if there is a common language, '0' otherwise) α= intercept, U_{ijt} = omitted variables or unobserved factors that influence bilateral trade, and β_i=coefficients ($\beta_1, \beta_2, \ldots, \beta_6$ represent elasticities of variables).

Analytical techniques

The Analytical Techniques are the methods through which we enumerate the level of bilateral trade between Pakistan and the SAARC countries. These techniques include pooled OLS, fixed effects, and random effects. All these techniques are explained in the coming sections.

Pooled Ordinary Least Squares (OLS)

The easiest technique for panel data estimation is the pooled ordinary least square (OLS) technique. It ignores the panel format (time and space dimensions) of the data and merely applies the typical OLS regression technique. The pooled OLS estimator can be written as:

$$Y_{it} = \alpha + X_{it}\beta_i + \mu_{it} \tag{3.6}$$

Where Y_{it} =the dependent variable for country *i* in time period *t*. α = intercept. X_{it} =1 × K vector of independent variables for country *i* in time period *t*. β_i= K ×1 vector of coefficients, and μ_{it} = the error or disturbance term of country *i* in time period *t*. This technique is based on the assumption that the intercept (α) and all the parameters (β_i) are equal for all countries individually across time, and that $\mu_{it} \sim iid(0,\sigma^2)$ for all *i* and *t*. It implies that there is no autocorrelation, and the error terms are homogenous for each individual country *i* during time period *t*.

Fixed Effects Estimator

It is a well-known reality that every individual cross-sectional component has several unique properties. The intercept of a fixed-effects equation varies among different individual units, but the same intercept remains constant (no variations) over time. While estimating the FEM, the disturbance term μ_{it} is divided into two parts, one is component-specific and the other is the time-specific element. The summation of intercept α and specific disturbance term ε_{it} constitutes:

$$\mu_{it} = \alpha + \varepsilon_{it} \ .$$

Therefore the estimated fixed effect model (FEM) can be written as:

$$Y_{it} = X_{it}\beta_i + \alpha_i + \varepsilon_{it} \quad \varepsilon_{it} \sim iid\left(0,\sigma^2\right) \tag{3.7}$$

The term α_i = the fixed parameter, that is to be estimated. Dummy variables are incorporated for every cross-sectional component during the estimation process. This procedure is known as the Least Squares Dummy Variables (LSDV) method. The estimation of the fixed effect model (estimators) helps to remove the endogeneity problem from the OLS regression model. Otherwise, it will give spurious results (Roy & Rayhan 2011).

On the other hand, the random-effects model (REM) is based on the assumption that individual effects (heterogeneity) are separately divided between the disturbance term (ε_{it}) and the intercept (α_i). It means that the disturbance term is not linked to the explanatory variables.

The REM can be shaped as:

$$Y_{it} = X_{it}\beta_i + \mu + \alpha_i + \varepsilon_{it} \quad \varepsilon_{it} \sim iid\left(0,\sigma^2\right) \quad \alpha_i \sim iid\left(0,\sigma^2\right) \tag{3.8}$$

Where $\alpha_i + \varepsilon_{it}$ is considered to be an error term that consists of two elements; one is the individual specific element (time-invariant) and the other is a mixture of cross-section and time series error elements. The benefit of the REM is that it takes into account the impacts of time-invariant variables which are not included in the process of the fixed effect estimation process.

To make a selection between the two models (fixed and random), we apply the Hausman test. The Hausman test decides which model is suitable for estimation, the fixed effects model, or the random-effects model. We set the null hypothesis as: the random effect model is best for estimation. The alternative hypothesis is: the fixed-effects model is best for estimation. If we accept the null hypothesis, then we conclude that the random effect model is reliable for estimation. Conversely, if we accept the alternative hypothesis then we conclude that the fixed effect model is favorable for estimation.

Trade potential concept and methodology

The idea of trade potential is very common and widely used in studying international trade. Usually, two methods are used to estimate the trade potential of a country. One is the ratio method, and the other is the absolute difference method.

In the ratio method, the ratio of predicted trade and actual trade (P/A) is calculated. The predicted (P) value means the estimated value of the dependent variable, while the actual (A) value means countries' actual trade with partner countries. The ratio (P/A) indicates trade potential and future trade direction of the country. If the value of P/A is more than unity, it means that the home country has the potential to develop trade relations with partner countries.

In the second method, the absolute difference between the predicted and actual values (P-A) is used to calculate trade potential. A positive value indicates that the home country has the opportunity to increase its trade with the partner country, while a negative sign indicates that the home country has exceeded its trade potential with a particular trading country. In this study, the ratio method (P/A) will be applied to categorize those countries with which Pakistan has the potential to expand its trade.

Results and Discussion

The main theme of this chapter is to present and discuss the empirical findings of the study. In the first section, descriptive statistics are calculated. In the second section, the augmented gravity model is estimated, and the preliminary results are obtained through the fixed-effects (FE), random-effects (RE) and pooled OLS estimators. In the last section, the trade potential of Pakistan is calculated.

Descriptive statistics

Descriptive statistics provide information about the nature of data used for analysis by measuring variations in the data. Normally, the mean and median are used to measure the central tendency of the variables. The mean values of every variable are bigger than the values of the median. It indicates that all the variables included in the current study are positively skewed. Dispersion in the data is shown by maximum and minimum values and standard deviation. From the values of standard deviation, it has been observed that POP_i (the population of Pakistan) has the smallest variations whereas the $RGDP_j$ (the RGDP of the partner country) has the greatest variation. The same is observed from the minimum and maximum values (Table 1). Now, we go forward with the position that all the variables in the study are adequately normal.

Table 1. Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
TT_{ijt}	583.504	270.557	2859.824	0.009	773.069	98
$RGDP_{it}$	177489.1	176004.2	227747.9	129748.8	27340.90	98
$RGDP_{jt}$	261020.5	19245.61	2464933	888.427	586244.8	98
POP_{it}	169.5010	168.804	193.203	147.7034	14.225	98
POP_{jt}	206.859	25.9170	1324.171	0.304	419.275	98
EXR_{ijt}	5135.157	4338.572	15252.46	739.225	3140.125	98
$DIST_{ij}$	1784.286	1731.000	3285.000	367.000	1029.636	98

Note: Results are obtained by Eviews9, using panel data set from 2003–2016

Sources: World Development Indicators (WDI 2017) and the International Trade Center (ITC 2017).

Results of the Augmented Gravity Model

Starting with the pooled OLS results, the coefficients of all straight gravity variables ($RGDP_{ijt}$ and distance) are significant and have predetermined signs. The empirical results indicate that a one percent increase in RGDPs will result in a 0.74 percent increase in Pakistan's bilateral trade. In contrast, the impact of the distance variable is found to be negative. A one percent increase in distance will reduce bilateral trade by 0.16 percent. It means that the greater the distance between Pakistan and its trading partner, the smaller the trade flow between them will be. The coefficient of the population is found to be negative. A one percent increase in population will decrease the trade volume by 0.36 percent. The impact of the real bilateral exchange rate is also observed to be negative. A depreciation of the local currency (Pakistan) in terms of the partner currency will increase trade between them. The dummy variables (common border and common language) are significant and have a positive impact on Pakistan's bilateral trade volume.

Table 2. Results of Augmented Gravity

Estimated Method	Pooled OLS Model	Fixed Effects Model	Random Effect Model
Independent variables	lnTT	lnTT	lnTT
	Coefficient P-value	Coefficient P-value	Coefficient P-value
Constant	−0.186* (0.096)	−0.748* (0.061)	−0.186** (0.013)
$lnRGDP_{ijt}$	0.742** (0.023)	1.046*** (0.001)	0.742** (0.045)
$lnPOP_{ijt}$	−0.359 (0.230)	−1.934** (0.040)	0.359* (0.072)
$lnEXR_{ijt}$	−0.491* (0.102)	−0.914** (0.037)	−0.491** (0.012)
$lnDIST_{ij}$	−0.156** (0.015)	−0.837*** (0.004)	−0.156 (0.121)
lnCBOR	2.417*** (0.004)	−1.236** (0.015)	2.417*** (0.007)
lnCLANG	0.405* (0.088)	0.271 (0.304)	0.405* (0.064)
R^2	0.696	0.860	0.646
Adjusted R^2	0.622	0.845	0.622
Hausman [χ2]			682.410 (0.000)
Durbin-Watson	2.33	1.98	

Note: ***, ** and * indicate significance level at 1%, 5% and 10% respectively. Results are obtained by Eviews9, using panel data set from 2003–2016.
Source: World Development Indicators (WDI 2017) and the International Trade Center (ITC 2017).

The major drawback of the pooled OLS technique is that it ignores the composition of time and space dimensions (panel structure) of the pooled data and only estimates the standard OLS regression model. This creates a serial correlation problem in the data and bypasses the effects of ignored heterogeneity on the volume of bilateral trade. To handle this problem, the researchers also estimated fixed-effects (FE) and random-effects (RE) models.

The empirical results of the Hausman test indicate that the null hypothesis of the random effects is strongly rejected, as the coefficient value of the Hausman test = 682.410 and the p-value = 0.000. So it was decided that the fixed effect (FE) model is suitable for measuring Pakistan's bilateral trade. Thus, the remaining discussion of this section is restricted only to the results of the gravity model of trade based on the fixed-effects estimation technique.

The empirical results of the gravity model, estimated through the fixed-effect method, indicate that the RGDPs of Pakistan and the partner country (the product of RGDPs) have a positive and significant impact on the total bilateral trade volume of Pakistan. A one percent increase in economic masses (RGDPs) of both countries will increase the trade volume by approximately 1.05 percent (Table 2). The results clearly follow the theoretical foundation of the gravity model. As the RGDP of Pakistan increases, it will export more commodities to the partner country. On the other hand, if the RGDP (economic mass) of the partner country increases, the people of that country (country *j* or partner country) will import more commodities from Pakistan according to their needs. To generalize the results, Pakistan has an opportunity to extend

her trade with countries that have higher incomes. The same conclusion was reached by Sokchea (2006), Chan-Hyun (2005) and Turkcan (2005).

Population is used as a proxy for market size. According to gravity theory, as the market size expands, the trade volume of a country also expands, *ceteris paribus*. Unfortunately, the empirical results of the study are against the theoretical background of the gravity theory. The product of the population coefficient is found to be significant but, surprisingly, to have a negative sign (–1.93). The estimated results suggest that a one percent increase in population will reduce the trade volume of Pakistan by 1.93 percent. This decline in the bilateral trade flows can be justified, as all the SAARC member countries, including Pakistan, are developing economies and their populations are still at the dynamic stage. Most domestically produced goods are utilized by the local population. This strongly recommends the reality of the absorption effect of the rising population. As most goods are sold in the home markets due to absorption capacity, fewer goods are left for export. As a result, bilateral trade volumes decline. These results are in line with Oguledo and Macphee (1994).

The exchange rate measures the value of the local currency in terms of foreign currency. The empirical results of the gravity model suggest that instability in the exchange rate has a negative relationship with bilateral trade. The coefficient of the exchange rate has a negative sign (–0.91), which implies that a one percent devaluation in Pakistan's currency will boost her trade by 0.91 percent and vice versa, *ceteris paribus*. If the currency depreciates, net exports increase because they are now relatively cheaper, and imports decrease because they are expensive. If the currency appreciates, exports decrease because of its expensiveness in terms of foreign currency. This theoretical justification of the exchange rate is in line with the findings of Kandilov (2008), Cho et al. (2002), and Eichengreen and Irwin (1995).

The distance variable is incorporated as a proxy for transportation costs. The distance coefficient is found to be negative and significant. It implies that a 1% increase in distance between two economic centers will lead to a decrease in total bilateral trade by approximately 0.84%. This perception clearly satisfies the theoretical foundation of distance in gravity theory. The results can be explained as: the further away from Pakistan the country is, greater the transportation costs will be and hence the smaller the trade activities. The outcome of the current study follows the results of Gul and Yasin (2011), Achakzai (2006), and Buch et al. (2003).

The term "common border" is used for border adjacency. Surprisingly, the coefficient of the common border is found with a negative sign i.e. approximately – 1.24. These empirical results imply that Pakistan's bilateral trade is 1.24% lower with neighboring countries (India and Afghanistan) compared to other SAARC countries. In fact, these results contradict the theory and common perception. The reasons for this contradiction are very clear. Trade between Pakistan and India is limited because of political divergence. Moreover, historical disputes like the Kashmir issue, two wars (1965 and 1971) between the two countries, and continuous tensions on the line of control (LOC) are the key factors that impede bilateral trade volumes between the two

neighboring countries. Similarly, trade between Pakistan and Afghanistan is not encouraging. Terrorism is a common issue in both countries. Moreover, mistrust and misunderstanding from both sides negatively affect their trade. This perception is relevant to the findings of Rahman (2005).

The role of language is very important in determining trade between the two countries. The coefficient of the common language is positive (0.27), but it is not significant (Table 2). The result implies that the bilateral trade flow of Pakistan is 0.27% greater with those countries that have a common language than the other countries of SAARC. The coefficient value of a common language is very small, meaning that its impact on Pakistan's exports is nominal. The same opinion was expressed by Gul and Yasin (2011).

Finally, the values of R^2 and adjusted R^2 are 0.86 and 0.84, respectively. It shows that 86% of the total bilateral trade between Pakistan and SAARC countries is explained by our estimated gravity variables. For the remaining 14% discrepancy, there may be some other variables which are not included in the model. The value of the Durbin-Watson D-test is equal to 1.98, which is closer to two. So, it is assumed that there is no first-order autocorrelation, either positive or negative, among the selected variables.

Pakistan's Trade Potential

After estimating the gravity models, we are in a position to calculate the trade Pakistan's potential with the SAARC countries. As mentioned above, the findings of the gravity models based on the fixed-effects estimator are quite reliable and follow the theoretical background of the gravity model. In light of these findings, we estimate the trade potential of Pakistan across territorial borders.

Table 3. Trade Potential of Pakistan with SAARC Region

Country Name	P/A (2003–2007)	P/A (2008–2012)	P/A (2013–2016)
India	1.451*	1.318*	1.315*
Sri Lanka	1.379*	1.286*	1.308*
Bangladesh	1.712*	1.522*	1.506*
Nepal	4.755*	9.477*	14.557*
Bhutan	2.895*	1.404*	1.681*
Afghanistan	1.037*	0.921**	0.963**
Maldives	0.588**	0.671**	0.574**

Note: * shows the highest trade potential and ** shows the exhausted trade potential. The results are obtained by Eviews9, using panel data set from 2003–2016.
Sources: World Development Indicators (WDI, 2017) and the International Trade Center (ITC, 2017).

According to the estimated results, Pakistan has a great deal of trade potential with all SAARC countries except for the Maldives and Afghanistan. Pakistan has the greatest trade potential with Nepal, as the ratio of predicted values and actual values (*P/A)*

is at the highest level in the last four years (2012 to 2016). Though the Nepalese economy is heavily dependent on the Indian economy and its trade flow is mainly with India, Pakistan has the highest trade potential with Nepal. Pakistan and India are the two major players of the SAARC region. India has a very wide market and Pakistan can extend its trade with India if they solve their disputes peacefully.

Similarly, Bangladesh and Sri Lanka are the two major economies of SAARC. Pakistan has very close trade relations with both countries, especially with Sri Lanka. There is an opportunity for Pakistan to strengthen these relations in the future. Pakistan had the maximum trade potential with Bhutan from 2003 to 2007. However, that trade potential still exists and Pakistan can expand its trade with Bhutan in the future.

Afghanistan and Pakistan share long border. Pakistan had a trade potential with Afghanistan from 2003 to 2007, as the predicted trade was greater than the actual trade (P/A>1) during this period. However, now, Pakistan's actual trade is greater than the predicted trade, as the ratio is less than one (P/A<1) in recent years of the study period. Pakistan has exhausted its trade potential with the Maldives (Table 3).

Conclusion

The study concentrates on bilateral trade flows between Pakistan and SAARC countries within the framework of the gravity model using a panel data set for the period 2003 to 2016. The estimation process used several econometric techniques like pooled OLS, and fixed-effects and random-effects estimation models. The empirical findings of the study indicate that the gravity model of trade is a very useful tool for measuring Pakistan's bilateral trade flows. The estimated coefficients of the basic gravity variables (RGDPs and distance) are found to be strongly consistent with the theoretical foundation of the gravity model. In particular, Pakistan's total bilateral trade volume with the SAARC region considerably increases with the expansion in the real gross domestic product (RGDPs) and diminishes with every increase in distance. The impact of population on bilateral trade was found to be significant but with a negative sign. This confirmed the theory of absorption effect of a rising population on bilateral trade. The coefficient of the bilateral exchange rate was found to be negative, which means that devaluation in Pakistani currency will boost its exports and vice versa. A common border has a negative impact on Pakistan's bilateral trade flows. Pakistan shares borders with India and Afghanistan, but it still has nominal trade relations with these two countries. Civil war and terrorism in Afghanistan, and political and military conflicts with India are the main factors that impede Pakistan's bilateral trade with these two countries. Lastly, a common language (official or commercial) was found to be expansionary in its effects. Though its coefficient is very small, its impact is significant. From the analysis of trade potential, it was concluded that Pakistan has maximum trade potential with all SAARC member countries except the Maldives and Afghanistan.

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Streszczenie

Zastosowanie modelu grawitacyjnego do oszacowania bilateralnej wymiany handlowej Pakistanu z krajami SAARC

W artykule podjęto próbę oszacowania wielkości bilateralnej wymiany handlowej Pakistanu z krajami SAARC przy użyciu grawitacyjnego modelu handlu. Niniejsze badanie panelowe obejmuje okres od 2003 do 2016 r. Wyniki empiryczne uzyskano za pomocą metody najmniejszych kwadratów (pooled OLS), metody efektów stałych i estymatorów efektów losowych. Z uwagi na wyniki testu Hausmana w pracy skoncentrowano się wyłącznie na ustaleniach modelu efektów stałych. Badania empiryczne wskazują, że zarówno PKB Pakistanu, jak i państwa partnerskiego, mają pozytywny wpływ na wielkość wymiany handlowej. Wielkość rynku ma negatywny wpływ na handel i jest to uzasadnione z uwagi na występowanie efektu absorpcji. Podobnie odległość i kurs wymiany są również ujemnie skorelowane z wielkością wymiany handlowej. Badanie wykazało, że pomimo wspólnej granicy wielkość wymiany handlowej Pakistanu z Indiami i Afganistanem jest bardzo niska. Wspólny język ma pozytywny, ale nieznaczny wpływ na wielkość wymiany handlowej Pakistanu. W artykule podjęto również próbę obliczenia potencjału handlowego Pakistanu. Wyniki tego badania wskazują, że Pakistan ma duży potencjał handlowy w relacjach ze wszystkimi krajami członkowskimi SAARC, z wyjątkiem Malediwów i Afganistanu.

Słowa kluczowe: bilateralna wymiana handlowa, wspólny język, kurs walutowy, model grawitacyjny, liczba ludności

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Is It the Natural Rate Hypothesis or the Hysteresis Hypothesis for Unemployment Rates in Newly Industrialized Economies?

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Abstract

The focus of our study is on determining whether unemployment rates in 8 New Industrialized Economies conform to the natural rate hypothesis or the hysteresis hypothesis. To this end, we employ a variety of unit of unit root testing procedures to quarterly data collected between 2002:q1 and 2017:q1. Summarizing of our

findings, conventional unit root tests which account neither for asymmetries nor structural breaks produce the most inconclusive results. On the other hand, tests which incorporate structural breaks while ignoring asymmetries tends to favour the natural rate hypothesis for our panel of countries. However, simultaneously accounting for asymmetries and unobserved structural breaks seemingly produces the most robust findings and confirms hysteresis in all unemployment rates except for Asian economies/countries of Thailand and the Philippines.

Keywords: natural rate hypothesis, hysteresis hypothesis, unemployment, unit root tests, Fourier function approximation, newly industrialized economies

JEL: C22, C51, E24, J60

Introduction

From the Great Depression of the 1930's, to the stagflation period of the 1970's and early 1980's, to the Asian Financial crisis of 2000 and the more recent global financial crisis and recession periods of 2007–2010, the social severity of any major crisis is measurable by the extent to which it impacts unemployment. In the face of a crisis, policymakers commonly rely on fiscal and/or monetary expansionary strategies aimed at stimulating the economy and reducing prevailing unemployment rates. With respect to the recent global crisis, implementing such policies was a success in a few industrialized economies such as the US and Germany but it did not suffice in other European countries like Greece, Spain and Italy. Historical trajectories tend to support these occurrences tracing back to Friedman's (1968) contention for the existence of a natural rate of unemployment for the US economy, a situation whereby unemployment reverts back to its 'natural rate' after a shock to the series. On the other hand, Blanchard and Summers (1986) argument for hysteresis in unemployment for other European countries appears to hold since shocks to unemployment in these countries have permanent effects.

The current consensus based on the available empirical literature is that the issue of whether shocks exert transitionary or permanent effects on the unemployment rate can be tested straightforwardly via the following set of hypotheses:

H0: Natural rate hypothesis ~ unemployment in a I(0) process,

HA: Hysteresis hypothesis ~ unemployment in a I(1) process.

Nevertheless, the empirical testing of the above hypothesis is plagued with several technical complexities with respect to econometrically capturing the true data generating process of the unemployment series. In particular, whereas conventional, first-generation unit root tests can be commended for providing a convenient platform for directly testing the natural rate hypothesis versus the hysteresis hypothesis, many of these integration tests fail to appropriately account for structural breaks and asymmetries in the data generating process of the unemployment series. It is well known

from the current literature that ignoring either structural breaks or asymmetries will produce low power in the testing for integration properties of a time series (Perron 1989, Kapetanois et al. 2003, Kruse 2011).

In order to appropriately address these concerns, our study adopts a flexible Fourier form (FFF) approximation to Kapetanois et al.'s (2003) nonlinear unit root testing procedure which is applied to 8 Newly Industrialized Economies (i.e. Brazil, China, Mexico, South Africa, Turkey, the Philippines, Malaysia and Thailand) between 2002 and 2017. The FFF methodology comes as a variant of Galliant (1981) seminal paper on Fourier approximation usage in capturing the dynamics of unknown periodic and non-periodic functions and has been more formally ushered into the time series paradigm by Becker et al. (2006), Christopoulos and Leon-Ledesma (2010), Rodriguez and Taylor (2012) and Enders and Lee (2012). Within the econometrics paradigm, flexible Fourier approximation has the remarkable ability to capture a series of smooth structural breaks without a-priori knowledge of the break dates. This is a notable improvement on other 'structural break' unit root tests which cannot test for more than two structural breaks in a series due to concerns about losing testing power. Notably, FFF-based unit root tests have recently been applied with a high degree of success to investigate the integration properties of unemployment rates for various regions (see Cheng et al. (2014) for PIIGS countries; Furoka (2014) for 5 Asian Pacific countries and Bakas and Papapetrou (2014) for 13 Greek regions and Li et al. (2017)), but is yet to be applied to New Industrialized economies as a wider transcontinental-continental group of countries. Our study acknowledges this gap and extends on the literature towards these NIE's.

Against this background, the rest of the study is structured as follows. The next section of the paper presents the literature review while the third section outlines our empirical methodology. The data and empirical results are presented in section four and section five concludes.

Review of the associated literature

In his celebrated Presidential address in 1968, Milton Friedman formally coined the term "natural rate" of unemployment, which refers to the rate of unemployment which is consistent with a steady rate of inflation (Phelps 1967; Friedman 1968). In describing the encompassing Natural Rate Hypothesis (NRH) also known as the Non-Accelerating Inflation Rate of Unemployment (NAIRU), Friedman (1968, 1977) and Phelps (1967, 1968) propose that natural unemployment is a combination of frictional as well as structural unemployment that is unavoidable in the long run and this natural rate is independent of monetary policy and consequentially inflation i.e. money neutrality. Therefore, according to the Friedman-Phelps synthesis monetary authorities cannot exploit the conventional Phillips (1958) curve trade-off and this served as a plausible explanation for the then paradox of the soaring inflation and unemployment experienced during the stagflation periods of the 1970's.

Blanchard and Summers (1986) challenged the natural rate hypothesis by advocating for the concept of 'hysteresis', in which the natural rate can be influenced by the path of actual unemployment. According to the authors, there are two theoretical justifications for the existence of hysteresis in unemployment. The first justification is based on market rigidities. Lindbeck and Snower (1988) support the view that the existence of hysteresis is due to the power of labour unions that keep the equilibrium wage high, and therefore increase unemployment. The second justification for hysteresis is based on the anticipation of inflation in a Phillips Curve approach, whereby downward pressures on inflation lead to sustained high unemployment (Hall 1979). Overall, under the assumption of hysteresis, cyclical fluctuations exert permanent effects on structural unemployment, in the presence of labour market restrictions (Albulescu and Tiwari 2018).

In perspective, the issue of whether unemployment adheres to the natural rate hypothesis or to the hysteresis hypothesis boils down to the issue of whether unemployment converges back to it's steady-state equilibrium after a transitory shock or whether long-lasting unemployment spells arise from cyclical fluctuations. Pragmatically, empirical academics have sought to untangle this puzzle by employing unit root testing procedures, a strategy popularized by the influential seminal contribution of Nelson and Plosser (1982). The decision rule is that the natural rate holds if unemployment rates are mean-reverting whereas the hysteresis hypothesis holds if the series contains a unit root and the empirical works found in the literature can be best categorized according to their methodological influences.

The first group of studies which can be identified from the literature are those which relied on conventional unit root tests such as the ADF, PP, KPSS and DF-GLS (Brunello (1990) for Japan; Mitchell (1993) for 18 OECD countries; Roed (1996) for 16 OECD countries; Song and Wu (1997) for 48 US states; Symth (2003) for Australian states; Leon-Ledesma and McAdam (2004) for 12 CEE countries; Chang et al. (2007) for Taiwan; Mednik et al. (2010) for 13 Latin American countries; Liu et al. (2012) for Australian states; Bakas and Papapetrou (2014) for Greek regions; Marques et al. (2017) for 28 OECD countries). Notably, these conventional unit root tests fell under severe criticism as they failed to account for important structural breaks in the time series. This shortcoming was initially pointed out by Perron (1989) who demonstrated that failure to account for structural breaks leads to a bias against rejecting the null hypothesis in the unit root tests when the null should be rejected.

A second group of studies emerged in the literature which took heed of the arguments posed by Perron (1989), and began implementing unit root tests on the unemployment series which accounted for structural breaks (Zivot and Andrews 1992; Lee and Strazicich 2004, 2013). Some prominent studies which fall under this category of studies are the works of Song and Wu (1998), Gomes and daSilva (2008) for Brazil and Chile; Cuestas et al. for 8 CEE countries; Ayala et al. (2012) for 18 Latin American countries; and Garcia-Cintado et al. (2015) for Spanish regions. Nonetheless, the unit root tests accounting for structural breaks could not explain intermediate theories

of unemployment such as the persistence theory of Hall (1975) nor the structuralist hypothesis of Phelps (1994) which argued that the movements in the unemployment rate are movements around the natural rate and that an increase in unemployment is the result of a combination of constant shocks whose speed of adjustment varies.

Ultimately, these intermediate theories characterize the unemployment rate as a non-linear process which is stationary around an occasionally changing natural rate. These hypotheses could only be faithfully accounted for by either using fractional integration or nonlinear unit testing procedure since conventional unit root tests suffer from low power properties in the presence of existing asymmetries (Lanzafame 2009, Bahmani-Oskooee et al. 2018). This has led to a third and more recent group of 'nonlinear' studies which can be further sub-divided into two sub-groups. Under the first sub-group are studies which employ nonlinear unit root tests which do not account for structural breaks. In this regard, one of the most popular asymmetric unit root test found in the literature comes courtesy of Kapetanois et al. (2003), Ucar and Omay (2009) and Kruse (2011) and has been extensively applied in the works of Gustavsson and Osterholm (2006) for 5 EU countries; Yilanci (2008) for 19 OECD countries; and Lee (2010) for 29 OECD countries. Nevertheless, these nonlinear tests have proven to be unreliable in capturing structural breaks, which has led to the second sub-group of studies which augment the unit root testing procedures with flexible Fourier form (FFF). Studies belonging to this latter group include the works of Chang (2011) for 17 OECD countries, Cheng et al. (2014) for PIIGS countries, Furuoka (2014) for 5 Asian-Pacific countries, Bolat et al. (2014) for 17 Eurozone countries, Bakas and Papapetrou (2014) for 13 Greek regions, Furuoka (2017) for 5 EU countries and Meng et al. (2017) for 14 OECD countries, and Li et al. (2017) for PIIGS countries. Our current study extends on these recent works for the case of Newly Industrialized Economies.

Methodology

KSS nonlinear unit root test

We begin our analysis following Kapetanois et al. (2003), and assume that the unemployment rate, which we denoted as UNEMPt, evolves as the following ESTAR data-generating process:

$$\Delta UNEMP_t = \phi_i UNEMP_{t-1} + \gamma_i UNEMP_{t-1}[1 - exp(-\Phi UNEMP_{t-d}^2)] + et \qquad (1)$$

where et ~ iid(0, σ2) and Φ is a smoothness parameter. Following Kapetanois et al. (2003) we assume that ϕi = 0 and d=1 i.e.

$$\Delta UNEMP_t = \gamma i UNEMP_{t-1}[1 - exp(-\Phi UNEMP_{t-1}^2)] + e_t \qquad (2)$$

In which the series is assumed to be globally stationary if the condition $-2 < \gamma < 0$ is satisfied. Nevertheless, the unit root hypothesis can be formally tested as H0: $\Phi = 0$, and yet testing this hypothesis is problematic due to the unidentified, nuisance parameters existing under the alternative hypothesis (Davies 1987). To circumvent this problem, a first order-order Taylor series approximation to equation (2) around $\Phi = 0$ results in the following auxiliary regression:

$$\Delta UNEMP_t = UNEMP_{t-i}^3 + e_t \tag{3}$$

And in augmenting equation (3) with lags to correct for serial correlation in the disturbance term, we obtain:

$$\delta_i \Delta UNEMP_t = UNEMP_{t-i}^3 + \sum_{j=1}^{p} UNEMP_{t-i} + e_t \tag{4}$$

The null hypothesis of a linear unit root process can be now tested as H0: $\delta i = 0$ against the alternative of the stationary ESTAR process (i.e. H1: $\delta i = 0$). Like the conventional ADF test, the asymptotic critical value of the Kapetanios et al. (2003) unit root test is computed as:

$$tKSS = \frac{\hat{\beta}}{\sqrt{\widehat{var}\left(\hat{\beta}\right)}} = \frac{\sum_{t=1}^{T} y_{t-1}^3 y_t}{\sqrt{\hat{2}\sum_{t=1}^{T} y_{t-1}^6}} \tag{5}$$

Note that the tKSS statistic does not follow an asymptotic standard normal distribution, and hence Kapetanios et al. (2003) tabulate the relevant critical values.

Flexible Fourier Form (FFF) augmented tests

A major criticism with the testing procedure of Kapetanois et al. (2003) surrounds its failure to appropriately capture structural breaks in the testing procedure. The seminal papers of Becker et al. (2006), Christopoulos and Leon-Ledesma (2010), Rodriguez and Taylor (2012) and Enders and Lee (2012) develop unit root testing procedures which uses selected frequency component of a Fourier function to estimate the deterministic components of the series. Denoting $\alpha(t)$ as a function with an unknown number of unspecified form, the Fourier approximation to the function produces the following series:

$$\alpha(t) = \alpha o + a_i \sum_{k=1}^{n} \sin\left(\frac{2\pi Kt}{T}\right) + b_i \sum_{k=1}^{n} \cos\left(\frac{2\pi Kt}{T}\right) + \zeta t, \quad n < \frac{T}{2} \tag{6}$$

k is the frequency selected for the approximation and n denotes the number of frequencies, which as suggested by Becker et al. (2006) and Enders and Lee (2012) should

be kept to a single-frequency component (i.e. n = 1). which is sufficient to capture a series of smooth structural breaks and circumvent the problem of over-fitting and loss of regression power i.e.

$$\alpha(t) = \alpha o + a_i \sin\left(\frac{2\pi Kt}{T}\right) + b_i cos\left(\frac{2\pi Kt}{T}\right) + \zeta t, \tag{7}$$

And augmenting the nonlinear unit root testing regression (4) with equation (7) results in:

$$\Delta UNEMP_t = UNEMP_{t-i}^3 + \sum_{j=1}^{p} {}_i UNEMP_{t-i} + a_i \sin\left(\frac{2\pi Kt}{T}\right) + b_i cos\left(\frac{2\pi Kt}{T}\right) + \zeta = t \tag{8}$$

Becker et al. (2006), Christopoulos and Leon-Ledesma (2010), Rodriguez and Taylor (2012), and Enders and Lee (2012) commonly suggest that regression (8) be estimated after conducting a grid search in optimal values of K ∈[1, 5] and lag length, p. As before, the test statistic testing the null hypothesis of a unit root (i.e. H0: δi = 0) is derived using equation (5).

Data and empirical results

Data description

The data used in our empirical study were retrieved from the International Monetary Fund (IMF) online statistics. They consist of the total unemployment rate for 8 NIE economies (i.e. Brazil, China, Mexico, South Africa, Turkey, the Philippines, Malaysia and Thailand) and were collected on a quarterly basis spanning from 2002:q1 to 2017:q1. The descriptive statistics of the time series are reported in Table 1 and the associated time series plots are presented in Figure 1.

As can be easily noted, the lowest unemployment rates for all NIE countries is found for Thailand (1.34%) followed by Malaysia (3.32%), China (4.10%), Mexico (4.12%), the Philippines (8.02%), Brazil (8.63%), and Turkey (10.10%) while the highest unemployment averages are for South Africa (25.23%). Based on the reported standard deviations, we find the highest volatile unemployment rates in Brazil (2.76) followed by South Africa (2.06), the Philippines (2.04), Turkey (1.43), Mexico (0.81), Thailand (0.48), and Malaysia. with the lowest volatility being found in China (0.12). Lastly, we note that a number of unemployment rates display non-normality for China, Turkey, the Philippines and Thailand, an observation that advocates for preliminary signs of asymmetries within the unemployment series of Newly Industrialized Economies.

In terms of continental distribution African and South American countries (South Africa and Brazil) have the highest and most volatile unemployment rates whereas

North American (Mexico) and Asian countries (China, the Philippines, Malaysia, and Thailand) have the lowest and least volatile unemployment rates, with Euro-Asian (Turkey) being intermediate. Judging by the report J-B statistics, unemployment in Asian and Euro-Asian countries are non-normal, an observation which advocates for preliminary signs of asymmetries existing within the observed unemployment series.

Table 1. Descriptive statistics

	Brazil	China	Mexio	South Africa	Turkey	Philippines	Malaysia	Thailand
Mean	8.63	4.10	4.24	25.23	10.10	8.02	3.32	1.34
Median	8.42	4.10	4.12	25.00	9.90	7.40	3.24	1.18
Maximum	13.75	4.30	6.15	30.40	14.53	13.90	4.00	3.23
Minimum	4.60	3.60	2.69	21.00	7.70	4.70	2.74	0.48
Std. dev.	2.76	0.12	0.81	2.06	1.43	2.04	0.30	0.65
Skewness	0.11	–1.01	0.11	0.44	0.85	1.26	0.38	1.10
Kurtosis	1.80	6.42	2.06	3.24	3.41	3.91	2.36	3.57
Jarque-bera	3.81	39.99	2.39	2.13	7.80	18.36	2.53	13.14
Prob.	0.15	0.00	0.30	0.34	0.02	0.00	0.28	0.00
Observations	61	61	61	61	61	61	61	61

Source: authors own computations from eviews.

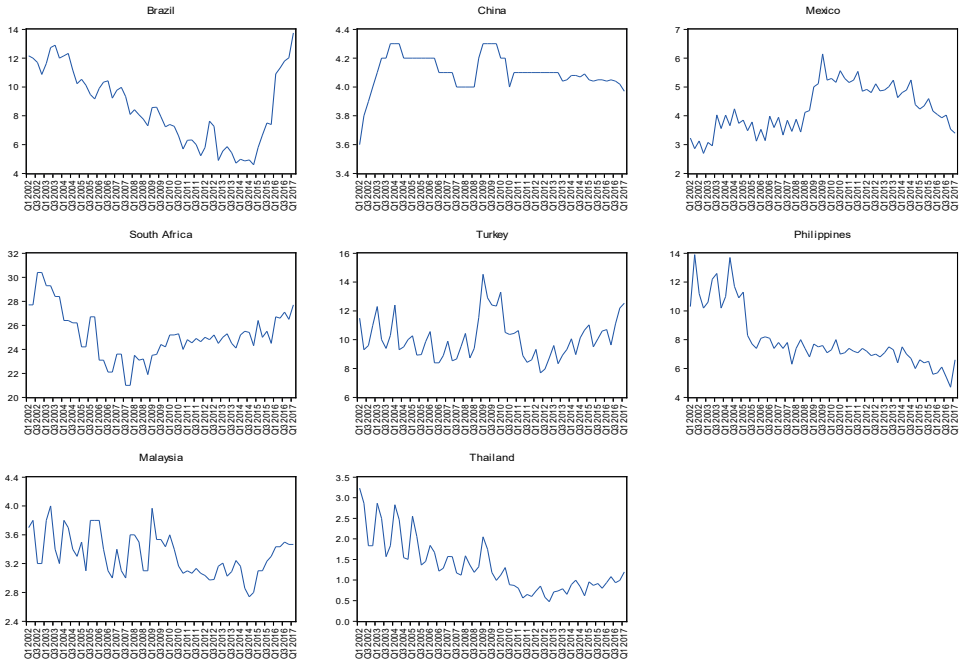

Figure 1. Time series plots of unemployment rates for 8 NIE's
Source: authors own plot on eviews.

First-generation unit root test

Our initial empirical analysis involves the testing of the integration properties for unemployment in the 8 NIE's using the ADF, PP, DF-GLS and KPSS. While the ADF, PP and DF-GLS test the null of a unit root against the alternative of a stationary process, the KPSS tests the stationary null against the alternative of a unit root. Moreover, the ADF and DF-GLS critically depend on the number of appropriate lags include in the test regression, which in our analysis is determined through the AIC and SC information criterion. The findings of these tests performed with an intercept and a trend are respectively reported in Panels A and B of Table 2.

As can be observed from Panel A, when an intercept is used, the KPSS detects a unit root for Brazil (5%), Mexico (5%), the Philippines (1%), Malaysia (5%) and Thailand (1%). However, when the ADF and PP tests are used with an intercept then the unit root null is rejected for China, Turkey, Malaysia and Thailand at all critical levels whilst the DF-GLS test finds stationarity for Brazil (10%), Mexico (10%), South Africa (10%), Turkey (10%), Philippines (10%) and Malaysia (1%). From Panel B, when the trend is included in the KPSS test, all countries fail to reject the stationary null hypothesis. However, the ADF and PP tests mutually reject the unit root null hypothesis for China (1%), Turkey (5%), and the Philippines (5%), while the PP exclusively does so for Malaysia (1%) and Thailand (1%). The DF-GLS test does the same for the Philippines (1%) and Malaysia (1%). Nevertheless, the inconclusiveness of these unit root tests in distinguishing between the natural rate hypothesis and the hysteresis hypothesis for the 8 NIE's is unsurprising considering that the employed integration tests do not account for important structural breaks in the data, mainly attributed to the different global crisis experienced within the timeframe of the data (i.e. the Asian financial crisis (1998–1999), the global financial crisis (2007–2008), or the Sovereign Euro debt crisis (2010)).

Table 2. Conventional unit root test results

Country	Panel A: Intercept				Panel B: Trend			
	H0: stationary	H0: unit root	H0: unit root	H0: unit root	H0: stationary	H0: unit root	H0: unit root	H0: unit root
	KPSS	ADF	PP	DF-GLS	KPSS	ADF	PP	DF-GLS
Brazil	0.50**	−1.85 [4]	−1.02	−1.66* [4]	0.19	−0.90 [4]	1.43	−1.94[4]
China	0.14	−4.61*** [0]	−4.46***	−1.02 [0]	0.10	−5.30*** [0]	−5.01***	−1.58 [0]
Mexico	0.49**	−2.26 [4]	−2.24	−1.63* [4]	0.20	−1.46 [4]	−2.23	−1.90[4]
South Africa	0.23	−2.27 [0]	−2.15	−1.86* [0]	0.20	−1.61 [3]	−1.77	−2.04[0]
Turkey	0.07	−3.96*** [8]	−3.68***	−1.71* [9]	0.07	−3.83** [8]	−3.64**	−2.22 [9]
Philippines	0.77***	−2.21 [0]	−1.86	−1.76* [0]	0.18	−3.87** [0]	−3.81**	−3.88*** [0]
Malaysia	0.63**	−4.27*** [0]	−4.22***	−3.36*** [0]	0.11	−4.69*** [0]	−4.67***	−4.68*** [0]
Thailand	0.95***	−2.08 [4]	−3.55***	0.06 [4]	0.24	−0.06 [3]	−5.00***	−0.62 [4]

Notes: Optimal lag length of ADF and DF-GLS tests reported in brackets [].
Source: authors own computations from eviews.

Second generation unit root tests

The so-called second-generation tests of Lee and Strazicich (2004, 2013) develop the influential works of Perron (1989), Zivot and Andrews (1992) and Lumsdaine and Papell (1997) who initially criticized conventional unit root tests on the premise that they ignore structural breaks in the testing procedure which then heightens the possibility of accepting the unit root hypothesis when the alternative stationary hypothesis is true. Lee and Strazicich (2004, 2013) particularly contributed to the paradigm by accounting for 'breaks' under both the unit root null hypothesis as well as in the stationary alternative as opposed to testing the unit root null against the alternative of structural breaks of which the alternative hypothesis could either be structural breaks with unit root or structural breaks with stationarity. The authors thus propose endogenous minimum Lagrange-Multiplies (LM) testing procedures which are invariant to breakpoint nuisance parameters and these tests can account for single (Lee and Strazicich 2004) or double (Lee and Strazicich 2004) structural breaks.

Table 3. LS unit root test results: "Crash" model

Country	Panel A: LS (one break)		Panel B: LS (double breaks)		
	Minimum LM-stat	Break	Minimum LM-stat	Break1	Break2
Brazil	–2.87 [7]	2003:q1	–2.85 [7]	2013:q1	2014:q2
China	–1.31 [2]	2006:q2	–1.59 [7]	2010:q2	2013:q2
Mexico	–2.49 [8]	2006:q2	–2.97 [8]	2006:q2	2007:q4
South Africa	–3.72** [4]	2005:q4	–5.36*** [5]	2004:q4	2005:q4
Turkey	–5.47*** [8]	2009:q1	–5.50*** [8]	2005:q1	2013:q3
Philippines	–4.12*** [8]	2004:q2	–4.07** [8]	2003:q3	2007:q3
Malaysia	–5.96*** [1]	2014:q4	–6.47*** [1]	2010:q2	2014:q4
Thailand	–1.96 [8]	2007:q2	–2.28 [8]	2007:q4	2008:q4

Notes: ***, **, * denote the 1%, 5% and 10% critical levels, respectively. Optimal lag length of LS tests reported in brackets [].
Source: authors own computations from eviews.

We apply two variations of these models to our empirical data, the first being the 'crash' model, which allows for a one-time change in level, while the second is the 'break' model which allows for a change in level and trend slope. The results of the 'crash' and 'break' model unit root tests for the NIE economies are reported in Tables 3 and 4, respectively. Starting with the results from the crash model as found in Table 3, Panels A and B respectively report the findings of the single-break and double-break tests which both reject the unit root hypothesis in support of the natural rate hypothesis for South Africa (5%), Turkey (1%), the Philippines (1%) and Malaysia (1%), while accepting the hysteresis hypothesis for Brazil, China, Mexico and Thailand.

However, the unanimity of results is not observed for the break model as the single-break version as found in Panel A of Table 4 rejects the hysteresis hypothesis in favour of the natural rate for all countries (Brazil (1%), China (10%), Mexico (5%), South Africa (1%), Turkey (5%), the Philippines (1%) and Malaysia (1%) with the sole exception of Thailand. On the other end of the spectrum, the double-break tests found in Panel B of Table 4 only rejects the hysteresis hypothesis for Brazil (1%), China (5%), South Africa (1%), Turkey (5%), the Philippines (1%) and Malaysia (1%). Based on an overall summary of these second-generation tests we conclude that all performed tests mutually reject the hysteresis hypothesis only for South Africa, Turkey, the Philippines and Malaysia and they consistently reject the natural rate hypothesis for Thailand.

Table 4. LS unit root test results: "Break" model

Country	Panel A: LS (one break)		Panel B: LS (double breaks)		
	Minimum LM-stat	Break	Minimum LM-stat	Break1	Break2
Brazil	–7.17*** [4]	2013:q4	–8.38*** [4]	2013:q4	2014:q4
China	–4.08* [4]	2005:q1	–5.12** [4]	2010:q1	2013:q3
Mexico	–4.58** [4]	2008:q4	–3.43 [4]	2004:q1	2007:q4
South Africa	–4.96*** [6]	2006:q1	–5.68*** [4]	2007:q2	2010:q4
Turkey	–4.32** [4]	2014:q1	–4.96** [4]	2009:q1	2014:q3
Philippines	–4.81*** [6]	2006:q2	–6.24** [6]	2008:q1	2011:q2
Malaysia	–6.65*** [1]	2015:q2	–8.67*** [1]	2004:q4	2005:q4
Thailand	–2.80 [5]	2008:q1	–3.69 [5]	2008:q1	2010:q3

Notes: ***, **, * denote the 1%, 5% and 10% critical levels, respectively. Optimal lag length of LS tests reported in brackets [].
Source: authors own computations from eviews.

Nonlinear and flexible Fourier function-based unit root tests

The unit root tests presented thus far have not addressed the issue of possible asymmetries dictating the evolution of the time series. In this section of the paper we present the findings of the KSS nonlinear unit root tests performed without an FFF and with an FFF and the findings from this empirical exercise are presented in Tables 1 and 2, respectively. To recall, FFF approximation is a low frequency component which captures a number of smooth breaks without requiring prior knowledge of the structural break dates. So, while nonlinearity may be an important consideration in determining the integration properties of the unemployment time series, the inclusion of the FFF approximation strengthens the reliability of the nonlinear test by accounting for unobserved structural breaks.

For control purposes, we begin our analysis by focusing on the KSS test performed without an FFF approximation as found in Table 5. The results point to the hysteresis hypothesis being rejected for only the Philippines (10%) and Thailand (1%), while for the remaining economies – Brazil, China, Mexico, South Africa, Turkey and Malaysia -, the hysteresis hypothesis holds. Moreover, similar results are obtained when the FFF approximation is included in the test regression, with the slight exception that the hysteresis hypothesis is mutually rejected at a 5 percent critical level for both the Philippines and Thailand. Collectively, these results emphasize the importance of simultaneously accounting for nonlinearities and unobserved structural breaks when testing the integration properties of the unemployment series.

Table 5. KSS unit root test without FFF

Country	KSS Stat	Optimal lag	AIC	SC
Brazil	–1.08	5	2.285	2.505
China	–0.37	2	–2.898	–2.791
Mexico	–0.75	6	0.411	0.669
South Africa	–0.88	4	2.999	3.180
Turkey	–0.55	5	2.320	2.539
Philippine	–2.07*	2	2.488	2.595
Malaysia	–0.29	3	0.087	0.230
Thailand	–2.46***	4	–0.409	–0.229

Notes: ***, **, * denote 1%, 5% and 10% critical levels, respectively. The optimal lag lengths for the tests are based on the minimization of AIC and SC information criterion. The critical values associated with KSS tests are derived from Kapetanois et al. (2003).
Source: authors own computations from eviews.

Table 6. KSS unit root test with FFF

Country	KSS stat	Optimal lag	K*	SSR
Brazil	–0.37	6	5	21.990
China	–0.33	6	3	0.132
Mexico	–0.989	6	1	3.212
South Africa	–0.436	6	2	44.928
Turkey	–0.19	6	2	22.844
Philippine	–2.57**	6	3	28.494
Malaysia	–0.81	6	4	2.450
Thailand	–2.38**	6	3	1.529

Notes: ***, **, * denote 1%, 5% and 10% critical levels, respectively. The optimal lag lengths for the tests are based on the minimization of AIC and SC information criterion. Optimal frequency approximation, K*, is selected by minimizing the SSR. The critical values associated with KSS tests are derived from Kapetanois et al. (2003).
Source: authors own computations from eviews.

Conclusion

Using quarterly data collected between 2002:q1 and 2017:q1, this study sought to determine whether unemployment rates in 8 Newly Industrialized Economies (countries) adhere to the natural rate hypothesis or the hysteresis hypothesis. We consider our empirical exercise important since the most recent sub-prime crisis and the ensuing global recession periods, crippled the global economy, with increased unemployment rates being the yardstick measure of the social repercussions of the global downturn. The crisis itself poses an econometric challenge, as techniques which account for such structural breaks must be utilized in order to overcome problems of low testing power in detecting possible unit root patterns.

Our study bypasses conventional structural unit root testing procedures, which can only account for a maximum of two known structural breaks, and relies on unit root testing procedures which simultaneously account for a series of unobserved structural breaks as well as possible asymmetries. However, as a preliminary exercise we firstly performed a variety of unit root test which ignored structural breaks and other unit root tests which endogenously account for either one or two structural breaks. These preliminaries provide mixed inferences, with the endogenous structural break tests more-or-less pointing to the natural rate hypothesis in most countries. However, when performing the more rigorous tests which account for asymmetries and unobserved structural breaks, unemployment in most Newly Industrialized Economies conform to the hysteresis hypothesis, with the exception of two Asian countries, Thailand and the Philippines, whose unemployment rates are found to be mean-reverting stationary. It would, therefore, be advised that policymakers in the other countries should direct efforts towards labor markets reforms aimed at reducing unemployment rates.

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Streszczenie

Czy stopy bezrobocia w gospodarkach nowo uprzemysłowionych kształtują się zgodnie z hipotezą stopy naturalnej czy z hipotezą histerezy?

Celem badania było ustalenie czy stopy bezrobocia w 8 gospodarkach nowo uprzemysłowionych kształtują się zgodnie z hipotezą stopy naturalnej czy z hipotezą histerezy. W tym celu zastosowano wiele rodzajów testów pierwiastka jednostkowego w odniesieniu danych kwartalnych zebranych między 1 kwartałem 2002 a 1 kwartałem 2017. Podsumowując ustalenia można stwierdzić, że konwencjonalne testy pierwiastka jednostkowego, które nie uwzględniają ani asymetrii, ani zmian strukturalnych, dają najbardziej niejednoznaczne wyniki. Z drugiej strony, testy uwzględniające zmiany strukturalne przy zignorowaniu asymetrii potwierdzałyby hipotezę stopy naturalnej dla przyjętego panelu państw. Jednak jednoczesne uwzględnienie asymetrii i niezauważalnych zmian strukturalnych wydaje się dawać najbardziej wiarygodne wyniki i potwierdza histerezę w przypadku stóp bezrobocia wszystkich państw, za wyjątkiem gospodarek/państw azjatyckich: Tajlandii i Filipin.

Słowa kluczowe: hipoteza stopy naturalnej, hipoteza histerezy, bezrobocie; testy pierwiastka jednostkowego, aproksymacja Fouriera; gospodarki nowo uprzemysłowione

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The Role of China's Exchange Rate on the Trade Balance of Sub-Saharan Africa: a Gravity Model Approach

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Abstract

This study seeks to investigate theimpactof China'sexchange rate onthe trade balance of 41 Sub-Saharan African countries for the period from 1994 to 2016. Using an augmented gravity model, the grouped and ungrouped results of the study confirm the elasticity and absorption approaches of the trade balance. Similarly, the robustness check, by dividing the sample period into two sub-periods (2005–2016 and 1994–2004), also confirms the elasticity and absorption approaches of the trade balance.

Keywords: bilateral trade, China, SSA

JEL: F41, C23

Introduction

In the last several years, the effect of devaluation on the trade balance has been debated extensively. According to Krueger (1983), theelasticity approach to the exchange rate proposesthat iftransactions are completed at the time of depreciation or devaluation, then it leads toshort-term change in the trade balance. The trade balance initially deteriorates during the 'contract period', before imports and exports adjust.[1]

Over time, the trade balance improves, quantities respond tothe changedeffective prices, andelasticities of imports and exports increase. However, due to devaluation, the import prices increase, which leads to high domestic pricesof goods which are not traded (Williamson 1983). The effective real exchange rate rises due to the resulting overall inflation; thepotential for an increase in thetrade balance is eliminated. When the real supply of money decreases due to a devaluation (or depreciation), according to the monetary approach to the exchange rate, the phenomenon leads to an increase in the excess domestic demand for money. Inturn, hoardingand the trade balance increase.

Theoretically, currency devaluation can impact the trade balance via two channels, i.e., firstly, the currency devaluation influences the exchange rate, and secondly, it directly affects domestic absorption. Through the first channel, competitiveness improves due to a nominal devaluation, which in turn improves the trade balance and affects thereal exchange rate, i.e., the relative price. The absorption effect on devaluation is the second channel. In countries that are relatively small in size, where prices are exogenously given, wage rates and price levels are flexible in real and nominal terms, andwhere goods and assets are substitutes, the devaluation results in price level increases by the same proportion. The domestic absorption falls due to the increase inthe price level, which leads to a reduction in the real balances. In the trade literature, arguments both for and against devaluation are not uncommon.

To address this important issue, different methodologies were utilized in previous studies. However, the results were inconclusive. The results of empirical work show no clear consensus regarding the effect of exchange rates on the trade balance. By using the parameter estimates of a general macro model, Gylfason and Risager (1984, Table 3) show that in less developed countries (LDCs), devaluation improves the current accounts. By estimating price elasticities through the models of export and import demand, Bahmani-Oskooee (1986, Tables 2–8) shows that the elasticities are high enough to explain the improvement in the trade balance. Miles (1979) and Marquez (1990), on the other hand, reached the opposite conclusion.[2]

1 The unfavorable effect of devaluation on the trade balance is termed the J-Curve phenomena. Junz and Rhomberg (1973) identified that the trade balance deteriorates first, but after the passage of time it begins to improve.

2 For instance, Marquez (1990) identify that for LDCs, in order to get better results of successful devaluation; the trade elasticities (import + export price elasticities) is equal to –0.78, which is insufficient.

This paper aims to explore the changes in the bilateral trade balance of Sub-Saharan Africa (SSA) with China due to the effect of changes in the exchange rate. Furthermore, the objective of the study is to use a gravity model for grouped and ungrouped data and to identify the variables, specifically the exchange rate, which affects the trade balances of SSA countries while engaging in trade with China.

The organization of this paper is as follows. In Section 2, there is an overview of SSA – China trade relations. Section 3 contains the methodology and data. Section 4 provides the results, and Section 5 presents the conclusion.

Overview of SSA-China trade relations

Trade between China and Sub-SaharanAfrican has seen an impressive increase since 2000. Over the past decade, the economic ties between China and SSA have expanded. Between2000 and 2013, trade increased from a negligible level to more than $170 billion, which makes China a major financial and trade partner for SSA (World Bank 2015). During 2013, the total trade volume between SSA and China reached $103.17 billion which is the highest value of trade from 2000–2017 (see Fig. 3).

Compared to the European Union and the United States, the SSA-China trade is growing much faster. By surpassing the United States, China became SSA's largest trading partner in 2009.[3] Similarly, in 2013, SSA's trade with China accounted for 22% of SSA's total trade with the rest of the world. As far as China's development financing and foreign investments are concerned, the official data isnot very encouraging, but trade with SSA has grown rapidly.

Commodities dominated SSA's trade with China. The bulk of SSA's exports to China, including oil, metals, and gas, are sourced from a few countries, although SSA's exports are even more concentrated in commodities to the major emerging market economies, as well as the EU (European Union), and the USA. In contrast, China's exports to SSA are diverse. About 1/3 consist of capital goods, including telecommunications equipment, factory machinery, generators, and vehicles. Manufacturing and consumer goods account for the remainder, which are nearly three times as large as imports from the EU and USA.

Fig. 1 shows the top five countries from which SSA imported goods in 2017. In this regard, China is the leading countries with around $37.39 billion exports to SSA. Similarly, Fig. 2 shows the top five countries to which SSA exported goods in 2017. China is the second largest importer of SSA's goods. The total value of trade volume between the two blocks is exhibited in Fig. 3. It can be seen that trade flow has increased from 2000 to 2017. In 2000, the trade volume was $4.09 billion. The volume reached to $55.90 billions. From 2014 to 2016, the trade volume has been declined. It is due to the weak commodity prices since 2014, which have greatly impacted the value of African exports to China, even while Chinese exports to Africa remained steady.

3 Global Economic Prospects, World Bank (2015).

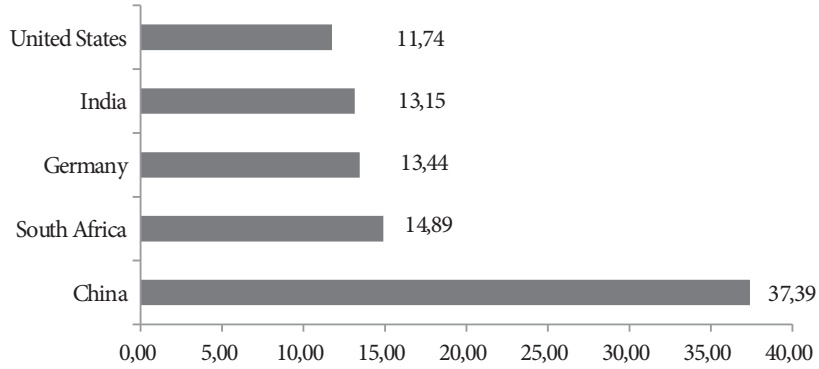

Figure 1. Top five countries from which SSA imported goods in 2017 (billion USD)
Source: authors' calcutaions, World Integrated Trade Solution

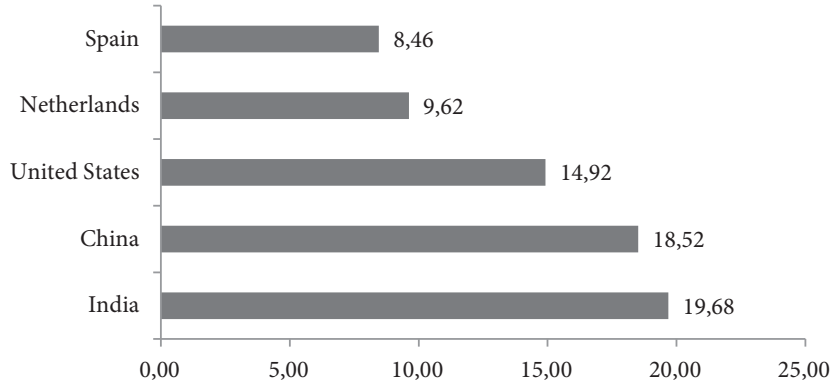

Figure 2. Top five countries to which SSA exported goods in 2017 (billion USD)
Source: authors' calcutaions, World Integrated Trade Solution

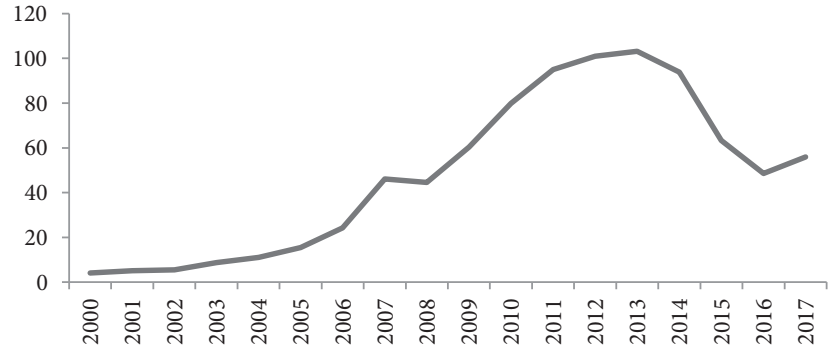

Figure 3. Trade flow between SSA and China from 2000–2017
Source: authors' calcutaions, World Integrated Trade Solution

Data and methodology

Theoretical framework

Anderson (1979), Linneman (1966), Poyhonen (1963), and Tinbergen (1962) are the pioneers of the Gravity Model of trade, whichas in former approaches, may also be represented inthe reduced form of a 4-equation partial equilibrium model of export supply and import demand. The basic form of the gravity model expresses bilateral trade between two countries as a function of their respective sizes (in terms of income or population) and the geographical distance between them (which serves as a proxy for the transportation costs).

To estimate the trade balance function for SSA, we rely on the gravity model specified by Anderson & Wincoop (2003), Matyas (1997), and Deardorff (1997). Trade flow is a function of a country's income (GDPs), distance, and population. The relative priceis expressed in a common currency, which is the country's export price relative to the foreign price of related goods. The real effective exchange rate rises due to the rise in the price level, which affects the trade.

The essential idea of this approach is that the *"absolute size"* of countries with regards to the populations and incomes is not so important in bilateral trade; rather, the "*relative size"* determines import demand and export supply. Bahmani-Oskooee (1991; 2001) argues that trade balance can be interpreted as a nominal exchange rate or a real exchange rate because the modelis unit free. Moreover, it helps to identify the specific causes of bilateral trade imbalances. The models presented as follows:

$$TB_{ij} = \beta_0 + \beta_1 RGDP_{ij} + \beta_2 RGDPPC_{ij} + \beta_3 RER_{ij} + \beta_4 D_{ij} + \mu_i \quad (1)$$

To simplify, the time subscript '*t*' is excluded from the model. The subscript '*i*' denotes the SSA countries and '*j*' represents China; TB_{ij} is the ratio of export to import; RGDP is the ratio of relative GDPs; RGDPPC is the relative per capita GDP ratio; RER is the relative exchange rate; and D is the distance between the capitals of country *i* and *j*used as a proxy for transport costs. To put together the absorption, elasticity, and monetary approaches, the vectors of the four independent variables should be consideredin order to identify their impact on the trade balance. The variables are defined as follows;

$$TB_{ij} = X_{ij}^{s} \Big/ M_{ij}^{d} \quad (2)$$

where X_{ij}^{s} is the export supply of country *i* to its partner*j*; similarly, M_{ij}^{d} is the demand for import by country *i* from partner *j*.

$$RGDP_{ij} = {GDP_i}/{GDP_j} \tag{3}$$

In equation (3), GDP_i and GDP_j represent the gross domestic products of country *i* and country *j*. Similarly,

$$RGDPPC_{ij} = {GDPPC_i}/{GDPPC_j} \tag{4}$$

In equation (4), $GDPPC_i$ and $GDPPC_j$ represent the per capita GDPs of country *i* and country *j*.

$$EXR_{ij} = {1}/{ER_{ij}} * {P_i}/{P_j} \tag{5}$$

Where ER_{ij} is the exchange rate between country *i* and *j*, while P_i and P_j are the consumer price indices of the countries.

Data

To assess the impact of China on the trade balance of 41 SSA countries, the data with its sources are given in Table 1.

Table 1. Description and source of variables.

Indicators / Variables	Source
Gross Domestic Product constant at 2010 $	WDI
Per capita GDP constant 2010	WDI
Consumer Price Index	WDI
Exchange Rate	WDI
Distance	www.timeanddate.com
Bilateral Import and Export	China Statistical Yearbook

Source: The data is sourced from World Bank, China Statistical Yearbook, and www.timeanddate.com

Estimation techniques

To estimate the trade relationships and trade effects for a particular period, classic gravity models normally use cross-sectional data. This studyuses paneldata methodology. The advantages of this method are that it cancapture the effect of time-invariant variables and country-specific effects. Similarly, the method monitors trade partners' individual effects, captures important relationships between variables over time, and avoids estimation bias.

In comparison with the random and fixed-effects models that are not restricted, the pooled model is restricted and assumes that countries are homogeneous. When it is necessary to control for omitted variables that are constant over time but differ between countries, the fixed-effects model is desirable. Since fixed-effects consider heterogeneity and individual country effects, it gives better estimates than the pooled model. On the other hand, no individual country effects are assumed in the random-effects model. To test this assumption and to compare the fixed and random effects estimates of coefficients, the Hausman (1978) test is employed. The Hausman test specifies whetherthe explanatory variables are correlated with specific effects or not. The Hausman test makes sure a model is selected that has consistent results. Random effects are not correlated with the explanatory variables, which is the main assumption in the random-effects estimation. The fixed-effects model is feasible if the p-value is significant, i.e., < 5%. On the other hand, if it is greater than 5%, then the most appropriate model is the random-effects model.

Empirical results

Specifications for Different Groups of Countries from 1994–2016

Table 2 presents the results of our estimation of the 41 SSA countries with their trade partner, China. For all groups of countries, the pooled OLS, fixed-effects, and random-effects models are estimated. The Hausman test suggests that fixed-effects estimation is the proper strategy for all of the specifications (for all the groups). Following economic theories, all the variables, including the intercept, are significant with correct signs. We use robust method, i.e., White's heteroscedasticity-corrected covariance matrix estimator. Without altering the estimates of the slope coefficients, the method allows standard errors to be improved.[4]

The slope coefficients are considered to remains the same for all countries while the intercept terms β_0 are considered to be country-specific in the model. Regarding the global sample ***(the group of SSA countries excluding Somalia, Djibouti, South Sudan, and Eritrea, for which the data are not available***), the coefficient of relative GDP (*RGDP*) is highly significant and positive (4.44). It means that when the GDP of China increases relatively more than that of SSA, the trade balance of SSA deteriorates. This implies that China's exports and production capability increase at a higher rate than those of SSA. The situation adversely affects the trade balance of SSA, because China exports more to SSA or imports less from SSA. Similarly, for the sub-group of ***oil-producing countries,*** the coefficient of relative GDP (*RGDP*) is insignificant (1.34) and positive. This implies that China's GDP does not affect the trade balance of SSA's oil-pro-

4 The SE (β) s should be estimated in a manner that may not alter the estimates of the slope coefficients because heteroscedasticity causes problems with standard errors but does not cause problem forthe coefficients.

ducing countries. The regression results for the third sub-group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of relative GDP (*RGDP*) is significant at the 1% level of significance and positive (4.79). This implies that when China's GDP increases comparatively more than that of SSA, the trade balance of SSA deteriorates.

Similarly, for the ***global sample,*** the coefficient of the relative RGDPPC is highly significant and negative (–3.98), as expected. A higher relative per capita GDP (RGDPPC) means a higher absorption capacity of the country since per capita GDP determinescountry's absorption capacity. This means that China imports more from SSA due to theincrease in absorption capacity. This, in turn,supports the *Linder hypothesis*[5] in the case of SSA. Similarly, for the sub-group of ***oil-producing countries,*** the coefficient of relative GDP (*RGDP*) is significant at 10% and negative (–1.99). This implies that anincrease in China's per capita GDP tends to increase the export volume of oil-producing countries. The regression results for the third sub-group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of the relative per capita GDP (*RGDPPC*) is significant and negative (–4.24). The increase in China's per capita GDP reduces the ratio of RGDPPC and improves the trade balance of the third group of SSA countries.

The coefficient of the real exchange rate (*RER*) is positive for all the sample of countries. The positive signis in line with the *theoretical* expectation. For all the three groups of countries, the coefficients are significant. The more the *RERij* index increases, the more there is a depreciation of SSA currencies with respect to China's currency; hence, the coefficient of the real exchange rate (*RERij*) is positive. This improves their trade balance (*TBij*) because the export competitiveness of SSA increases.

Specifications for Different Groups of Countries from 1994–2004

Table 3 presents the estimation results for the trade balance of the 41 SSA countries' with their trade partner China for the period of *1994 to 2004* (the first eleven years in our sample). For all groups of the countries, the pooled OLS, fixed-effects, and random-effects models are estimated. The Hausman test suggests that fixed-effects estimation is the proper strategy for all of the specifications (for all the groups). Following economic theory, all the variables have correct signs. We use a robust method, i.e., White's heteroscedasticity-corrected covariance matrix estimator. Without altering the estimates of the slope coefficients, the method allows standard errors to be improved.

The slope coefficients are considered to remain the same for all countries while the intercept term β_0 is considered being country-specific in the model. Regarding

5 The Linder hypothesis states that if per capita income is similar in two countries, the demand structure will be similar.

the global, the coefficient of relative GDP (*RGDP*) is highly significant and positive (9.22). It means that when China's GDP increases relatively more than that of SSA, the trade balance of SSA deteriorates for the period *1994 to 2004*. This implies that China's export and production capability increase at a higher rate than that of SSA. The situation adversely affects the trade balance of SSA because China exports more to SSA or imports less from SSA. Similarly, for the sub-group of ***oil-producing countries,*** the coefficient of RGDP is insignificant (0.79) and positive. This implies that China's GDP does not affect the trade balance of the oil-producing countries of SSA. The regression results for the third group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of RGDP is significant at the 1% level of significance and positive (9.06). This implies that when the GDP of China increases comparatively more than that of SSA, the trade balance of SSA deteriorates.

Similarly, forthe ***global sample,*** the coefficient of the relative per capita GDP (RGDPPC) is highly significant and negative (–8.04), as expected. The higher RGDPPC means higher absorption capacity of the country since per capita GDP determines the absorption capacity of a country. This means that China imports more from SSA due to increased absorption capacity. Similarly, in the sub-group of ***oil-producing countries,*** the coefficient of relative GDP (*RGDPPC*) is insignificant and negative (–4.26), which implies that an increase or decrease in China's per capita GDP has no impact on the trade balance of oil-producing countries. The regression results for the third sub-group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of the RGDPPC is significant and negative (–7.78). The increase in China's per capita GDP reduces the ratio of RGDPPC and improves the trade balance of SSA countries for the third group of countries.

The coefficient of the real exchange rate (*RER*) is positive and insignificant for the whole sample and for the 3rd group of countries for the period *1994 to 2004*. However, its value is positive and significant for the oil-producing countries. The positive sign is in line with the *theoretical* expectation. The more the index of *RERij* increases, the more there is a depreciation of the currencies of oil-producing countries with respect to the currency of their partner, China; hence, the coefficient of the real exchange rate (*RERij*) is positive. This improves the trade balance (*TBij*) because the export competitiveness of oil-producing countries increases.

Specifications for Different Groups of Countries from 2005–2016

Table 4 presents the trade balance equation resultsfor SSA countries for the period *2005 to 2016* (the last 12 years in our sample). For all country groups, the pooled OLS, fixed-effects, and random-effects models are estimated. The Hausman test suggests

that fixed-effects estimation is the proper strategy for all of the specifications (for all groups). We use a robust method, i.e., White's heteroscedasticity-corrected covariance matrix estimator.

Regarding the global group, the coefficient of relative GDP (*RGDP*) is highly significant and positive, which implies that in the 3rd sample period (2005 to 2016), when China's GDP increases relatively more than that of SSA, SSA's trade balance deteriorates. The results in the 3rd sample period confirm the results of our estimation for the full period (1994–2016). This implies that China's export and production capability increase at a higher rate than that of SSA. The situation adversely affects the trade balance of SSA, because China exports more to SSA or imports less from SSA. Similarly, in thesub-group of ***oil-producing countries,*** the coefficient of relative GDP (*RGDP*) is significant at 5% and positive. This implies that China's GDP has affected the trade balance of SSA's oil-producing countries in the last decade. The regression results for the third sub-group of countries ***(SSA countries excluding the oil-producing countries)*** indicate that the coefficient of relative GDP (*RGDP*) is insignificant. This implies that the GDP of China has no impact on the trade balance of SSA.

Similarly, for the ***global sample,*** the coefficient of the RGDPPC is highly significant and negative (–1.25) for the period from *2005 to 2016*. This indicates that in that period, China's per capita GDP improved and she imported more from SSA. Similarly, for the sub-group of ***oil-producing countries,*** the coefficient of RGDPPC is significant at 10% and negative (–2.71), implying that an increase in China's per capita GDP tends to increase the export volume of oil-producing countries. The regression results for the third sub-group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of the relative per capita GDP (*RGDPPC*) is negative (–0.85) but insignificant. The per capita GDP for the third sub-group between 2005 and 2016 has no impacts on the trade balance of SSA.

Between 2005 and 2016, the coefficients of the real exchange rate (*RER*) are positive for all groups of countries. The positive sign is in line with the *theoretical* expectation. For all the three groups of countries, the coefficients are significant. The more the index of *RERij* increases, the more SSA currencies depreciate with respect to the currency of their partner, China; hence, the coefficient of the real exchange rate (*RERij*) is positive. This improves the trade balance (*TBij*) because SSA's export competitiveness increases.

Table 2. Dependent Variable lnTB (1994–2016)

Explanatory Variables	Group-I SSA Countries (excluding Eritrea, South Djibouti, Sudan, and Somalia)			Group-II Oil-producing countries of SSA (Angola, Nigeria, Congo Rep., and Sudan)			Group-III SSA Countries excludingoil-producing countries		
	POLS	*FE*	*RE*	*POLS*	*FE*	*RE*	*POLS*	*FE*	*RE*
lnRGDP	0.66*** (0.09)	4.44*** (1.17)	1.07 (0.22)***	1.33*** (0.12)	1.34 (1.66)	1.33*** (0.12)	0.70*** (0.06)	4.79*** (1.27)	1.07*** (0.24)
lnRGDPPC	−0.06 (0.06)	−3.98*** (0.92)	−1.32*** (0.19)	−0.74*** (0.38)	−1.99* (1.18)	−0.74** (0.38)	−0.23** (0.09)	−4.24*** (1.01)	−1.32*** (0.20)
lnEXR	0.03 (0.04)	1.08*** (0.36)	0.32** (0.12)	1.04 (0.18)	1.02*** (0.36)	1.04*** (0.18)	0.01 (0.04)	1.04** (.45)	0.27** (0.13)
lnDIS	−1.06* (0.57)	–	−3.79* (2.31)	−16.16*** (2.65)	–	−16.16*** (2.65)	−1.27** (0.58)	–	−4.05* (2.36)
Cons	7.92* (5.28)	15.56** (6.36)	33.75* (21.34)	−150.14*** (24.05)	1.03 (6.44)	−150.14*** (24.05)	−9.85* (5.46)	17.95** (7.33)	−35.96 * (21.85)
No. of observations	943	943	943	92	92	92	851	851	851
Hausman test	457.43***			46.27***			156.12***		

Notes: Robust standard errors are in parentheses. ***, ** and * indicate that the coefficient is significantly different from zero at the 1%, 5% and 10% levels, respectively.

Source: The data is sourced from World Bank, China Statistical Yearbook, and www.timeanddate.com.

Table 3. Dependent Variable lnTB (1994–2004)

Explanatory Variables	Group-I SSA Countries (excluding Eritrea, South Djibouti, Sudan, and Somalia)			Group-II Oil-producing countries of SSA (Angola, Nigeria, Congo Rep., Sudan)			Group-III SSA Countries excluding oil-producing countries		
	POLS	*FE*	*RE*	*POLS*	*FE*	*RE*	*POLS*	*FE*	*RE*
lnRGDP	0.58*** (0.08)	9.22*** (1.51)	0.79*** (0.26)	2.06 (0.24) ***	0.79 (8.38)	2.06*** (0.24)	0.60*** (0.09)	9.06 (1.57) ***	0.79*** (0.28)
lnRGDPPC	−0.59*** (0.15)	−8.04*** (1.26)	−0.64 (0.32)**	−3.44 (0.97)***	−4.26 (5.80)	−3.44 (0.97) ***	−0.42*** (0.15)	−7.78*** (1.32)	−0.55* (0.34)
lnEXR	0.10 * (0.06)	0.40 (0.32)	0.17 (0.16)	1.11 (0.36)	0.33*** (0.63)	1.11 (0.36) ***	0.09* (0.06)	0.36* (0.37)	0.15 (0.17)
lnDIS	−0.06 (0.57)	–	−2.15 (2.55)	−24.86*** (4.88)	–	−24.86*** (4.88)	−0.27 (0.89)	–	−2.09 (2.64)
Cons	0.53 (7.94)	44.49*** (8.53)	−18.88 (23.56)	−233.58*** (44.28)	1.73 (34.19)	−233.58*** (44.28)	−1.49 (8.27)	44.80*** (9.18)	−18.36 (24.40)
No. of observations	451	451	451	44	44	44	407	407	407
Hausman test	52.70***			7.69**			41.67***		

Notes: Robust standard errors are in parentheses. ***, ** and * indicate that the coefficient is significantly different from zero at the 1%, 5% and 10% levels, respectively.

Source: The data is sourced from World Bank, China Statistical Yearbook, and www.timeanddate.com.

Table 4. Dependent Variable lnTB (2005–2016)

Explanatory Variables	Group-I SSA Countries (excluding Eritrea, Djibouti, South Sudan, and Somalia)			Group-II Oil-producing countries of SSA (Angola, Nigeria, Congo Rep., Sudan)			Group-III SSA Countries excluding oil-producing countries		
	POLS	*FE*	*RE*	*POLS*	*FE*	*RE*	*POLS*	*FE*	*RE*
lnRGDP	0.73*** (0.07)	1.48*** (2.59)	.799*** (.23)	1.20*** (0.10)	5.40** (1.20)	1.20*** (0.09)	0.81*** (.07)	0.76 (2.99)	0.81 (0.28) ***
lnRGDPPC	−0.18 (0.13)	−1.25*** (2.00)	−0.61** (0.25)	−2.83*** (0.54)	−2.71* (1.04)	−2.83*** (0.95)	−0.40*** (0.13)	−0.85 (2.36)	−0.07* (0.50)
lnEXR	0.03 (0.05)	1.24** (0.60)	0.18 (0.15)	0.78*** (0.15)	1.80* (0.72)	0.78*** (0.18)	0.01 (0.05)	1.08* (0.66)	0.12 (0.17)
lnDIS	−1.45** (0.72)	–	−2.32 (2.33)	−8.60*** (2.72)	–	−8.60** (4.24)	−1.78** (0.74)	–	−2.61* (1.52)
Cons	−10.81 (6.68)*	−0.22 (13.86)	−19.96 (21.52)	−79.37*** (25.04)	15.54* (6.61)	−79.37** (39.62)	−13.65** (6.86)	−3.79 (16.76)	−22.60* (14.50)
No. of observations	492	492	492	48	48	48	444	444	444
Hausman test	13.57***			34.57***			8.92**		

Notes: Robust standard errors are in parentheses. ***, ** and * indicate that the coefficient is significantly different from zero at the 1%, 5% and 10% levels, respectively.
Source: The data is sourced from World Bank, China Statistical Yearbook, and www.timeanddate.com.

Conclusion

The analysis shows that despite an unfavorable trade balance position, the economies of SSA in recent years have streng then ed their macroeconomic structure and growth. In the popular gravity model, the factors that determine trade flow also impact the trade balance. The determining factors of SSA's trade balance include the relative absorption capacity in terms of the relative per capita GDP of China to SSA countries and the relative size of countries in terms oftheir relative GDP. The trade balance is also determined by traditional variables like the import-weighted distance of the partners and the real exchange rate. Here, rather than absolute distance in the gravity model, the import-weighted distance proxy for transportation cost is more appropriate. A static cross-country analysis for the bilateral trade balance of SSA countries with China was our main objective for this study.

A fixed-effects estimator was used in our analysis. A static panel data analysis technique was applied for SSA countries' trade with China for the periods 1994–2016, 1994–2004, and 2005–2016. The appropriate model for the study is a fixed-effects model specified by the Hausman test.

The empirical analysis of the study shows that the coefficient of RGDP*ij* (relative GDP) is significant and positive forgroup-I and group-III for the periods 1994–2016 and 1994–2004. Similarly, the results are significant for the period from 2005–2016 for group-I and group-II, implying that with an increase in the relative GDP of China, the trade balance of SSA deteriorates.

On the other hand, the coefficient of RGDPPC*ij* is significant and negative for all groups of countries for the period 1994–2016. However, in the period 1994–2004, the value of RGDPPC*ij* is insignificant for group-II countries. Similarly, for the period 2005–2016, the value is significant for group-III countries. However, for group-III countries, the value is significant and negative in all sample periods, implying that an improvement in China'sabsorption capacity induces it to import more from SSA.

Similarly, the coefficients of *RERij* indicate it is significant and positive for group-II and group-III countries for all the three periods. Similarly, the value of *RERij* is significant for the group-I countries in the periods 1994–2016 and 2005–2016; however, the value remains insignificant for the period 1994–2016. Overall, the results of *RERij* shows that appreciation in the Chinese currencyimproves the export performance of SSA and hence improves the trade balance (*TBij*). This implies a positive sign of the coefficient of thereal exchange rate (*RERij*).

The empirical analysis of the study gives some useful insight into the trade balance of SSA. A static panel data analysis was applied to investigate time-invariant, country-specific effects, as well as the cross-country variations in trade balances with heterogeneous economies and the important factors that significantly affect the trade balance of SSA.

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Appendix

List of the Sub-Saharan African countries used in this study

S. No	Country	S. No	Country
1	Angola	22	Madagascar
2	Benin	23	Malawi
3	Burkina Faso	24	Mali
4	Burundi	25	Mauritania
5	Cabo Verde	26	Mauritius
6	Cameroon	27	Mozambique
7	Central African Republic	28	Namibia
8	Chad	29	Niger
9	Comoros	30	Nigeria
10	Congo, Dem. Rep.	31	Rwanda
11	Congo, Rep.	32	Sao Tome and Principe
12	Cote d'Ivoire	33	Senegal
13	Ethiopia	34	Sierra Leone
14	Gabon	35	South Africa
15	Gambia, The	36	Sudan
16	Ghana	37	Tanzania
17	Guinea	38	Togo
18	Guinea-Bissau	39	Uganda
19	Kenya	40	Zambia
20	Lesotho	41	Zimbabwe
21	Liberia		

Streszczenie

Rola kursu walutowego Chin w bilansie handlowym państw Afryki Subsaharyjskiej: zastosowanie modelu grawitacyjnego

Niniejsze opracowanie prezentuje rezultaty badania wpływu kursu walutowego Chin na bilans handlowy 41 państw Afryki Subsaharyjskiej w latach 1994–2016. Przy zastosowaniu rozszerzonego modelu grawitacyjnego, pogrupowane i niepogrupowane wyniki badania potwierdzają słuszność podejścia elastycznościowego i absorpcyjnego do bilansu handlowego. Podobnie test wrażliwości, dokonany poprzez podział analizowanego okresu na dwa podokresy (2005–2016 i 1994–2004), potwierdza słuszność podejścia elastycznościowego i absorpcyjnego do bilansu handlowego.

Słowa kluczowe: handel dwustronny, Chiny, ASS

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Do Remittances Enhance Financial Development in Transitional Markets?

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Abstract

The paper explored (1) the impact of remittances on financial development and (2) whether the interaction between remittances and human capital development had an influence on financial development in transitional economies using the dynamic GMM approach, with data ranging from 1996 to 2014. Remittances were found to have had a non-significant positive influence on financial development in transitional economies when stock market turnover, stock market value traded, domestic credit to the private sector by banks, and public bond sector development were used as measures of financial development. When stock market capitalisation, domestic credit to the private sector by financial sector, and private bond sector development were used as measures of financial development, remittances had a non-significance negative effect on financial development. Using all other measures of financial development except stock market capitalisation (which produced a negative sign), the interaction between remittances and human capital development had an insignificant positive influence on financial development. Transitional economies are therefore urged to avoid over-relying on remittance inflow and human capital development as sources of financial development.

Keywords: remittances; financial development; transitional economies

JEL: F24, G15, P2

Introduction

Background of the study: Financial system efficiency has been lauded for its potential to positively impact savings, enhance investment activity and to result in improved economic performance in the long run (McKinnon 1973). Generally, the determinants of financial system performance are extensive, but it is imperative that a good understanding of these factors will help policymakers utilise these drivers to leverage financial development for the health of both their financial systems and the economy. The positive role of financial development on economic growth is undisputed and widely documented in the recent literature (Bongini et al. 2017). It is also important to note that remittances also have a positive direct influence on economic growth (Kumar et al. 2018). Thus, financial development and remittances are all important determinants of economic growth, but, it also is interesting to note that their interaction enhances Gross Domestic Product (GDP), according to Aggarwal et al. (2011). This is the basis upon which research on how to enhance financial system efficiency is justified.

Remittances have taken an upward trend according to World Bank reports. They sprang from $3 billion in the mid–1970s to about $370 billion by the beginning of the global financial crisis and further rose to US$441 billion by 2016 (Ratha et al. 2016). Abundant literature concedes that remittances have emerged to be the second source of foreign finance to most developing countries, despite the fact that substantial migrant income remitted through informal channels is unaccounted for (Freund and Spatafora 2008) with Foreign Direct Investment (FDI) remaining in the lead position. It is confirmed that this growth has worked well to promote financial development (Aggarwal et al. 2006). Furthermore, remittances surpass capital flows in that they exhibit more stability and counter cyclicality, according to Yang (2008). The rising significance of remittances as an income source has necessitated investigations into channels through which remittances impact economic growth. According to key contributions to date, it is clear that remittances impact financial development, poverty, employment, human capital development, and foreign direct investment, among others. However, it is also critical to understand how the connections between remittances and human capital can foster efficient, deep, and stable financial systems.

Research problem and gaps found in the literature: Recent research work considers the linkage between remittances and human capital development (Azam and Raza 2016) while some concentrate on the effects of either remittance (Williams 2016; Bhattacharya et al. 2018) or human capital (Satrovic 2017) on financial development but ignore any possible interaction effects of remittances and human capital on financial development. In terms of the relationships that exist, mixed findings have been reported in the literature, with evidence of positive (Ajilore and Ikhide 2012), negative (Coulibaly 2015), and zero (Chowdhury 2016) associations between financial development and remittances. The same is true from a theoretical point of view, with Altruism Theory and Base Broadening Theory implying a positive relationship, while

Self Interest Theory suggests a negative or insignificant link between the two. This diversity in findings and theoretical views leaves room for further investigation.

Turning to the measurement of financial development, it is important to note that most researchers measured financial development using one or only a few variables (Mbaye 2016). This does not bring out all the dimensions of financial development and gives misleading results biased towards the measure or few measures chosen. Also interesting to note is the fact that previous research mainly utilised bivariate data (Ajilore and Ikhide 2012); hence, it suffered greatly from omitted variable bias. Therefore, the authors came to the conclusion that there is a paucity of literature on remittances and financial sector development in transitional economies.

Contribution of the study: This study is important because the nexus between remittances and financial development is key to understanding the effect of the global financial crisis on transitional markets. A flashback to the recent trends shows that remittance issues dominate research and the policy agenda, according to the World Bank (2006). In addition, cross-country studies are very important in facilitating comparisons. The fundamental contribution of this study is that it investigates and explains the interaction effect of remittances and human capital on financial development, which is unexplored by previous research. In so doing, the study extends the literature on remittances and human capital development by clarifying how their interplay stimulates financial development.

This study deviates from the majority of prior similar studies in that it includes quite a number of variables in measuring financial development. The study used seven indicators of financial development. Hence, analysis of the effect of remittances on different measures of financial development help to provide an impartial view. The study also makes an important contribution to research on transitional economies by extending coverage to include more countries from diverse backgrounds. Transitional economies from Europe, Latin America, Asia, and Africa are included; hence, this work is pioneering in terms of coverage. Last but not least, our study captured a number of variables in order to avoid omitted variable bias, prevalent in other studies.

Organisation of the study: Section 2 of the paper is a theoretical and empirical literature review, while section 3 explains how the explanatory variables influence financial development. Section 4 discusses the personal remittances and financial development trends for transitional economies during the period from 1996 to 2014. Section 5 deals with the research methodology framework, the discussion, and the interpretation of the results. Section 6 concludes the paper. Section 7 is the bibliography.

Literature review

Empirical evidence on remittances and financial development is inconsistent, with some reporting no association, some positive, and some negative results, which are either unidirectional or bidirectional. Such disparities appear to emanate from incon-

sistencies in the choice of study countries, measurement variables, econometric models, and the study period. However, every conclusion seems to be sensible, given there is always a theoretical underpinning to substantiate it. Some studies document evidence of there being no relationship between the two (Cherono 2013). A recent study by Coulibaly (2015) on 19 countries in Sub-Saharan Africa used liabilities to measure financial development and found no significant evidence of a relationship between the two. The converse relationship was also confirmed to be true, that financial development does not precede remittance flows.

The absence of a relationship between financial development and remittances is also evident in a study by Das (2009). The data for the study came from four economies which were receiving remittances from diasporans working in oil-producing companies in Arab countries. Financial development was proxied by investment. Combining the analysis of panel and time-series data, the study found no relationship between investment and remittances for Egypt, Syria, or Pakistan, but did for Bangladesh. Chowdhury (2016) reached a similar conclusion using a dynamic panel methodology to investigate how financial development can mediate the remittance-growth nexus for the 33 top beneficiary countries of remittances.

On the other hand, there is a fair share of research evidence showing the existence of a negative relationship between remittances and financial development. This supports the substitutability nature of remittances and financial development, where remittances provide an alternative access root to finance for individuals who cannot meet stringent requirements on loan applications. Mallick (2012) conducted a study in India to test the existence of a relationship between the two and confirmed that remittances have a crowding-out effect on household investment. Brown et al. (2013) combined macro and micro-economic analysis to study the linkage between financial literacy and remittances in Azerbaijan and Kyrgyzstan. The study found an adverse relationship between the two, suggesting that an increase in remitted funds constrains financial inclusion. This negative link was more pronounced for Azerbaijan, whose level of financial development was higher than that of Kyrgyzstan.

The other strand of researchers, for example, Gupta et al. (2009), argues for a positive relationship between financial development and remittances, meaning that they uphold the complementary hypothesis. A Mexican study by Demirgüç-Kunt et al. (2011) substantiates this strong positive remittance-development nexus by ascertaining a simultaneous increase in remittances, bank branches, account holders, and deposit base at the municipality level. Esteves and Khoudour-Castéras (2011) studied the effect of remitted inflows on the development of the financial system to peripheral European countries 40 years prior to the First World War. Their results show that the effect of remittances far exceeded that of other international capital flows, and the relationship was more robust than any studies using contemporary data. Ajilore and Ikhide (2012) examined the short and long-run dynamics of the interaction between remittances and financial sector development utilising data from Togo, Senegal, Nigeria, Lesotho, and Cape-Verde. They confirmed a long-run relationship from ARDL

tests in all countries except Nigeria. In El Salvador, where the government actively engages migrant workers in bank remittances through state banks, Ambrosius (2011) determined that municipalities that were high on remittances were also high on savings per capita and accounts opened.

This complementary relationship between remittances and financial development has been proven to magnify the impact of remittances on economic growth in a number of empirical studies. Mundaca (2009) determined that developing financial systems is remittance enhancing in the long run in the Caribbean and Latin America, which in turn is a stimulus for economic growth. Bettin and Zazzaro (2012) developed a new measure for qualitative inefficiency of the local banking sector and demonstrated a positive effect of remitted income on the performance of the economy for efficient banks. This holds true even after controlling for institutional quality and different financial market determinants. The last group in the literature shows a reciprocated relationship between financial transfers and remittances. A study conducted on 39 countries in Latin America and the Caribbean by Fromentin (2015) found a strong, positive, two-way association between financial development and remittances. Irrefutably, empirical evidence on remittances and financial development is inconsistent, and it is inconceivable that a universal position can be devised. It is thus from this understanding that the current study seeks to investigate the same interrelationships in transitional economies.

Explanatory variables

Other factors that affect financial development are discussed in Table 1.

Table 1. Theory intuition and a priori expectation

Variable	Proxy used	Theory intuition	Expected sign
Trade Openness (OPEN)	Exports + Imports (% of GDP)	The better the measure, the higher the possibility of accessing better and more financial services in line with the simultaneous openness hypothesis by Rajan and Zingales (2003), which holds that a country should be open both for trade and capital flows for its financial development.	+
Economic growth (GROWTH)	GDP per capita	Robinson (1952) developed the demand-following hypothesis, arguing that better economic performance improves living standards, which induces a high demand for financial services, leading to improved banking sector activity. A study by Wahid et al. (2011) established a stimulating effect of GDP on financial development for Bangladesh.	+

Table 1. (continuous)

Variable	Proxy used	Theory intuition	Expected sign
Inflation	Inflation consumer prices (annual %)	A theory underpinning the negative inflation-finance nexus by Huybens and Smith (1999) explains that inflation induces credit rationing by banks, leading to reduced activity in financial markets. Conceding, Bittencourt (2008) observed that an increase in inflation negatively affected financial market performance in Brazil. In contrast, Sogut (2008) found a positive link between inflation and banking sector development for low-income economies.	+/-
Foreign Direct Investment	Net FDI (as a ratio to GDP)	Misun and Tomsik (2002) found that foreign direct investment crowds out private investment in Poland. Contrary to the above two positions, Agosin and Machado (2005) concluded there is independence between foreign capital flows and private domestic investment in Africa after observing an insignificant association between the two.	+/-
Remittances	Personal remittances received (% of GDP)	Lucas and Stark (1985) opined that migrants invest remittances in order to accumulate returns for a better status when they return home. Opposing theoretical reasoning from the popular finances view says remittances substitute credit. However, Karikari et al. (2016) found evidence of a negative relationship between remittances and financial development in Africa.	+/-
Savings	Gross domestic savings (% of GDP)	Dorrucci et al. (2009) disapproved of the use of savings to augment financial development in emerging markets. Mbulawa (2015) determined that savings sapped financial development for Southern African Development Countries since it is a leakage from the usual flow of funds.	-
Human Capital Development	Human capital development index	Human capital theory (Becker, 1964) postulates that knowledge, creativity, and skills empower individuals to take appropriate financial decisions. Meisenberg and Lynn's (2011) comparative study on Japan and Nigeria contends that human capital positively influences economic consequences.	+
The interaction between remittances and human capital development	Interaction term (remittances × HCD)	A priori, the interaction between remittances and human capital development undermines financial development, as individuals substitute remittances for credit to finance education and health expenses, (Stahl 1982). Stahl further argued that migration is a withdrawal of human capital, which affects the stability of financial systems due to brain drain. By contrast, Rapoport and Docquier's (2005) theoretical argument is that remittances may be a source of funds for the repayment of loans taken to finance the education of migrants, in which case it may complement financial development.	+/-

Source: author's own compilation.

Trend analysis

Table 2 shows the mean values of each variable for every country during the period from 1996 to 2014.

Table 2. Mean personal remittances received and financial development trends in transitional economies (1996–2014)

	REMIT	DCFIN	TURN	VTRADED	MCAP	DCRED	ODPR	ODPUB
Europe								
Greece	0.96	107.76	55.80	26.88	48.38	79.38	12.72	59.03
Poland	1.35	48.01	40.15	9.57	25.27	33.42	1.04	20.70
Portugal	0.65	149.94	62.49	23.93	37.07	143.62	39.24	37.51
Russia	0.28	32.24	41.42	24.55	44.38	30.07	3.29	4.77
Turkey	0.78	52.92	145.74	38.98	28.41	32.49	0.36	25.82
Latin America								
Argentina	0.13	32.43	17.98	3.04	15.49	15.03	4.65	13.99
Brazil	0.23	80.72	55.18	25.15	45.84	41.79	17.96	48.40
Colombia	1.72	50.98	11.00	4.74	33.81	35.76	0.45	19.48
Mexico	1.88	36.92	28.27	8.11	29.34	20.53	11.94	16.19
Peru	1.55	20.79	11.62	3.47	36.26	25.02	10.73	3.27
Asia								
China	0.19	132.53	159.46	65.90	42.85	116.12	18.16	11.91
Hong Kong	0.12	159.72	55.58	370.51	673.17	164.85	16.17	17.33
Indonesia	0.93	47.51	38.94	11.45	32.55	31.32	3.84	12.84
India	3.11	60.56	111.04	46.46	58.26	38.29	2.04	9.65
Malaysia	0.48	134.41	30.25	41.60	145.61	121.83	47.61	35.38
Philippines	10.35	55.07	22.21	12.05	54.57	35.61	0.71	30.26
South Korea	0.69	121.93	184.82	106.51	63.44	110.74	56.79	23.58
Thailand	1.11	137.82	74.41	43.78	58.93	118.64	24.56	18.24
Africa								
South Africa	0.23	167.64	25.87	51.64	198.75	135.58	15.71	33.52
Overall mean	1.41	85.78	61.70	48.33	88.02	70.00	15.16	23.26

Source: author's own compilation.

Only five countries (Colombia, Mexico, Peru, India, and the Philippines) had their mean personal remittances received as a ratio of GDP above the overall mean personal remittances ratio of 1.41% of GDP. India and the Philippines are outliers because their individual mean personal remittances ratio is far higher than the overall mean personal remittances ratio. Greece, Portugal, China, Hong Kong, Malaysia, South Korea, Thailand, and South Africa had their individual mean domestic credit provided by the financial sector ratios much higher than the overall mean domestic credit provided by the financial sector ratio.

On stock market turnover, Turkey, China, India, and South Korea are outliers because their individual stock market turnover ratios far exceed the overall mean stock

market turnover ratio of 61.70%. On the other hand, Colombia, Mexico, Peru, the Philippines, and South Africa are also outliers because their individual mean stock market turnover ratios are far below the overall mean value. There are only four countries whose mean stock market value traded ratios are above the overall mean stock market value traded ratio of 48.33% of GDP, namely China, Hong Kong, South Korea, and South Africa. Hong Kong, South Korea, Poland, Argentina, Colombia, Mexico, Peru, Indonesia, and the Philippines are outliers because their mean stock market value traded deviated by a wider margin from the overall mean value.

Only three countries (Hong Kong, Malaysia, and South Africa) had their individual mean stock market capitalisation ratio above the overall mean stock market capitalisation ratio of 88.02% of GDP. These countries are also outliers. The ratio of domestic private credit by banks to GDP for Greece, Portugal, China, Hong Kong, Malaysia, South Korea, Thailand, and South Africa was above the overall mean domestic private credit by banks ratio of 70% of GDP. With the exception of Greece, all other countries whose individual mean domestic private credit by banks ratio exceeded the mean ratio are outliers. Argentina, Mexico, and Peru are also outliers because their individual mean domestic private credit by banks ratios are far lower than the overall mean domestic private credit by banks ratio of 70% of GDP.

On private bond sector development, countries such as South Korea, the Philippines, Poland, Portugal, Russia, Turkey, Argentina, Colombia, Indonesia, India, and Malaysia are outliers. This is because the deviation between their individual and overall mean private bond sector development ratio is too wide. Countries whose mean public bond sector development ratios exceeded the overall mean public bond sector development of 23.26% of GDP are Greece, Portugal, Turkey, Brazil, Malaysia, the Philippines, South Korea, and South Africa. Outlier countries include Greece, Portugal, Russia, Argentina, Brazil, Peru, China, Indonesia, India, Malaysia, and South Africa because their individual mean public bond sector development ratios deviated too much from the overall mean public bond sector development ratio of 23.26% of GDP.

Research methodology

Data, description and sources: The paper used 19 years of secondary panel data, ranging from 1996 to 2014. The data were mainly collected from the World Bank, the International Monetary Fund (IMF), and the Global Financial Indicators databases. Alongside data availability constraints, the International Monetary Fund's (2015) list of transitional economies was used to select the countries to be included in the current study. These countries included Argentina, Indonesia, China, Colombia, Brazil, Greece, Hong Kong, India, South Africa, Malaysia, the Philippines, Mexico, Peru, South Korea, Russia, Thailand, Poland, Portugal, and Turkey.

Econometric models for the current study: The general model specification for the current study is represented by equation 1.

$$FIN = f(REMIT, HCD, FDI, OPEN, SAV, GROWTH, INFL) \quad (1)$$

In econometric terms, equation 1 is transformed into equation 2 below.

$$FIN_{i,t} = \beta_0 + \beta_1 FIN_{i,t-1} + \beta_2 REMIT_{i,t} + \beta_3 HCD_{i,t} + \beta_4 FDI_{i,t} + \beta_5 OPEN_{i,t} + \beta_6 SAV_{i,t} + \beta_7 GROWTH_{i,t} + \beta_8 INFL_{i,t} + \varepsilon_{it} \quad (2)$$

where β_0 is the intercept term, β_1 to β_9 are coefficients of the variables, and ε_{it} is the error term. *t* stands for time while *i* represents the country.

In order to investigate whether personal remittance and human capital development complemented or substituted each other in enhancing financial development, and also taking into account the dynamic nature of the financial development data, equation 2 is transformed into equation 3, consistent with Nor et al. (2015).

$$FIN_{i,t} = \beta_0 + \beta_1 FIN_{i,t-1} + \beta_2 REMIT_{i,t} + \beta_3 HCD_{i,t} + \beta_4 (REMIT_{i,t} \cdot HCD_{i,t}) + \beta_5 FDI_{i,t} + \beta_6 OPEN_{i,t} + \beta_7 SAV_{i,t} + \beta_8 GROWTH_{i,t} + \beta_9 INFL_{i,t} + \varepsilon_{it} \quad (3)$$

FINit–1is the lag of financial development in support of a theoretical view by Almalki and Batayneh (2015). Following Tsaurai (2018), the interaction term $REMIT_{i,t}.\ HCD_{i,t}$ is introduced in order to be able to investigate whether human capital development and personal remittances substituted or complemented each other in developing the financial sector in emerging markets.

Discussion and interpretation of results: In line with Chindo and Rahim (2017) and Tsaurai (2018), among others, the current study used four panel unit root tests, including the Fisher-PP test (Choi 2003), Levin et al. (2002), the Fisher-ADF test (Madala and Wu 1999) and Im et al. (2003) – see the results in Table 3.

Where SCAP, STURN, SVALUE, DCFIN, DCBANKS, PVBOND and PBBOND respectively stand for stock market capitalization, stock market turnover, stock market value traded, domestic credit by the financial sector, domestic private credit by banks, private bond sector development proxied by outstanding domestic private debt securities (% of GDP), and public bond sector development as measured by outstanding domestic public debt securities (% of GDP).

The study assumed the existence of a null hypothesis which says that there is a unit root in the panel. At level, the study could not reject the null hypothesis for all the variables at 1% significance level. However, at first difference, the study rejected the null hypothesis at the 1% level of significance for all the variables. In other words, the data for all the variables studied were found to be stationary at first difference.

Table 3. Panel unit root tests – Individual intercept

	Level				First difference			
	LLC	IPS	ADF	PP	LLC	IPS	ADF	PP
REMIT	–3.52***	–2.83***	63.30***	362.05***	–8.69***	–7.18***	124.98***	193.68***
HCD	–9.94***	–6.77***	113.87***	158.87***	–16.54***	–14.17***	234.48***	2002.5***
FDI	–5.88***	–5.04***	92.11***	131.43***	–12.56***	–12.87***	213.41***	1406.5***
OPEN	–1.93**	0.25	32.97	50.43	–11.01***	–8.85***	150.01***	259.74***
SAV	–2.60***	–1.73**	59.69**	53.63**	–9.01***	–8.51***	143.66***	359.86***
GROWTH	0.74	4.26	9.63	11.44	–11.6***	–8.18***	141.41***	137.42***
INFL	–3.68***	–3.15***	65.90***	107.76***	–15.39***	–13.36***	229.2***	788.93***
SCAP	–3.31***	–2.14**	59.32**	337.51***	–12.47***	–13.15***	218.86***	1295***
STURN	–2.76***	–4.11***	78.88***	236.84***	–8.21***	–11.22***	186.48***	1078***
SVALUE	–7.56***	–8.40***	140.72***	281.46***	–7.56***	–8.40***	140.72***	281.46***
DCFIN	–5.41***	–5.96***	104.18***	178.35***	–5.41***	–5.96***	104.18***	178.35***
DCBANKS	–3.99***	–0.64	49.52*	35.78	–6.29***	–5.56***	98.67***	139.46***
PVBOND	–2.24**	0.13	49.73*	220.3***	–8.82***	–7.61***	129.87***	139.85***
PBBOND	–13.52***	–7.69***	338.09***	96.86***	–16.01***	–8.19***	294.3***	125.75***

Note: LLC, IPS, ADF and PP stands for Levin, Lin and Chu (2002); Im, Pesaran and Shin (2003); ADF Fisher Chi-Square and PP Fisher Chi-Square tests respectively. *, ** and *** denote 1%, 5% and 10% levels of significance, respectively.
Source: author's own compilation.

The Kao (1999) approach for panel co-integration was used in this study. The panel co-integration method's null hypothesis says that there is no co-integration among the variables studied.

Table 4. Results of Kao co-integration tests

Series	ADF t-statistic
SCAP REMIT HCD FDI OPEN SAV GROWTH INFL	–2.8666***
STURN REMIT HCD FDI OPEN SAV GROWTH INFL	–3.0781***
SVALUE REMIT HCD FDI OPEN SAV GROWTH INFL	–3.1998***
DCFIN REMIT HCD FDI OPEN SAV GROWTH INFL	–4.6800***
DCBANKS REMIT HCD FDI OPEN SAV GROWTH INFL	–6.3896***
PVBOND REMIT HCD FDI OPEN SAV GROWTH INFL	–1.3737*
PBBOND REMIT HCD FDI OPEN SAV GROWTH INFL	–8.3534***

Source: author's own compilation.

From the results presented in Table 4, the study rejected the null hypothesis for all the series. In other words, there is a long-run relationship between and or among the variables studied.

Table 5 shows the results of the dynamic GMM estimation technique.

Table 5. Dynamic GMM (Arellano and Bond, 1991) Results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
$FIN_{i,t-1}$	0.79***	0.88***	0.90***	0.98***	0.97***	0.95***	0.90***
REMIT	–0.03	0.02	0.02	–0.001	0.02	–0.02	0.04
HCD	–0.03	–0.36	0.31	–0.06	–0.15*	0.24	0.09
REMIT.HCD	–0.05	0.09	0.16	0.01	0.05	0.04	0.16
FDI	0.002	–0.02	–0.02	–0.002	–0.002	0.01	–0.002
OPEN	0.17***	0.02	0.09	–0.006	–0.006	0.03	0.08**
SAV	0.06	0.15*	0.15*	–0.003	0.03	0.01	–0.11**
GROWTH	–0.01	0.05	–0.02	0.02**	0.05***	–0.01	–0.01
INFL	–0.03	0.01	–0.01	–0.002	–0.01	–0.08***	0.01
Adjusted R-squared	0.80	0.80	0.87	0.98	0.98	0.94	0.91
J-statistic	351	351	351	351	351	351	351
Prob (J-statistic)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

***, ** and * denote 1%, 5% and 10% levels of significance, respectively

Source: author's own compilation from E-Views.

Across all the seven models, financial development was found to have been positively and significantly affected by its lag, consistent with Almalki and Batayneh (2015). In model 1, personal remittances had a negative but non-significant impact on stock market capitalisation. The direction of influence is consistent with Kimani

and Mutuku (2003). In contrast to the theoretical expectations and findings by Meisenberg and Lynn (2011), human capital development also had a non-significant negative effect on stock market capitalisation. Stock market capitalisation in emerging markets studied was found to have been negatively but non-significantly affected by the interaction between personal remittances and human capital development. In other words, evidence showing that personal remittances and human capital development complemented each other to enhance stock market capitalisation was not detected in model 1.

In model 2, personal remittances had a positive but non-significant effect on stock market turnover while human capital development's influence on stock market turnover was negative but insignificant. However, the interaction between personal remittances and human capital development was found to have had a positive but non-significant effect on stock market turnover. Although human capital development was found to have had a negative effect on stock market turnover, the interaction between personal remittances and human capital development improved stock market turnover in model 2, which is a new contribution to the empirical evidence, as previous studies do not include interaction effects. This resonates with the human capital theory by Becker (1964), who argued that human capital investment facilitates skills and knowledge acquisition, which in this case gives more confidence to trade more on stock markets, hence the high turnover.

Although personal remittances and human capital development had a separate non-significant positive influence on stock market value traded in model 3, the interaction between the two variables had an insignificant positive effect on stock market value traded in the same model. It is clear in model 3 that human capital development enhanced the positive impact of personal remittances on stock market value traded. The finding is consistent with the Complementarity Hypothesis and remittance growth literature. Despite the fact that both personal remittances and human capital development had a non-significant negative influence on domestic credit by the financial sector, the combination of the two variables had an insignificant positive effect on domestic credit by the financial sector in model 4. The finding provides evidence that the complementarity between personal remittances and human capital development had an enhancing influence on domestic credit by the financial sector, in line with theoretical postulations (Rapoport and Docquier 2005). In model 5, personal remittances had a non-significant positive effect on domestic private credit by banks, while human capital development's influence on domestic private credit by banks was significantly negative. However, the interaction between personal remittances and human capital development had an insignificant positive impact on domestic private credit by banks, consistent with the altruistic hypothesis where migrants finance their families' education through remittances while crowding out domestic credit. Hence, the family members are less likely to seek domestic credit, but should they want to borrow, they stand a better chance of accessing local credit if remittances come through formal channels. This explains the insignificant effect on domestic credit.

In model 6, personal remittances' effect on outstanding domestic private debt securities was negative but insignificant, while human capital development had a positive but non-significant effect on outstanding domestic private debt securities in the same model. Just like in models 2, 3, 4, and 5, the combination of personal remittances and human capital development had a non-significant positive influence on financial development as proxied by outstanding domestic private debt securities. Both personal remittances and human capital development separately had an insignificant positive influence on outstanding domestic public debt securities in model 7. On the other hand, the combination of personal remittances and human capital development's influence on outstanding domestic public debt securities was positive but non-significant in model 7. The finding resonates with the Popular Finances view where remitted funds are saved through local cooperatives and savings clubs, rather than finding their way to the formal channels as public debt. This provides easy access to the funds should the saver require an educational loan later. Hence, the effect on public bonds is negligible.

Conclusion

The paper explored (1) the impact of remittances on financial development and (2) whether the interaction between remittances and human capital development had an influence on financial development in transitional economies using the dynamic GMM approach, with data ranging from 1996 to 2014. Remittances were found to have had a non-significant, positive influence on financial development in transitional economies when stock market turnover, stock market value traded, domestic credit to the private sector by banks, and public bond sector development were used as measures of financial development. When stock market capitalisation, domestic credit to the private sector by the financial sector, and private bond sector development were used as measures of financial development, remittances had a non-significant negative effect on financial development. Using all other measures of financial development except stock market capitalisation (which produced a negative sign), the interaction between remittances and human capital development had an insignificant, positive influence on financial development. Transitional economies are, therefore, urged to avoid over-relying on remittance inflow and human capital development as sources of financial development. The study has two limitations, namely (1) more transitional economies would have been included in the sample if the data were available, and (2) other measures of financial development would have been part of the model if the data could have been found.

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Streszczenie

Czy przekazy pieniężne wzmacniają rozwój finansowy na rynkach przejściowych?

W artykule przeanalizowano (1) wpływ przekazów pieniężnych na rozwój finansowy oraz (2) zbadano czy interakcja między przekazami pieniężnymi a rozwojem kapitału ludzkiego miała wpływ na rozwój finansowy w gospodarkach przejściowych. Wykorzystano dynamiczne podejście GMM w oparciu o dane z okresu 1996–2014. Przyjęcie jako miar rozwoju finansowego wartości obrotów giełdowych, wolumenu obrotów na rynku akcji, kredytów krajowych dla sektora prywatnego udzielanych przez banki oraz rozwoju sektora obligacji publicznych, pozwoliło na wykazanie, że przekazy pieniężne miały nieistotny pozytywny wpływ na rozwój finansowy w gospodarkach przejściowych. Kiedy jako mierniki rozwoju finansowego przyjęto kapitalizację rynku akcji, kredyty krajowe dla sektora prywatnego udzielane przez sektor finansowy oraz rozwój sektora obligacji prywatnych, przekazy pieniężne nie miały istotnego negatywnego wpływu na rozwój finansowy. Zastosowanie wszystkich innych miar rozwoju finansowego, z wyjątkiem kapitalizacji rynku akcji (która dawała znak ujemny) pozwoliło na wykazanie, że interakcja między przekazami pieniężnymi a rozwojem kapitału ludzkiego miała nieznaczny pozytywny wpływ na rozwój finansowy. Wzywa się zatem gospodarki przejściowe, aby unikały nadmiernego polegania na wpływach z przekazów pieniężnych i na rozwoju kapitału ludzkiego jako źródłach rozwoju finansowego.

Słowa kluczowe: przekazy pieniężne, rozwój finansowy, gospodarki przejściowe

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Regional Aspects of the Development of Clustering in the Dairy Branch

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Abstract

In this paper, we study the classical and modern approaches to the formation of regional agro-industrial clusters. In the current market conditions, the creation of a cluster based on the existing regional infrastructure is impractical. In most cases, clusters are called holding structures that include the full cycle of production, processing and marketing of agricultural products, for example, "dairy clusters" – there are traditional groups of companies that formally follow the classical cluster principles, but do not give individual participants in the production process sufficient organizational and legal autonomy. The conditions for the development of innovation within the cluster, as well as the mechanism for creating the scientific and innovation component of the cluster as a fully-fledged newly created cluster element are investigated. We show that the cluster should be created on the basis and strict adherence to fundamental organizational and economic principles. In particular, while in holdings the economic result of the activity is aimed at achieving the goals of the parent company, in a cluster the maximum interest in the result and the satisfaction of the economic interests of all participants in equal measure should be laid. Moreover, the classical cluster approach in the current market conditions may be unrealizable and the author's concept of cluster development is preferable.

Keywords: cluster, rural economy, mechanism

JEL: O13, Q19, R12

Introduction

The article examines the current state and trends of the dairy industry in selected post-Soviet countries, reveals the clustering potential, its key advantages and barriers. The article argues that for the full and comprehensive development of both the cluster as a whole and its participants, it is necessary to respect organizational independence and meet the economic interests of all its participants.

These research are based on previous IKED research: Thomas Andersson, Sylvia Schwaag Serger, Jens Sörvik, Emily Wise Hansson (2004), Organization for Economic Co-Operation and Development (2007), Thomas Brenner, Carsten Emmrich and Charlotte Schlump (2013).

These previous studies show that the widespread implementation of cluster policy and the organization of sectoral clusters provide benefits from integration in comparison with traditional forms of management, due to the specifics of production and terms of trade, which in turn reduce the efficiency and economic benefits from production. This study takes another step to assess the importance of clustering, taking into account regional and sectoral specificities based on adherence to key cluster principles. The material for the study was the results of the activities of typical dairy enterprises of the post-Soviet countries (Russia, Belarus, Kazakhstan, Ukraine, Georgia, Turkmenistan) for the period 2001–2017.

The literature on the effect of clusters on the development of competition has drawn attention to the development and deepening of integration processes before evolution into clusters. Research M. Porter (1979–2017), International Organization for Knowledge Economy and Enterprise Development (2004), Organization for economic co-operation and development (2007) and a number of other scientists, in particular, show that the principles of clusterization are obligatory to observe when creating clusters in most industries, regardless of the region of origin. This paper attempts to build on these existing studies, showing that in the context of globalization and corporatization, as well as in the conditions of a significant lag of agricultural science from advanced production and processing enterprises, these principles are not respected, and therefore, it is necessary to focus on organizational autonomy, maximum satisfaction of the interests of the cluster members and the creation of their own scientific and innovative divisions, developing problematic issues based on the industry cluster.

In this paper, we have found convincing evidence that conducting scientific and technical research has a stimulating effect on the modernization of production processes, reduces the cost of research, and also increases the scientific and technological potential of the cluster and its investment attractiveness. This conclusion can have important implications for the management of agricultural enterprises: the conduct of indigenous scientific and technical research can attract large investors to the cluster and stabilize the cluster as a self-sustaining structure, and the potential of the cluster will allow attracting both large business and small but sustainably developing members. enterprises of the industry, creating a natural industry monopoly on the regional market.

The rest of this document is organized as follows. Section two examines the organizational realities of integration development in the region's livestock industry. Section III introduces clustering methodologies. Section IV describes the proposed model of the sectoral cluster and the science and innovation sector, and Section V presents the main results and competitive advantages of the proposed cluster.

Organizational realities of development of integration in the animal breeding industry of the region

Today, the key principles of integration and clustering in the dairy industry of the agro-industrial complex in the post-Soviet states, particularly in Russia, are being implemented at a rather low level. In the course of the research it was revealed that there are key enterprises in the region that are developing in the direction of cluster formation, however, given the market conditions and established organizational and financial relations, it can be stated with confidence that the regional clusters in the dairy industry are in a rudimentary, protocluster state. To date, the following key clustering principles have not been observed in the regional dairy industry:

- there is no mutual interest of the participants in the development of a full-fledged cluster and the deepening of cooperation within the framework of the protocluster;
- members of the dairy subcomplex of the region are not involved in the creation and development of the cluster;
- absent and not ready for the formation of territorial cluster management bodies;
- there is no national program for the development of dairy industry clusters, as key enterprise management is not manifested interest in their formation;
- there are no common approaches to determining the quality of raw milk, as well as wide access to the laboratories by its definition;
- unwillingness of processing enterprises to offer a fair price for raw milk, caused by the presence of a large amount of cheap dry milk of Latin American production, as well as the ability to produce dairy products from by-products using simplified technologies;
- poor performance of agricultural cooperatives due to their absence in a number of regions, as well as low effectiveness of their purchasing and production activities, which translates them into the category of "unstable" suppliers of raw milk;
- shortage of food supply due to unstable weather conditions in a number of regions and the absence of major manufacturers of animal feed, compounded by the high cost of European high-protein feed, vitamin supplements, dressings and mineral complexes, high-demanding industry to feed and their significant weight in the cost of production (about 70%);

- the loss of its own breeding base, the gene pool of productive breeds of livestock due to the cessation of the work of most breeding plants, reproducers, control fattening stations, breeding hybrid-breeding centers;
- shortage of qualified personnel (there is no system for industry – specific training of workers and specialists with high education);
- unwillingness of many processing enterprises to cooperate with local agricultural producers, caused by lower prices for freeze-dried milk (Brazilian and Argentine enterprises that have been developing for several decades with the support of national budgets have spent sublimation technologies and, together with the lack of food export restrictions sell cheaper raw milk in Eastern Europe, which at the output gives almost dumping price for freeze-dried milk);

Thus, the current model of the milk protocluster is presented in Fig. 1.

Visually, the current protocluster model demonstrates the absence of a full-fledged cluster structure, which is further complicated by the lack of management initiative on the part of the management of key enterprises in the region to form and subsequently enter a full-fledged dairy cluster.

One of the reasons of this passivity is the objective negative aspects of clustering in a dairy-grocery branches:

- subordination of their own organizational and commercial interests to the interests of the cluster;
- the need to develop production and logistics infrastructure, maintain the quality of products established within the cluster;
- the need to supply agricultural raw materials at prices approved within the cluster, limiting the trade allowance;
- subjective, often imaginary danger of losing legal independence in favor of cluster-forming large enterprises.

At the same time, business entities represented by management underestimate the obvious advantages of creating a dairy cluster:

- organization and increase the efficiency of interaction between the participants of the cluster, the cluster infrastructure, external parties in the process of milk production of added value;
- informational, expert, methodical, consulting support for participants of the dairy cluster, including organization of training, retraining, professional development and training of personnel on the basis of the scientific institutions of the region, studying the problems and prospects of the dairy industry, providing consulting services in the interests of the cluster;
- promote cluster members in bringing to market new products (clean milk production, dairy production «Fitness» series, etc.), the development of cooperation of participants in scientific and technical sphere;
- developing external relations, including the organization of the exhibition and communication measures in the dairy industry, the management of informa-

tion and communication portal cluster, working media, work with external audiences in terms of attracting the attention of consumers to the novelties of dairy products;
– the creation of a natural monopoly in the dairy-food market due to the quality, price and range of products sold;
– organizational, informational and legal support from the national agricultural authorities on the production, processing and marketing of dairy products, in particular, the organization of fairs, exhibitions and sales of the dairy production.

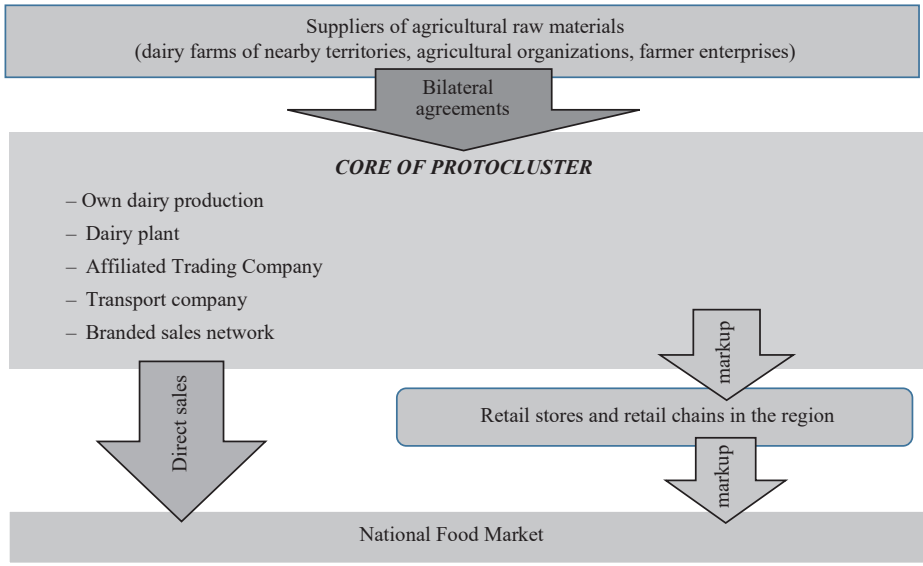

Figure 1. Organizational structure of the milk protocluster
Source: authors' own elaboration.

In the course of the research, the structure of value added formation in the dairy-commodity market was analyzed and a significant preponderance was revealed in the cost of finished products of the aggregate trade margin, which indicates insufficient interaction and the lack of coordination between the participants of the protocluster , which allows business entities to overestimate the price of their own products at all stages production cycle of goods (Table 1).

Table 1. Calculation of value added in dairy products industries (from the calculation of the average price of 2001–2017)

Name	Specific weight in total value added			The total cost %	Trading margin %	Market price
	Production (raw materials) %	Recycling %	Realization %			
Raw milk (3.4%)	100	–	–	100	8.7	108.7
Milk pack (2.5%)	44.58	46.38	9.04	100	74.2	174.2
Kefir (2.5)	41.95	48.81	9.24	100	116.5	216.5
Cottage cheese (9%)	36.21	54.68	9.11	100	79.3	179.3
Sour cream (15%)	64.96	25.97	9.07	100	142.0	242.0

Source: authors' own calculations.

Methodology clustering mechanism

The analysis performed allows us to state with confidence that today in the dairy industry there is a need for the evolution of the protocluster into a cluster. The essence of the evolution of cooperative and integrated structures into a cluster is the realization of the potential of the dairy industry and its constituent producers and processors. At the same time, attention is focused not on the targeted support of specific manufacturers or products, but on supporting the accelerated identification and pairing of the economic interests of the economic entities of the industry. At the same time, an increase in procurement prices, a reduction in production costs, and a decrease in trade margins are achieved, which ultimately leads to an increase in production by each specific enterprise and industry as a whole.

Such factors as:

- the conclusion of long-term contracts for solid volumes of raw milk;
- improving the quality and reliability of the rural households produced and purchased in private farms population of milk that meets the requirements of processors;
- creation of a transparent scheme for assessing the quality of purchased milk at the expense of organizing laboratories to prevent conflicts between cluster members;
- formation of a system for promoting marketable products to the market, including taking into account projected consumer preferences.

The growth of the purchase price enable organizations – milk producers to modernize equipment and upgrade the herd, as well as stimulates the owners of private households in rural areas to expand the private utility livestock and implement meas-

ures to improve safety produced milk (sanitation of the milking procedure, collection and storage of milk, manure removal, creation of an optimal microclimate in the stalls, optimization of the food supply).

Reducing production costs will be achieved through the joint development and implementation of innovative technologies for collecting, storing and processing milk, reducing resource intensity, productivity growth and wages, improving capital productivity, taking into account the characteristics of the cluster.

The firm contractual basis of relations in the cluster will reduce the dependence of raw milk producers on credit resources, eliminating, respectively, the cost of maintaining the collateral base, costs for processing and managing loans, allowing them to accumulate working capital for maintaining expanded reproduction.

Reducing trade margins will be achieved through the joint implementation of rules and procedures governing the production, marketing, logistics, financial and investment activities of cluster members, as well as supporting information exchange between cluster members with each other and government bodies on issues of: quality and safety of products, its certification, availability of various forms of support, requirements for its receipt and execution of various documents and so on.

When creating and developing dairy clusters in national sectoral economies of the region, the key factor should be the maximum allowable agreement and satisfaction of the economic interests of its participants on the basis of long-term cooperation and development agreements. The organizational mechanism of evolution into a cluster will consist of the following key elements:

- forecasting and development of an overall strategy for the development of the dairy industry;
- legal and legislative support for the development of the cluster by the authorities;
- determining the composition of participants on the basis of voluntary coordination of the interests of participants in the dairy industry (holdings and groups of companies, agricultural cooperatives, existing and newly created transport companies, equipped dairy products storage facilities);
- creation and regulation of the logistics network of the dairy cluster (operating in the protocluster, as well as transport companies involved in the cluster);
- administrative support and assistance of national governments, financial and credit organizations;
- conclusion of contracts between the parties, the organization of self-sufficiency;
- development of strategies for the management of expanded reproduction and technological modernization (with the involvement of specialists from scientific and educational institutions of the core area);
- organization of joint work of integrated enterprises;
- ensuring equality in the roles of cluster members among themselves.

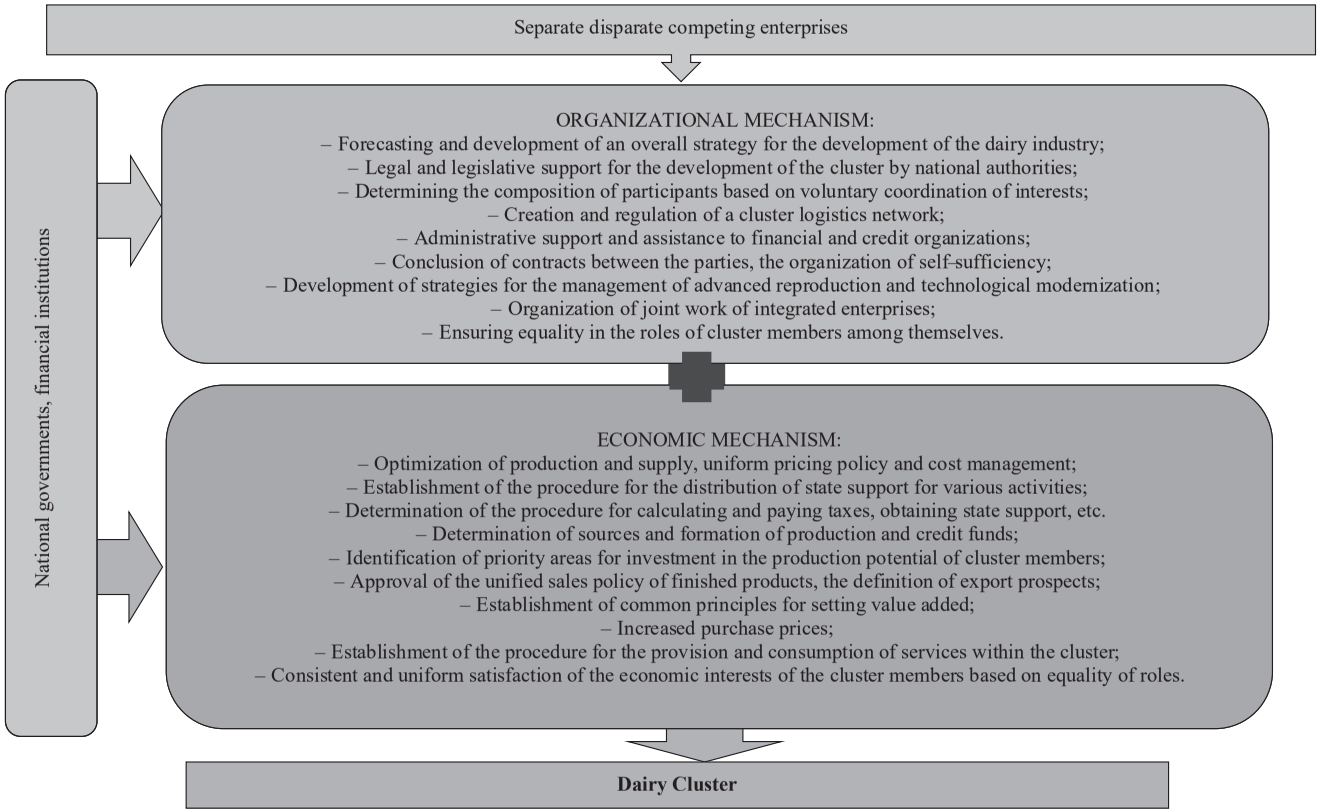

Figure 2. The organizational and economic mechanism for the development of integration and cooperation based on clustering of the dairy industry
Source: authors' own elaboration.

Compliance with these organizational elements will make the most efficient use of the production potential of cluster members, reduce administrative pressure and ensure the establishment of mutually beneficial cooperation of its members to improve the efficiency of the industry as a whole. The economic mechanism for the development of cooperation and integration based on clustering should be based on the following principles:

- optimization of production and supply, uniform pricing policy and cost management;
- establishment of the procedure for the distribution of state support for various activities;
- determination of the procedure for calculating and paying taxes, obtaining state support, etc.
- determination of sources and formation of production and credit funds;
- identification of priority areas for investment in the production potential of cluster members;
- approval of the unified sales policy of finished products, the definition of export prospects;
- establishment of common principles for setting value added;
- increased purchase prices;
- establishment of the procedure for the provision and consumption of services within the cluster;
- coordinated and uniform satisfaction of the economic interests of the cluster members based on equality of roles. (Figure 2)

Model of industry cluster

As a result of compliance with this mechanism, an individual dairy cluster will appear in the region through self-evolution from the protocluster, Figure 3.

The formed model clearly demonstrates the identified advantages of the cluster and allows its participants to lead an expanded reproduction by achieving a synergistic effect of comprehensive cooperation at all stages of the production cycle of the products produced.

The developed cluster will be a full-fledged, deeply integrated structure, focused on the expanded reproduction of its members and the implementation of a comprehensive modernization of its own capacities at the expense of partially accumulated own profits, partly at the expense of borrowed funds and state support funds.

Research and innovation activities in a full-fledged ideal cluster should be represented by the following participants:

- research institutes;
- experienced laboratories;
- the faculty of higher educational institutions of agrarian profile, engaged in research works;

- graduate students, undergraduates and graduate students;
- bank of innovations;
- experimental laboratories.

However, today, the region lacks a significant part of the required participants:

- Specialized faculties and scientific laboratories on the basis of large national universities were disbanded, which makes it impossible to involve these institutions in fully participating in the research and innovation work of clusters and the training of highly qualified specialists;
- There are no specialized research institutes dealing with the problems of production and processing of milk and dairy products;
- There is no full-fledged centralized national breeding systems in the region (weakly breeding plants, reproducing stations, stations for breeding work and artificial insemination, and grading of pedigree dairy cattle are unfunctioning or eliminated);
- The faculty of higher educational institutions of agrarian profile, engaged in scientific research, are mostly separated from the production realities and are not ready to carry out research in demand in the dairy cluster today;
- Graduate students, undergraduates of universities and colleges of the region are poorly focused on full-fledged work (including research) in the dairy industry in general and in rural areas in particular;
- There is no full-fledged bank and innovation market in the region, which forces participants in the dairy industry to purchase technologies, equipment and breeding material in other regions, in particular in the EU and the USA;
- Experimental laboratories conduct research on narrow specificity and, due to the high cost of their research, are not available for most participants in the dairy industry in the region.

The above trends hinder the involvement of scientific organizations and universities on an ongoing basis, which, in turn, creates prerequisites for independent research and innovation activities within the cluster.

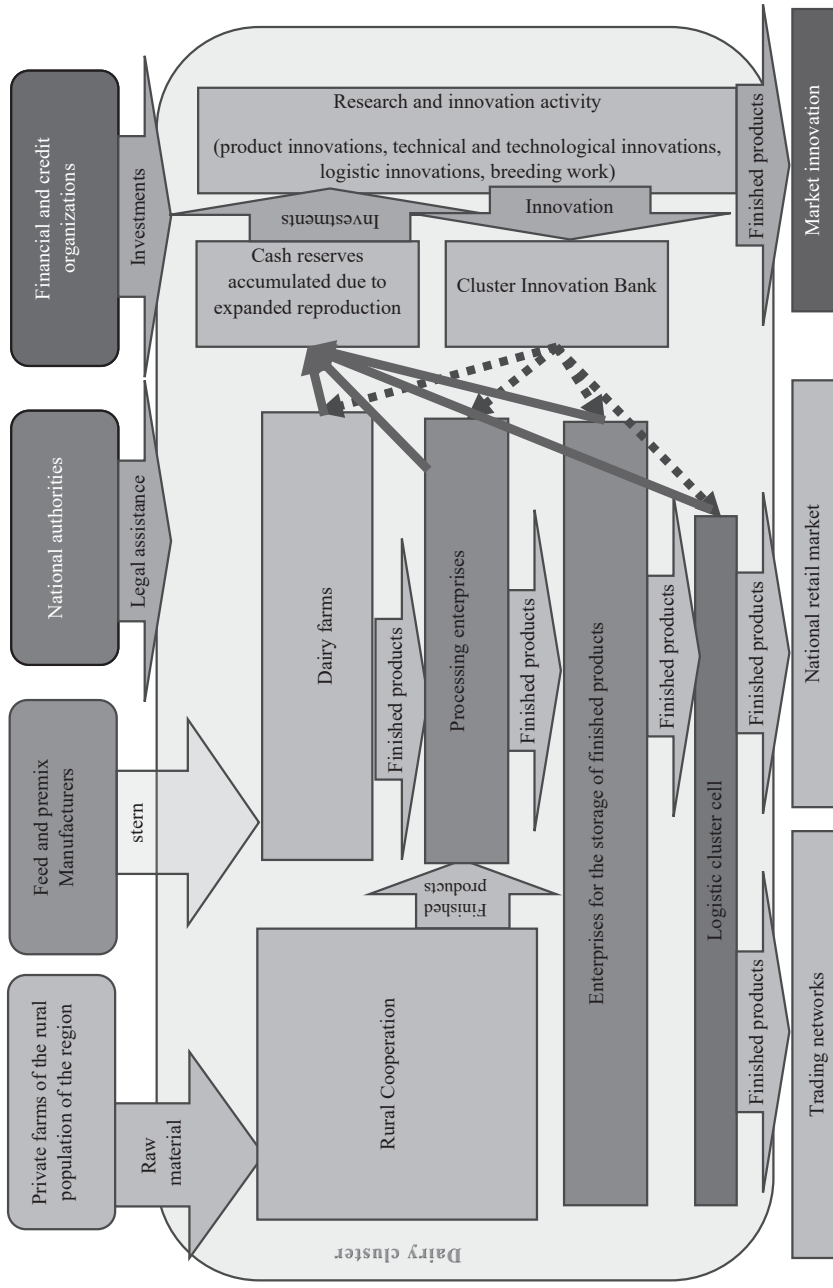

Figure 3. Functional model of the industry cluster
Source: authors' own elaboration.

To ensure comprehensive intensification and management of expanded reproduction in a cluster, it is necessary to improve the system and methods of management at agricultural enterprises through the systematic identification and use of reserves for increasing the efficiency of agro-industrial production, processing and sales logistics.

Priority in the field of cluster innovation should be the following areas:

- energy and resource saving technologies for the production, storage and processing of dairy products;
- innovations that make quality food cheaper;
- genetic and breeding work;
- technologies that improve the reliability, durability, efficiency and maintainability of agricultural machinery, parts and mechanisms;
- greening the dairy industry;
- development and improvement of waste-free production cycle;
- production diversification taking into account natural and climatic conditions and relief features;
- improvement of methods of processing, storage and packaging of finished food and convenience foods.

As a result of the integrated fulfillment of tasks and priorities, the model of the science and innovation component will become an organic element of the cluster multisystem (Figure 4).

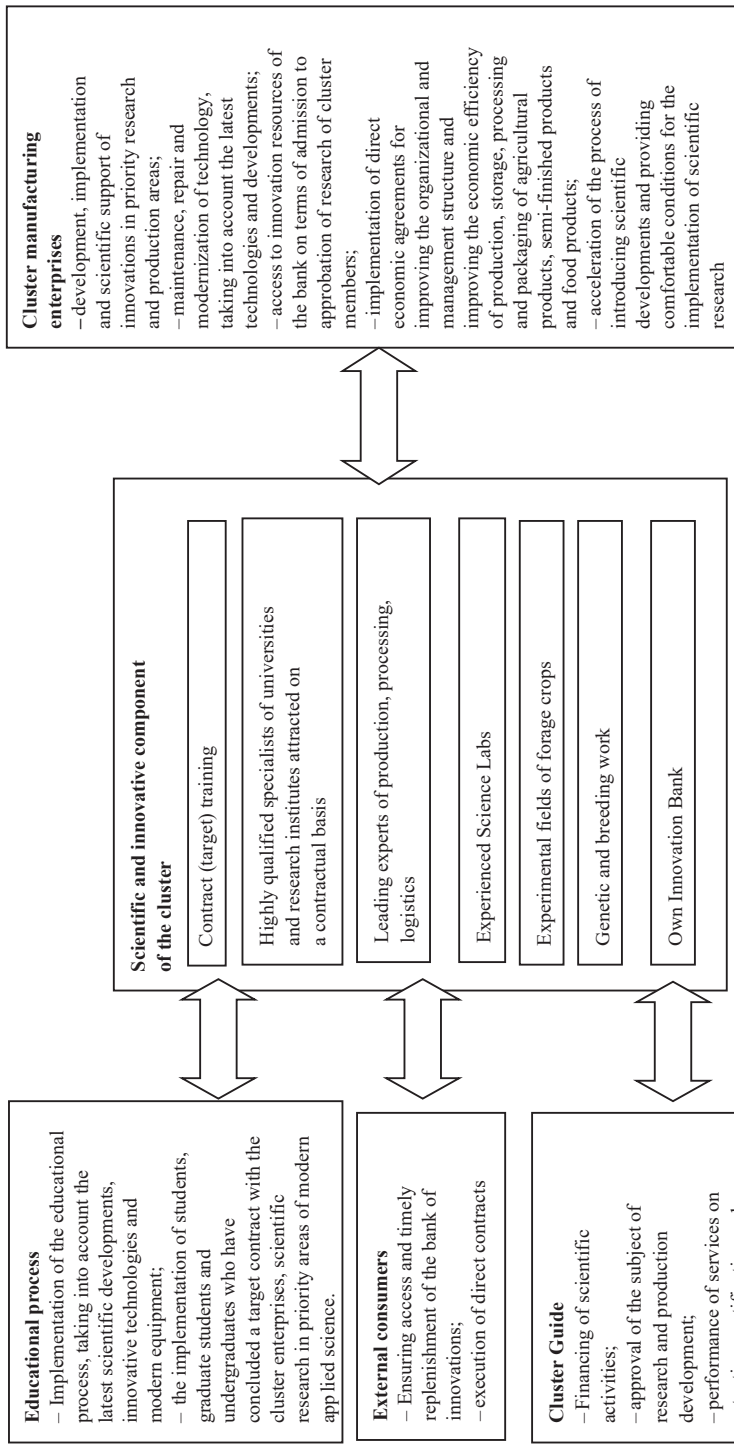

Figure 4. The functional model of the science and innovation component of the cluster
Source: authors' own elaboration.

Main results and competitive advantages of the proposed cluster

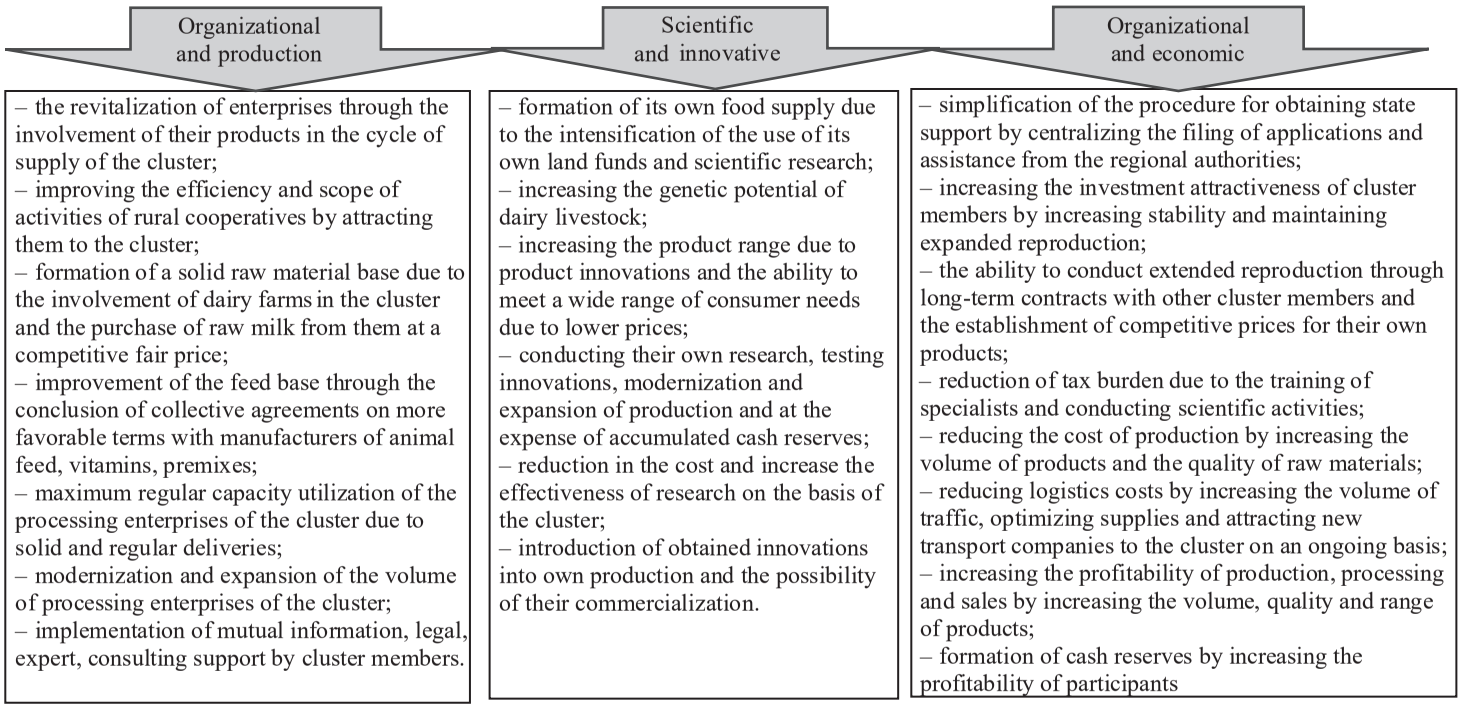

Figure 5. Competitive advantages of regional dairy clusters
Source: authors' own elaboration.

Concluding comments

The presented model of the dairy-food cluster reflects the system of interrelated relations between its participants, based on consideration of the economic interests of the latter. The model, together with the proposed mechanism, is a complex of organizational and economic principles of system development of integrated and cooperative structures of the region, designed to create deep ties and relations of agricultural production, storage, processing, marketing, service units, functional services and regional governments.

The inclusion of all participants in the agro-industrial complex in the systemic development of integration and cooperation processes will make clear the need to enhance regional dairy industry clustering and cooperation primarily in Russia, the Republic of Belarus and Kazakhstan as the basis for improving the efficiency and competitiveness of enterprises in the region. The implementation of the proposed mechanism increases the efficiency of integration processes, increases production volumes, optimizes the chain of value added formation of dairy products, reduces the trade margin due to the integration of intracluster connections. Systemic development of production and consumer cooperative processes creates opportunities for growth in production and processing of products in small business forms (Ukraine, Turkmenistan), expansion of farm production (Georgia), availability of loans, improvement of sales organization of dairy products by the cluster logistics network, provides for the consolidation and diversification of production and, accordingly, increases efficiency and competitiveness private farms and holding enterprises, processing enterprises, transport and infrastructure companies and their products. As a result, the systemic development of integration and cooperation processes will positively affect the well-being of rural residents and business entities of the industry and the degree of satisfaction of their needs.

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Streszczenie

Regionalne aspekty rozwoju klastrowania w branży mleczarskiej

Artykuł prezentuje wyniki analizy klasycznego i nowoczesnego podejścia do tworzenia regionalnych klastrów rolno-przemysłowych. W obecnych warunkach rynkowych utworzenie klastra w oparciu o istniejącą infrastrukturę regionalną jest niepraktyczne. W większości przypadków klastrami nazywane są struktury holdingowe obejmujące pełny cykl produkcji, przetwarzania i wprowadzania do obrotu produktów rolnych, na przykład „klastry mleczne" – istnieją tradycyjne grupy firm, które formalnie posiadają klasyczne cechy klastra, ale nie dają poszczególnym uczestnikom procesu produkcyjnego wystarczającej autonomii organizacyjnej i prawnej. Zbadano warunki rozwoju innowacji w klastrze, a także mechanizm tworzenia komponentu naukowego i innowacyjnego klastra jako nowopowstałego pełnoprawnego elementu klastra. Wskazano, że klaster powinien być tworzony z zachowaniem podstawowych zasad organizacyjnych i ekonomicznych. W szczególności, podczas gdy w holdingach wynik ekonomiczny działalności służy osiągnięciu celów spółki dominującej, w klastrze należy położyć maksymalny nacisk na wynik i zaspokojenie interesów ekonomicznych wszystkich jego uczestników. Co więcej, zastosowanie klasycznego podejścia do rozwoju klastrów w obecnych warunkach rynkowych może nie być możliwe, a lepsza będzie koncepcja rozwoju klastra przedstawiona przez autora.

Słowa kluczowe: klaster, gospodarka wiejska, mechanizm

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The Zombie Phenomenon in Banking and Business: a Comparative Analysis and the Origin of the Institutional Problem

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Abstract

The research presents an investigation of the zombie phenomenon in banking and business. The main goals are as follows: to reveal the consequences of the threatening dynamics of nonperforming loans for the states of Central and Eastern Europe, Western Europe, the group of former USSR states, and Latin America; to demonstrate the zombie business phenomenon in the case of Ukraine and disclose a new form of zombie business on the basis of different tools with exception of banking loans. The authors believe the solution to the zombie banks problem will not be found in the growth of government influence or control but in the restructuring of the banking system based on a decentralized but strongly controlled bottom-up model. The ineffectiveness of the institutional system also generates various forms of zombie business. The case of Ukraine is the best illustration of applying the tools, that are used in zombie business, with the exception of banking loans. The article helps to understand the influence of nonperforming loans on the economy and the perspectives for banking system formation in the light of the institutional aspect and interinstitutional interactions with the active participation of NPLs.

Keywords: bank system, banking, zombie banks, zombie business, nonperforming loans, institutional theory

JEL: D02, F34

Introduction

The problem of zombie banks occurring in the modern economy is a result of the strong growth of nonperforming loans – a unique indicator of the financial health of the banking system. This can be traced on the basis of the phenomenon and its consequences. According to Stephen Bush (2018), commercial banking and business consulting expert, the practice of zombie banks lives on. There are many banking institutions that are effectively bankrupt but are being kept in business through artificial government supports and guarantees. The expert notes that in some cases, these banks are being kept on a short leash and in others, they are operating with more flexibility, but they are certainly not lending normally. In the expert's opinion, the failure of these banks to operate like "real banks" is a major contributing factor in explaining why the economy and real estate, in particular, are still functioning as if they are on life support in many areas. The other phenomenon is zombie businesses, meaning firms that are unable to cover debt servicing costs from current profits over an extended period. This problem has also recently attracted increasing attention in both academic and policy fields.

In our research, we would like to focus on a comparative analysis of the influence of nonperforming loans (NPLs) on the economy, and the main directions of their use in Central and Eastern Europe, Western Europe, and Latin America. We would also like to propose perspectives for the formation of the banking system in light of the institutional aspect and the interinstitutional interactions with the active participation of NPLs. Apart from this, we would like to demonstrate the zombie business phenomenon in the case of Ukraine and show new forms of zombie business based on different tools, with the exception of banking loans. On the basis of the analysis, an institutional way of solving this problem is proposed.

The methodological basis for the research is both economic and statistical methods. The research contains zombie banking performance (estimated as bank non-performing loans to total gross loans (%)) in Japan, China, South Korea, Singapore, the EU states, Central and Eastern Europe, and Ukraine between 2008 and 2017. The influence of NPLs on particular economic indicators is presented by a model of linear regression in Central and Eastern Europe, Western Europe, a group of post-communist states, and Latin America. An investigation of zombie businesses in the case of Ukraine based on non-bank debt is made by a logistic regression mechanism and game theory tools. To do this, we consider the interaction of zombie structures based on traditional and manipulative strategies. The Nash equilibrium allows us to describe the current steady state of such an economy.

Zombie banking. The origin of the institutional problem

According to Stephen Bush (2018), the term "zombie bank" first appeared more than 25 years ago when the savings and loan crisis in the United States resulted in hundreds of financial institutions having liabilities in excess of their assets. The political response was a variation of "Too Many to Fail," and Zombie Banks were born.

A zombie bank is an insolvent financial institution that operates mostly thanks to implicit government support. Zombie banks have large amounts of nonperforming assets on their balance sheets (Investopedia 2018). Under legislation regulating banking activities, banks must bear all underlying losses when a loan becomes non-performing. Nonetheless, some banks are unwilling or financially unable to recognize loss trends, or they overvalue bad loans by arguing that they will recover the sum borrowed in the long run. Such solutions often transform these banks into "zombies." Zombie banks are creatures of financial repression, in which central banks keep debt-burdened banks, corporations, and households on life support, instead of allowing nature to take its course and creative destruction to do its work (Investopedia 2018). "Zombies" are banks that administrate such bad loans instead of offering new loans, losing its system-making role in the economy. Consequently, the circulatory system of the economy remains without a decisive component. Granting new loans is also restricted by the shortage of own capital as banks are forced to set aside a larger share of capital to cover the potential losses generated by bad loans (Markevičius 2017).

The financial and banking crisis in Japan in the late 1990s and early 2000s has attracted the interest of researchers on the specific subject of forbearance lending by commercial banks. Japan is the first well-documented case of zombie banking in a developed economy. Apart from this, Japan also contributes an interesting case with regard to the policy measures against zombie banks. The Japanese central bank has shifted to a zero interest rate policy, while the government has applied a wide range of measures, including equity injections, blanket guarantees, and asset transfers through bad banks. A detailed account of the course of events around the financial crisis, including the policy measures is provided by Nakaso (2001), Kanaya & Woo (2000) and Kawai (2005).

The sovereign debt and banking crisis in Europe shares many similarities with the situation in Japan, as outlined by Schnabl (2013). The study of Willam (2015) demonstrates the example of Japan and Europe as a case study of zombie-bank experience. Japan, for example, chose the approach of gradual recovery, tolerating the negative effects of zombie banking in order to reinstate bank health. In Europe, the policy was even more accommodative than in Japan.

Schoenmaker & Peek (2014) studied the 30 largest banks in Europe by analyzing balance sheets for the market capitalization for each bank. They assumed either a 3% or 5% threshold ratio of market capitalization over total assets for each bank and determined that the capital shortage for those banks comes to 84 billion and 365 billion EUR respectively. In their next study, they simulated a financial crisis and calculated what the capital shortfall would then be for a 3% ratio, which comes to 241 Euro. Similar research was

done by Acharya and Steffen (2014), who ran a stress-test for 124 banks in the Euro-area that are subject to the supervision by ECB from 2014 onwards. Such studies could show how much capital banks would need if another financial crisis broke out.

Radivojevic & Jovovic (2017) carried out a deep panel data analysis despite detecting a relationship between the macro- and micro-environment related to NPLs. The basis for their analysis was the results of the panel regression during the period 2000–2011. They examined the determinants of the NPL ratio using a cross-country analysis from a sample of 25 emerging countries. The results showed a negative and significant relationship between GDP and the rate of NPLs.

As noted by Mora (2017), the EU has developed harmonized definitions for NPLs and emphasized the need for restriction – 90 days for defaulted exposures. He also highlights supply-side and demand-side impediments. Supply-side impediments include an unwillingness to realize losses, the high cost of debt recovery not recognized in NPL book values, accounting and tax rules regarding NPLs, etc. Demand-side impediments include information asymmetry (the lemons problem) revealed in the unavailability of sufficient and reliable data on NPLs, barriers to entry to the EU secondary NPL market for investors represented in licensing and other compliance requirements, long and complicated debt enforcement processes, legal barriers to transferring loans to a new creditor, etc. To solve this problem in the Czech Republic, he proposed improving the legislative framework, to enable better collateral enforcement and debt collection and to decrease the average duration of litigation.

"Zombie banking" performance

Researchers use different indicators to measure banks' lending activities, but the most commonly used indicators to identify credit risk are *non-performing loans to total loans* (NPLs) and *loan loss provision to total loans* (LLP). Figures 1 and 2 present zombie banking performance in Japan, China, South Korea, Singapore (Figure 1) and EU states (Figure 2) between 2008 and 2017. As we can observe, the recent situation in the Asian region related to bad loans is fairly positive, while the Euro region is struggling with post-crisis challenges. Considering more specific challenges that euro area banks are facing in the post-crisis environment, we should underline the low profitability environment banks operate in, the structural challenges related to overcapacity in some banking markets, and the large number of NPLs.

According to Vice-President of the ECB, Vítor Constâncio (2016), a key challenge for European banks is linked to the prolonged period of low profitability in the sector. While bank profitability has recovered somewhat recently, it remains at very low levels. Considering the World Bank data, the average Return on Equity (ROE) of the major banks in the Euro area was 5.8% in 2015, remaining below their cost of capital (estimated to be around 9%). In fact, the negative gap between banks' ROE and the cost of equity has persisted since the 2008 financial crisis.

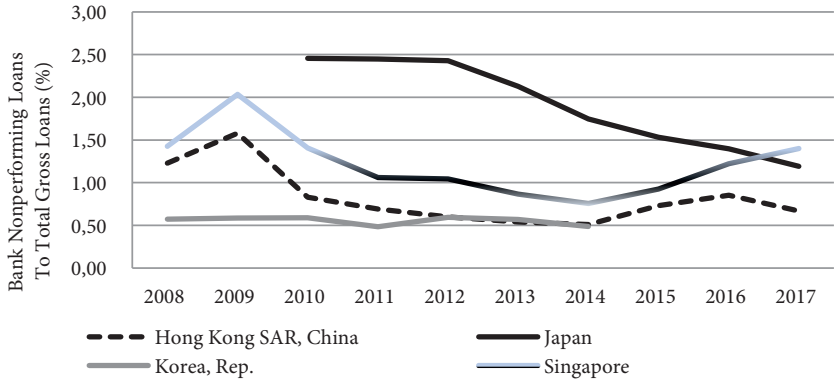

Figure 1. Japan's "zombie banking" performance in comparison to China, South Korea, and Singapore, 2008–2017
Source: authors' own elaboration on the basis of *World Bank data*.

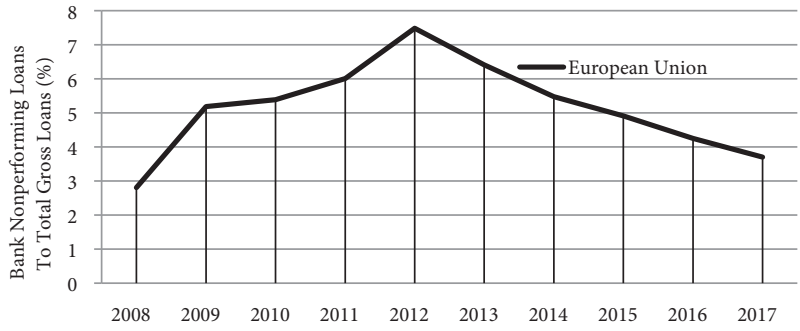

Figure 2. The EU's "zombie banking" performance, 2008–2017
Source: authors' own elaboration on the basis of *World Bank data*.

The presence of high NPLs has a significant impact on banks' profitability, as a great part of their assets do not generate revenue. Significant institutions in the Euro area held nearly EUR 950 billion of nonperforming loans at the end of 2015, equivalent to about 9% of euro-area GDP. Their average NPL ratio, at 7.1%, is high by international standards and clearly exceeds those of their US and UK peers. NPL ratios vary widely across the euro area but remain at somewhat elevated levels in the majority of countries that were most affected by the financial crisis (Constâncio 2016).

Furthermore, by introducing the banking situation on the European continent, we would like to draw attention to some countries of Central and Eastern Europe. Figure 3 presents the "zombie banking" performance in the Czech Republic, Hungary, Lithuania, Moldova, Poland, Russia, Slovakia, Slovenia, and Ukraine. The majority of these states are characterized by bad loans at a level under 10% of total gross loans in 2017. Moldova reached 20%, while Ukraine – more than 50%.

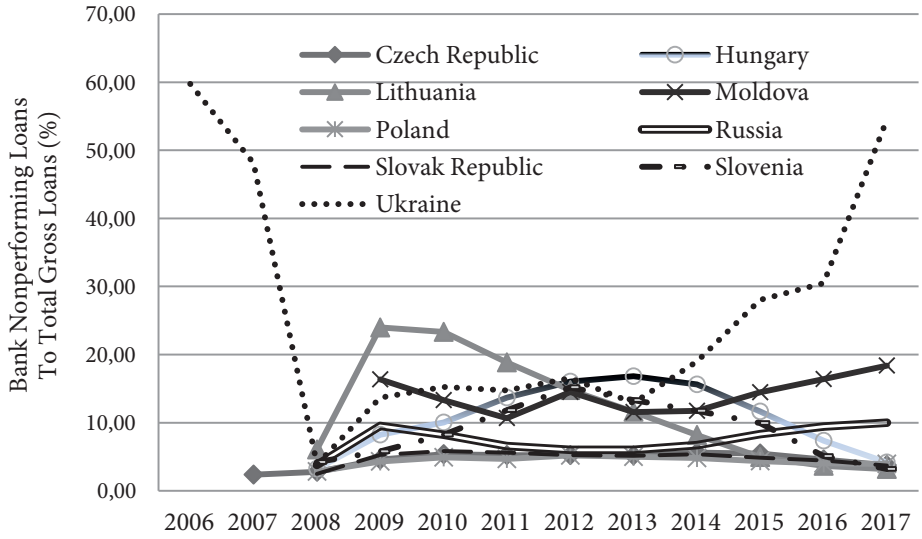

Figure 3. Ukraine's "zombie banking" performance in comparison to neighboring states, 2008–2017

Note: Ukraine's Non-Performing Loans Ratio was 54.5% in December 2017, compared with the ratio of 56.4% in the previous quarter. The data reached an all-time high of 59.8% in December 2006 and a record low of 2.7% in March 2008 (The Global Economy).

Source: authors' own elaboration on the basis of *World Bank data*.

Over the past year, the Ukrainian Deposit Guarantee Fund, along with the National Bank, has unsuccessfully run a pilot project to sell assets for "bad loans" through American sources with the help of foreign brokers with extensive experience. Since the auctions did not work as expected, the problem of nonperforming loans needs to be addressed, starting with the corporate portfolio. There is about 255 billion UAH in loans, 97% of which are issued to 40 companies. These companies are large industrial groups which today not only have significant debts but are also, in fact, the owners of the Deposit Guarantee Fund. Some of the beneficiaries of these companies have banks in Ukraine. They challenge loan agreements in courts and then receive a decision giving them 25 years to restructure their debts. Under such circumstances, it is easy to predict that in the absolute majority of cases there is no longer any incentive to carry out the restructuring. In 2009, the Guarantee Fund was engaged only in payments. The interim administrations, as well as the liquidation of banks, were under the competence of the National Bank. It was expected that a bad bank (in other words, a hospital bank) would be created to isolate illiquid and high-risk assets. However, despite years of intensive work of this institution, nothing was sold. It is obvious that under the condition of stimulating financial health, the banking system performs its functions only conditionally. According to the data of the Ukrainian Financial Forum, in 2013 less than 14% of small businesses in Ukraine used bank credit.

Banking system perspectives: the institutional aspect

Is there a general solution to the NPL-problem? Are the consequences of the long-term absence of this problem identical? We shall try to investigate the problem based on the nature of its occurrence as well as the main interinstitutional interactions with the active participation of NPLs.

Considering the dangers for the economic environment, such as offshore banking and nonperforming loans, particular attention should be paid to the basic banking background, such as the bank model, centralization/decentralization processes in the banking system, the decision-making model inside the bank, the bank institution as such, etc. The authors of the article are convinced that the solution to the earlier discussed problem should be sought in the reorganization of existing banking institutions, and in the case of EU member states – a return to the initial proven practice of a decentralized, three-pillar banking system.

For over 25 years, and perhaps in the broader context of more than two centuries, the European banking system (by applying the term "world banking system," it could include the American experience) is based on three pillars: private banks, public (savings banks) and mutual (cooperative) banks. The most interesting experience could be that of Germany. The experience of German savings and co-operative banks is unique since they have preserved both the "purity" of the model and most of its traditional functions, i.e., they have abandoned the transformation towards a "shareholder-oriented bank." The processes of deregulation, liberalization, and privatization changed the forms of all these banks; moreover, an attempt was made to portray these institutions as old-fashioned, outdated and ineffective. At the same time, there are initiatives to extend the behavior model of savings and co-operative banks to joint-stock companies. That is, the discussion focuses on the "business model" and "institutional features."

From the perspective of post-crisis Europe, there are two common features of savings banks: (1) a focus on savings and mobilizing savings and (2) a focus on the regional or even local level. However, this identification refers to the prevailing systems that have undergone a long process of transformation and harmonization. When considering Eastern European states, like Ukraine, it seems appropriate to use the experience of approximately 25 years ago, with the following list of key features identifying the institution of a savings bank (Bülbül, Schmidt & Schüwer 2013):

- Ownership, sponsorship, or management by the relevant public authority.
- Organization within the framework of public law.
- The public purpose is to support the local economy and, at the same time, act in accordance with the general business rules, to stay financially sustainable.
- Adherence to the "regional principle" – limiting the operations of a savings bank to areas under the public authorities' responsibility. Such banks consider each other to be colleagues, not competitors.
- Banks constitute a cooperative network of legally independent institutions. Therefore, the scale economy becomes the prerogative of the network as a whole.

If, in the recent past, this set of features made it possible to distinguish savings banks from everyone else, now in most countries, this system has become a distant prototype.

Most co-operative banks are largely resilient to savings. They follow a "regional principle" and work as part of a complex network that facilitates internal co-operation. Their scope is to support the economic efforts of their clients while remaining a profitable business. The main difference between a cooperative bank and other banks is their legal basis. There are three principles for the formation of the institutional structure of financial and other cooperatives:

- They are self-governing private organizations.
- Their members are mainly clients and vice versa. Many customers are both clients and members.
- Each member has only one vote at the annual general meeting, regardless of the size of his share. Members cannot sell their shares if they want to leave. They can return their shares to the cooperative to get what they invested at the beginning, with a share of the accumulated profit. Some analysts state that because of such principle the incentives are weak, since it is impossible to resell their share at a higher price, and there can be no pressure on management since it is impossible to accumulate votes. We disagree with this thesis since there are effective forms of collective decision-making and collective action in relation to part of the assets, which is described in detail in the research of Ostrom (1990).

Consequently, the German models of the savings and co-operative bank have become prototypes for other European countries. In Germany today, local savings banks, land banks, and associations form a dense network of institutions. Local banks remained the basis of this banking group. In 2001, the German government agreed with the European Commission on the gradual abandonment of having savings and land banks under state guarantees. This has had serious implications for land banks, but local savings banks have easily dealt with this change. Such banks are mainly funded by individuals' deposits, and there is a powerful internal control system. In addition, security operations had a good basis because of the concentration on operations in a well-studied local market. The focus on local interest is the best auditor for the banking institution. Cooperative banks have become a stabilizing instrument or mechanism for the entire banking system in a crisis (Henselmann, Ditter & Lupp 2016).

The problem of bank debt can be solved in two ways. The first path is an increase of control and involvement of the state. For example, in the United States, the Sarbanes Oxley Act (2002) was adopted to address the problem of the poor quality audit of large companies and to introduce a wide range of additional reports. The second way is less costly and more market-friendly. It is based on restructuring the banking system, transforming it into a more accessible and more controlled institution for citizens and communities. Obviously, such banks are becoming much weaker players in the market of derivatives or bonds, but they are starting to work for the real sector of the economy.

A comparative analysis of the influence of nonperforming loans on the economy in Central and Eastern Europe, Western Europe and Latin America

The problem of NPLs in banking does not have any geographic exclusivity and can be observed in every economy of the world. At the same time, there is a divergence in the consequences of tolerance. We want to demonstrate the influence of NPLs on particular economies by using a model of linear regression.

Considering the influence of NPLs on economic growth in Europe, including post-communist states (Table 1), we can state the negative influence of nonperforming loans on GDP growth. As we can also observe, this negative influence (of the amount of unpaid debt of such a banking system on the economic processes) is quite weak (with a correlation coefficient of –0.153). Such results could be explained by a too diversified sample of research, an insignificant share of long-term contracts (as too small resources are accumulated in the banking sector), the technological backwardness of production and equipment, as well as the problem of withdrawing capital abroad.

Table 1. The influence of NPLs on economic indicators in Central and Eastern Europe and a group of post-communist states

	NPL	R_D_GDP	GDP_D
NPL	1	–0.076 (0.335. 163)	–0.153 (0.020; 228)
R_D_GDP	–0.076** (0.335***.163****)	1	–0.030 (0.642; 237)
GDP_D	–0.153 (0.020; 228)	–0.030 (0.642; 237)	1

Notes: NPL – nonperforming loans in Central and Eastern Europe and a group of post-communist states; R_D_GDP – percentage ratio R&D/GDP; GDP_D – percentage change of GDP; ** – Pearson Correlation; *** – significance; **** – number of observations

Source: authors' own research.

Furthermore, the compression of the data sample in Table 2 in Central and Eastern Europe (including all states from the Federal Republic of Germany to the Russian Federation border) show a negative impact of NPLs on export flows (–0.132 (0.093; 162)). Such a negative influence can be explained by the significant role of banking for export support (like the KUKE export agency in Poland) under the conditions of the export orientation of the majority of the identified economies. The other reason is the prevalence of integrated transnational corporations in Central and Eastern Europe and therefore, the use of long-term contracts, the possibility of irregular investment, etc. At the same time, with lower statistical significance, we can observe a weak negative influence of NPLs on GDP growth.

Table 2. NPL Influence on economic indicators in Central and Eastern Europe

	R_D_GDP	NPL_CEU	IMPORT_D	GDP_D	EXPORT_D
R_D_GDP	1	0.015** (0. 86***; 128****)	–0.018 (0.81;166)	–0.115 (0.13; 167)	–0.077 (0.3; 166)
NPL_CEU	0.015 (0.867; 128)	1	–0.022 (0.78;162)	–0.118 (0.13;165)	–0.132 (0.093; 162)

Notes: NPL_CEU – nonperforming loans in Central and Eastern Europe; R_D_GDP – percentage ratio R&D/GDP; GDP_D – percentage change of GDP; IMPORT_D – percentage change of import; EXPORT_D – percentage change of export; ** – Pearson Correlation; *** – significance; **** – number of observations

Source: authors' own research.

The analysis of the influence of nonperforming loans on Western European economies (Table 3), as in previous studies, shows quite a weak, negative correlation between NPLs and the percentage change of GDP (–0.102 (0.179; 177)). Despite the fact that unpaid loans show no significant impact (a time lag was not considered in this article) on import flows and economic growth, their impact on the economy as a whole is evident, as a negative correlation exists with the share of research and development indicator/GDP (–0.47 (0.00; 134)). About a trillion of such debts in EU banks means that the prospects of the economy withstanding competition in the future are significantly reduced. On the other hand, it is likely that this debt was created to support exports, as shown by the positive correlation of indicators. We did not see such a phenomenon in any of other considered region. It also reflects the nature of the economies being considered. The results of the presented correlation on nonperforming loans and investment in R&D in Western Europe confirm that such a banking system differs favorably from all other worldwide approaches.

Table 3. The influence of NPLs on economic indicators in Western Europe

	R_D_GDP	NPL_WE	IMPORT_D	GDP_D_WE	EXPORT_D
R_D_GDP	1	–0.47 (0.00; 134)	0.004 (0.95; 169)	0.104 (0.17; 169)	–0.11 (0.88; 169)
NPL_WE	–0.47 (0.00; 134)	1	–0.031 (0.68; 177)	–0.102 (0.179;177)	0.166 (0.039; 155)

Notes: this table uses the same order of variables as in the previous one; NPL_WE – nonperforming loans in Western Europe; GDP_D_WE – percentage change of GDP in Western Europe

Source: authors' own research.

For comparison, we would like to consider Latin American countries (Table 4). According to the obtained results, we can also confirm the impact of nonperforming loans on the economy in this region, which is even more significant than in the case of Europe. Here, the negative dynamics of the nonperforming loans hurt export/import flows, as well as economic growth. Somewhat unexpectedly, it can be an indicator of either positive or negative phenomena for the economy. On the one hand, this means

that the banking system is an integral part of the economic system as a whole, and its imbalance immediately causes a reaction in the whole system. It is possible to recover such a banking system (we can see the diametrically opposite situation in Ukraine, where such interconnection is not observed). Despite this, this institute is a threat to the functioning of the economy as a whole. At the same time, there is not expected to be an interaction with the share of investment in research and development.

Table 4. The influence of NPLs on the economy in Latin America

	R_D_GDP	EXPORT_D	IMPORT_D	NPL_LA	GDP_D
R_D_GDP	1	–0.095 (0.47;60)	0.069 (0.6; 60)	0.197 (0.139; 60)	–0.132 (0.313; 60)
NPL_LA	0.197 (0.139; 58)	–0.162 (0.12; 94)	–0.281 (0.006; 94)	1	–0.182 (0.079; 94)

Notes: this table contains the same order of variables as in the previous one; NPL_LA – nonperforming loans in Latin America

Source: authors' own research.

Consequently, we can focus on the following results. If, in the case of Eastern Europe, the banking system generally is a supporter of export promotion and economic growth (Tables 1 and 2, respectively), then in the case of Western Europe, the main scope of the banking sector is to ensure technological growth and export support (Table 3). In the Latin America region, the influence of the banking sector on export-import flows, as well as the economy as a whole, is even more significant than in European countries (Table 4).

Zombie business: the case of Ukraine

What is a zombie company? It is a listed firm, with ten years or more of existence, where the ratio of EBIT relative to interest expenses is lower than one. In essence, as was shown by Lacalle (2017), a company that merely survives due to the constant refinancing of its debt and, despite re-structuring and low rates, is still unable to cover its interest expense with operating profits, let alone repay the principal. The focus on listed companies allows us to consider two different ways of identifying zombie firms: a broad measure proposed by McGowan (2017), based on the persistent lack of profitability in mature firms; and a narrow one proposed by Banerjee (2018) and Hofmann (2017), which additionally requires expectations of low future profitability inferred from a firm's stock market valuation.

Banerjee (2018) highlights the following key points: "The prevalence of zombie firms has ratcheted up since the late 1980s. This appears to be linked to reduced financial pressure, reflecting in part the effects of lower interest rates. Zombie firms are less productive and crowd out investment in and employment at more productive firms. When identifying zombie firms, it appears to be important to take into account expected future profitability in addition to weak past performance."

Banerjee's research shows many negative interactions between zombie and non-zombie companies. "[The] estimation results suggest that a 1 percentage point increase in the narrow zombie share in a sector lowers the capital expenditure (capex) rate of non-zombie firms by around 1 percentage point, a 17% reduction relative to the mean investment rate. Similarly, employment growth is 0.26 percentage points lower, an 8% reduction" (Banerjee 2018).

Quiggin considers the consequences for the economy as a whole after the return of such components to common functioning. "Translating to the real world question, if we observe one set of children born into a wealthy family, with parents willing and able to provide high quality schooling and 'legacy' admission to the Ivy League universities they attended, and another set, whose parents struggled to put food on the table, we should not be concerned that members of the first group almost invariably do better. After all, some people from very disadvantaged backgrounds achieve success, and there was no law preventing the rest from doing so" (Quiggin 2012).

At the same time, the use of profitability indicators encounters many institutional and technological problems. It is easier to manipulate earnings compared to operating cash flow. For example, there are many potential manipulative steps that use depreciation methods, that allow bad debt and write-offs, acquisitions, or that allow equity methods, etc. Excessive attention is paid to profitability, but it is, in fact, the result of the accountant's proficiency. That is why, in the practice of financial analysis, we use the ratio of operating cash flow to interest rate, taxes, and operating income. Such analysis aims to compare this ratio with "1", and in case of closeness, to reject the suspicion about potential manipulation.

That is why we have tried to find an additional approach to identify zombie firms. We shall focus on the case of Ukraine. The share of non-performing loans in the total volume of bank loans in Ukraine in May 2018 decreased to 56.09% from 56.18%, according to the National Bank of Ukraine (NBU). The share of NPLs in PrivatBank (the most significant example of a zombie bank in Ukraine) fell slightly, to 85.07% from 85.41%; in other state-owned banks it fell analogically – to 60.14% from 60.3%; in banks of foreign banking groups – to 42.83% from 42.94%; while in banks with private capital, it grew to 25.38% from 24.79% (Ministry of Finance of Ukraine 2018). In the case of financial analysis, we should eliminate the influence of associated structures on the profitability of an appraiser. However, in the case of Ukraine, we are talking about lending within the financial group, when the owner of the bank and the recipient of the loan are associates. It means that most Ukrainian businesses do not have access to credit, but at the same time, it is still necessary for them to look for opportunities for competitiveness on the market.

An unexpected case in Ukrainian practice is that for many businesses, it makes no sense to hide profits by using accounting methods. Such firms work only partially in the official economy. For this official part of their business, long-term negative financial results have no traditional consequence, e.g., bankruptcy. It is assumed that such firms do not pay income tax (there is no sense hiding this fact since there

are no official consequences) and they look for additional financial resources aimed at increasing accounts payables, for example, salaries payable, insurance payable, tax payable, advances payable, etc. In this way, such businesses try to compete with those of a "high level," which can function as traditional zombie businesses in the framework of a not transparent bank refinance system and an expanded Ponzi scheme with state treasury bills.

That is why we would like to study business debt practice in Ukraine by taking into account institutional aspects. The basis for our study is 70 observations in the form of balance sheets and income statements of selected enterprises. Among them are those which maintain a negative value of retained earnings for more than two years, and those which do not support such practices and use mainly a range of commonly known accounting tools. It is worth noting that the factual absence of a bankruptcy procedure in Ukraine (or its imitative, theoretical nature) makes it possible for both these types of enterprises to function. Moreover, as in reality, an enterprise which is going through bankruptcy proceedings could still hold shareholders' meetings, change its organizational and legal form, carry out business operations, win tenders, and so on. At the same time, there remains the possibility of the business not completely fulfilling its obligations to the state (budget), partners, or employees.

For our analysis, we chose a logit model (Table 5). Logistic regression is widely used to examine and describe the relationship between a binary response variable (e.g., 'success' or 'failure') and a set of predictor variables. We include in our analysis the dummy variable CHOICE, which is equal to "0" if retained earnings have a significant negative value and "1" if retained earnings are positive for two years, or negative in only one year, or negative values are negligible. Then, the first behavior will allow for non-payment in time salaries (ADD_STAFF), the accumulation of advances (AP_ADV), the non-payment of the insurance sum (AP_INS), and the non-payment of income tax (AP_TAX). And the second behavior will be based on the effective use of inventory accounting methods (result as COGS), amortization politics (result as AMORT_FIX), management encouragement (result as ADM_COST), the expansion of sales markets (result as PURCH_COST) and variation in equity instruments (result as ADD_CAP). In Table 5, we can observe a collaboration of these two behaviors as well as individually. It is worth noting that we consider a business that is not a part of large financial and industrial groups, so it is not possible to attract a nonperforming loan as an instrument. Therefore, it is compelled to seek other lenders or to abandon this type of instrument altogether.

As we can see in Table 5, MODEL 1 shows significantly negative retained earnings, which happens in both approaches (accounting techniques and accounts payables manipulations); MODEL 2 – the results of traditional accounting techniques, MODEL 3 – the result of accounts payables manipulations.

Then, in Table 6, we can predict the results of the group interaction in the case of the coexistence or separate use of instrument compositions, highlighted by the payoff matrix of percentage correct for the two values of the dummy variable choices: "AP" – us-

ing salaries, insurance, tax, or budget payables as a source of capital; "AT" – using strategic instruments like amortization policy, inventory accounting methods, exchange rates manipulation, or aggressive marketing, etc. According to game theory, the Nash equilibrium is a solution concept of a non-cooperative game which involves a strategical choice when the best decision for one player is at the same the best decision for another.

Table 5. Results of Logit modeling for different strategy choices

Variables	Model 1		Model 2		Model 3	
	Wald	Sig.	Wald	Sig.	Wald	Sig.
COGS	4.329	0.037	0.965	0.326		
AMORT_FIX	3.559	0.059	0.001	0.974		
ADM_COST	2.048	0.152	4.031	0.045		
PURCH_COST	4.668	0.031	2.469	0.116		
ADD_CAP	3.577	0.059	0.502	0.479		
AP_STAFF	2.467	0.116			4.193	0,041
AP_ADV	0.100	0.751			2.421	0.120
AP_TAX	1.006	0.316			0.004	0.950
AP_INS	2.625	0.105			1.715	0.190
CONSTANT	2.137	0.144	3.064	0.080	2.669	0.102
Cox&Snell R^2	0.589		0.307		0.391	

Source: authors' own research.

Table 6. Best prediction result of the group interaction in the case of the coexistence or separate use of instrument compositions

		Behavior 2	
		AT as the main instrument	Not AT as the main instrument
Behavior 1	Using AP	96.3; 92.3*	92.6; 46.2
	Don't use AP	93.1; 30.8	0; 0

Notes: * – percentage correct for the two values of the dummy variable choices: "AP" – using salaries, insurance, tax, or budget payables as source of capital; "AT" – using strategic instruments like amortization policy, inventory accounting methods, exchange rates manipulation, aggressive marketing, etc.

Source: authors' own research.

Table 7. Payoff matrix of the group interaction in the case of the coexistence or separate use of compositions of instruments

		Behavior 2	
		AT as the main instrument	Not AT as the main instrument
Behavior 1	Using AP	96.3*; 7.7	92.6; 53.8
	Don't use AP	93.1; 69.2	0; 0

Notes: * percentage of the positive pay-offs subject to the choice of a specific behavior model.

Source: authors' own research.

To demonstrate the payoff matrix, we have to rewrite such a schedule (Table 7), based on the widespread practice of the absence of a problem in long-term loss-making. An attractive position remains being unprofitable, as it makes no sense to demonstrate profitability, and there is nobody to hide the loss-making. There is no endeavor on the investor's positive impression on the market.

As expected, on such types of markets, Ukrainian Nash equilibrium is in the square "choice of first behavior and failure of second behavior" (92.6% and 53.8%). Other positions lead the company to non-equilibrium.

Conclusions and final remarks

Despite the significant differences in the impact of unpaid debt in the states of Eastern and Central Europe, Western Europe and Latin America, we can state its negative nature, as well as the divergence of the economic indicators on which this impact is directed.

According to our results, in the case of Eastern Europe, the banking system generally supports the promotion of exports and economic growth. A positive effect of unpaid debt on export flows was revealed (when ignoring the time lag effects) for the states of Western Europe, which can be explained by the banking corporation model in the EU, as the main scope of the banking sector is to ensure technological growth and export support. The interconnection between bank lending and the share of R&D investment is of particular interest in this case. In the Latin America region, the influence of the banking sector on export-import flows, as well as the economy as a whole, is even more significant than in European countries.

At the same time, we emphasized that, for example, in Ukraine, fewer than 14% of enterprises use bank loans. We consider that the solution to the problem is not in the growth of government influence or control, but in the reorganization of existing banking institutions, introducing practices of a decentralized banking system with institutional control from the bottom to the top, and transforming banks from being a "stakeholder" into an economic development tool.

An unexpected case in the Ukrainian practice is that is no point in businesses hiding profit by using accounting methods. Such firms operate partially due to the debt to the whole spectrum of their partners. For such a business, a negative financial result for a long period has no traditional consequence, e.g., bankruptcy. Looking at zombie banking in Ukraine, the functioning of enterprises can be based not only on bank lending, but also on the assistance of partners, the state, or even its own employees, by using salaries, insurance, tax, and budget payables as a source of capital. For Ukraine, this behavior today is in position of the Nash equilibrium.

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Streszczenie

Zjawisko zombie w bankowości i biznesie – analiza porównawcza oraz instytucjonalne podłoże problemu

W artykule przedstawiono zjawisko zombie w bankowości i biznesie. Główne cele publikacji to: wyjaśnienie negatywnych konsekwencji w przypadku niespłacalnych pożyczek dla państw Europy Środkowo-Wschodniej, Europy Zachodniej, Ameryki Łacińskiej oraz grupy byłych państw ZSRR oraz przedstawienie zjawiska firm zombie w przypadku Ukrainy, w tym ujawnienie nowej formy zombie biznesu na podstawie narzędzi pozabankowych. Autorzy twierdzą, że rozwiązaniem problemu zombie banków nie jest kontrola państwa, lecz restrukturyzacja systemu bankowego oparta na zdecentralizowanym i silnie kontrolowanym modelu oddolnym. Poza tym nieefektywność systemu instytucjonalnego generuje różne formy zombie biznesu. Przypadek Ukrainy jest doskonałą ilustracją narzędzi pozabankowych stosowanych w zombie biznesie. Artykuł podkreśla wpływ nierentownych kredytów na gospodarkę oraz perspektywy tworzenia systemu bankowego w świetle instytucjonalnym i interakcji międzyinstytucjonalnych przy aktywnym udziale niespłacalnych kredytów.

Słowa kluczowe: system bankowy, bankowość, banki zombie, zombie biznes, niespłacalne pożyczki, teoria instytucjonalna

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Education Level and Income Disparities: Implications for Financial Inclusion through Mobile Money Adoption in South Africa

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Abstract

Financial inclusion has recently become an issue of concern the world over for governments, policymakers, non-governmental organizations (NGOs), and financial and non-financial institutions alike. McKinnon (1973) and Shaw (1973), in seminal presentations, brought the world's attention to the importance of an effective financial system for economic development.
In recent years, there has been growing theoretical and empirical works showing the strong linkages between financial development with economic growth and poverty alleviation.
After conducting statistical analysis using Stata version 14 for Windows with a multivariate binary logistic regression modeling technique applied, this paper tested and concluded that there is a statically significant relationship between educational levels on the one-hand and income levels on the other on the probability of one having a mobile banking account in South Africa. From a policy perspective, this information will assist policymakers in making more informed decisions with respect to education, and from the banking fraternity point of view it will help, them in the developments of products that are more in line with the population's education and income levels.

Keywords: financial inclusion, level of education, level of income, mobile banking

JEL: G21, N3, N27

Introduction

Financial inclusion has recently become an issue of concern the world over for governments, policymakers, non-governmental organizations (NGOs), and financial and non-financial institutions (Quaye et al. 2014).

According to UNDESA and UNCDF (2006), the concept of financial inclusion encompasses two primary dimensions: (1) that financial inclusion refers to a customer having access to a range of formal financial services, from simple credit and savings services to more complex ones such as insurance and pensions; and (2) that financial inclusion implies that customers have access to more than one financial services provider, which ensures a variety of competitive options. Understanding and identifying the factors which affect the level of financial inclusion is important to policymakers and the academic field as well.

Research on issues regarding economic growth was pioneered by early economic theorists, who focused on shortages of real factors such as land and capital (e.g., machinery), but not the finance and financial markets as being constraints on economic growth. In the early 1990s, theorists like Schumpeter (1991) brought to the fore the importance of financial intermediary services for innovation and economic growth.

McKinnon (1973) and Shaw (1973), in seminal presentations, brought the world's attention to the importance of an effective financial system for economic development.

In recent years, there has been growing theoretical and empirical works showing the strong linkages between financial development with economic growth and poverty alleviation. Banerjee and Newman (1993) reported on the critical role that access to finance played in enabling people to exit poverty by enhancing productivity. Binswanger and Khandker (1995) and Eastwood and Kohli (1999) investigated the impact of Indian's rural banks' expansion program and found that rural poverty reduced and non-agricultural employment increased.

Burgess and Pande (2005) also echoed a similar positive impact on poverty reduction because of the bank branching regulations of India (between the 1970s and the 1990s) which required banks to open four branches in unbanked locations for every new branch opened in an urban area.

The study provides direct evidence that this expansion of the bank branch network had a positive impact on financial inclusion and, thereby, it led to a considerable decline in rural poverty (World Bank 2014).

Beck et al. (2009) showed how well developed financial markets and accessible financial services all reduce information and transaction costs, and influence savings rates, investment decisions, technological innovations, and long-run growth rates. According to Frost and Sullivan (2009), banking services are being viewed increasingly as a public good that needs to be made available to the entire population without discrimination.

It is against this background that this study seeks to examine the impact of income levels and education level on financial inclusion with respect to mobile banking and other modern financial instruments and gadgets.

In the context of South Africa, with its history of apartheid, an understanding of the causes of financial exclusion on both its economy and population is merited.

Literature review

The current drive towards financial inclusion is an initiative that started 20 to 30 years ago (Asian Development Bank Institute 2014; Consultative Group to Assist the Poor (CGAP) 2010; Demirgüç-Kunt and Klapper 2012a). Patel and Graham (2012) maintain that South Africa has a long history of economic exclusion of the majority of the population through colonialism and apartheid. Preisendoerfer, Bitz, and Bezuidenhout (2014) argued that the black population of South Africa has a low participation rate in entrepreneurial activities and a low level of entrepreneurial ambitions due to the apartheid regime. The challenges of access to finance and poor knowledge of available formal financial institutions minimized the rate of black-owned small business to participate in the formal sector (Cant, Erdis and Sephapo 2014).

Gertler and Rose (1991) argue that economic growth and financial sector development are mutually dependent. Other authors have emphasized that financial sector policy can affect the pace of economic development. King and Levine (1993) empirically investigated the dynamic link between financial innovation and economic development. They argue that financial institutions lower the social cost of investing in intangible capital through the evaluation, monitoring, and provision of financing services. Montiel (1994) also noted that economic growth could be spurred by innovation in financial development that improves the efficiency of intermediation, thereby increasing the marginal product of capital and raising the savings rate. Levine et al. (2000) found that the exogenous components of financial intermediary development were positively associated with economic growth.

In the context of South Africa, the inability of black-owned businesses to access finance has an impact on the economic growth of the country as the black population accounts for 90% in the small and medium enterprise (SME) sector compared to the larger sector (SEDA 2017). The OECD (2015) states that it is primarily the responsibility of governments the world over to ensure that small enterprises do well, as governments carry the burden of assessing the extent of small enterprises financing needs and eliminating the gaps with relevant stakeholders, such as banks and financial institutions. According to Freeman (2008), one of the main issues that remain of concern is that the apartheid government used legislation as one of its main tools to provide white South Africans with abundant resources and economic opportunities. In spite of the racist division of resources in pre- and post-apartheid South Africa, the country's economy and societal well-being have been drastically affected by the lack of access to finance by most black-owned small businesses.

A number of factors can be attributed to this demise, among them, education levels and income disparities, which are the subject of examination in this paper.

Kira and He (2012) agree that the main challenge preventing the small enterprise sector from contributing fully to economic growth is a lack of finance. Quaye, Abrokwah, Sarbah, and Osei (2014) share the same view as the researchers of a study in Ghana, who found that most small enterprises who were denied access to credit by commercial banks and other financial institution collapsed within the first three years of coming to being.

There is a great deal of literature linked to the subject of access to finance, especially in the small enterprise space. Beyers and Ndou's (2016) study addressed two main issues relating to the growth and development of small enterprises in South Africa, that is, the lack of financial management skills and lack of access to finance.

Kasseeah and Thoplan (2012) argue that the growth of small enterprises is a vital source of wealth creation for both the economy and the individual. It is implied, therefore, that denying someone access to financial resources for whatever reason is tantamount to denying both the economy and the individual access to wealth. Since banks, which spur economic growth and affect economic transformation, are key institutions in any economy (Djoumessi 2009), exploiting the advantages brought by information and communication technologies (ICT) is critical for economic development in the future. However, due to the challenges emanating from resistance to change, lack of information for consumers, and poor levels of education and income by those that are supposed to partake in new technologies, financial inclusion may remain a pipe dream for most African economies. Other common causes of financial exclusion (price or non-price barriers) cited in the literature include "geography (limiting physical access), regulations (lack of formal identification proof or of appropriate products for poor households), psychology (fear of financial institution's staff, structures, complicated financial products, etc.), information (lack of knowledge regarding products and procedures), and low financial acumen (low income and poor financial discipline), among others" (Ramji 2009; Demirgüç-Kunt and Klapper 2012a).

Demirgüç-Kunt et al. (2012b) observed that without inclusive financial systems, poor people have to rely on their own limited savings to invest in their education or become entrepreneurs, and small enterprises must rely on their limited earnings to pursue promising growth opportunities.

The available literature suggests that retail banks are facing huge challenges in migrating customers from the traditional ways of conducting business to take part in modern ways of conducting business (Singh 2004, p. 188; Brown and Molla 2005). Research conducted concluded that differences in attitude might exist between customers in different demographic groups. However, demographic factors alone are insufficient predictors of a customer's attitude. Financial inclusion must thus be treated like any public good due to its importance to both individual and economic development. The degree of 'publicness' in financial inclusion may be different from a typical public good like 'policing'

According to Creane et al. (2004), a robust financial system contributes to the economic and overall functioning of the national economy through promoting invest-

ment and funding good business opportunities, mobilizing savings, and enabling the trading, hedging, and diversification of risk. This, in turn, results in a more efficient allocation of resources, more rapid accumulation of physical and human capital, and faster technological progress, and finally, it feeds into economic growth. Honohan and Beck (2007), among others, have shown that well-functioning, healthy and competitive financial systems are an effective tool in creating opportunities and fighting poverty by providing people with a wide range of financial services, such as savings, credit, payment, and risk management services.

In various studies, it has been observed that the absence of inclusive financial systems contributes to persistent income inequality and slower economic growth (Demirguc-Kunt and Levine 2009; Kempson 2006).

Problem statement and research objectives

In a bid to foster financial inclusion from a policy perspective, the South African government introduced a number of acts, among which is the National Credit Act (NCA); among other rights, it enforces the right to credit by all citizens. The government went on to introduce the Mzanzi account, an account with conditions for a minimum balance and on which no charges are to be levied.

All these happened in the midst of the rapid introduction of technology by banks. In the process, the government seems to have underplayed the importance and impact of levels of both education and income on financial inclusion.

The FinMark Trust (2016) indicates that in the Southern African Development Community (SADC) region, mobile money ownership remains low among low-income groups and people with either no education or low levels of financial literacy because of lower education levels. It is in light of the above that this paper explores the implications of education level and income disparities on financial inclusion through mobile money adoption in South Africa.

Research questions and hypothesis

The paper seeks to answer the questions of the effect that education levels and income disparities have on financial inclusion through mobile money adoption in South Africa. The research hypotheses developed as a result are that:

- Education levels disparities have statistically significant and disproportionate effects on financial inclusion through mobile money adoption in South Africa.
- Income disparities have statistically significant and disproportionate effects on financial inclusion through mobile money adoption in South Africa.

Contribution of the study

This research study provides insights into the lack of financial inclusion through mobile money adoption in South Africa with respect to the existence of disparities in education and income levels among the country's population. It is also hoped that the research results may result in a policy shift by governments and financial sector players alike towards more consumer-friendly policies and financial products if the dream of financial inclusion is to be realized at all.

Methodology and analytical technique

Data description

The research used data from The World Bank (WB) Microdata 2014 Financial Inclusion Survey. The data was sourced from the World Bank Microdata Library online data portal. From the total 1000 participants surveyed, 995 were valid responses relevant to this research study, yielding a 99.5% effective response rate. Mobile money account ownership status was the binary response variable (no = 0; and yes = 1), while education level and income quintile were the covariates. Education level had three categories in the model (completed primary or less = 1; secondary = 2; and completed tertiary or more = 3). Income quintile had five categories, namely poorest 20% = 1; second 20% = 2; middle 20% = 3; fourth 20% = 4; and richest 20% = 5.

Estimation technique

Statistical analysis was conducted using Stata version 14 for Windows. A multivariate binary logistic regression modeling technique was applied to estimate odds ratios with 95% confidence intervals based on the function specified below:

$$\delta = \Pr(Y_i = 1 \mid X_i = x_i) = \frac{\exp(\alpha_0 + \alpha_1 x_i)}{1 + \exp(\alpha_0 + \alpha_1 x_i)} \tag{1}$$

$$\Rightarrow \operatorname{logit}(\pi_i) = \log\left(\frac{\pi_i}{1 - \pi_i}\right) = \alpha_0 + \alpha_1 x_i \tag{2}$$

where: Y represents the binary response variable (such that $Y_i = 1$ signifies the presence of mobile money account ownership, and $Y_i = 0$ describes the absence of mobile money account ownership), and X_i represents a vector of a set of exploratory variables which include the education level and income quintile.

To determine the proportion of overall variation in mobile money account ownership status that was accounted for by education level and income quintile, the Cox

& Snell Pseudo R-square and the Nagelkerke R-square were calculated. The respective test statistics were performed based on the functions specified below:

$$\text{Cox \& Snell Pseudo } R^2 = 1 - \left(\frac{-2LL_{null}}{-2LL_k}\right)^{\frac{2}{n}} \tag{3}$$

$$\text{Nagelkerke } R^2 \left(\text{which divides Cox \& Snell } R^2 \text{by its maximum}\right) = \\ = 1 - \frac{\left(\frac{-2LL_{null}}{-2LL_k}\right)^{\frac{2}{n}}}{1 - \left(-2LL_{null}\right)^{\frac{2}{n}}} \tag{4}$$

where: $-2LL_{null}$ symbolizes the likelihood for the model with only an intercept; and $-2LL_k$ represents the model with the predictor.

To examine the predictive power of the model, the area under the nonparametric Receiver Operating Characteristic (ROC) curve was computed. The respective curve, which is a graph of sensitivity versus 1 minus specificity, was derived at c = 0.5 probability cutoff. Sensitivity refers to the fraction of observed positive outcome cases that are correctly classified, and specificity is the fraction of observed negative outcome cases that are correctly classified in the analytical process.

Results and analysis

This section presents summary statistics on the demographic profiles of the participants and the mobile money account ownership status according to education level and income quintile. The cross-tabulated frequencies and estimated odds results of mobile money account ownership status for each education level group and income quintile group were provided.

Table 1 above shows that from the total of 995 respondents surveyed, approximately 18% (n = 183) reported they owned mobile money accounts, while 82% (n = 812) of respondents reported that they did not have mobile money accounts. From the 18% (n = 183) who had mobile money accounts, only 1% (n = 13) had completed primary education or less, 12% (n = 117) had completed secondary education, and 5% (n = 183) had completed tertiary education or more.

The cross tabulation results presented in Table 2 above show that from the total of 995 respondents surveyed, approximately 18% (n = 183) reported that they owned mobile money accounts, while 82% (n = 812) of respondents reported that they did not have mobile money accounts. From the 18% (n = 183) who had mobile money accounts, 1% (n = 14) were in the poorest 20% income quintile category, 2% (n = 17) were

in the second 20% income quintile category, 3% (n = 25) were in the middle 20% income quintile category, 4% (n = 36) were in the fourth 20% income quintile category, and 9% (n = 91) were in the richest 20% income quintile category.

Table 1. Respondent education level * Has a mobile money account

			Has a mobile money account		Total
			No	Yes	
Respondent education level	completed primary or less	Count	211	13	224
		% of Total	21.2%	1.3%	22.5%
	secondary	Count	539	117	656
		% of Total	54.2%	11.8%	65.9%
	completed tertiary or more	Count	62	53	115
		% of Total	6.2%	5.3%	11.6%
Total		Count	812	183	995
		% of Total	81.6%	18.4%	100.0%

Source: own elaboration.

Table 2. Within-economy household income quintile * Has a mobile money account

			Has a mobile money account		Total
			No	Yes	
Within-economy household income quintile	1 poorest 20%	Count	151	14	165
		% of Total	15.2%	1.4%	16.6%
	2 second 20%	Count	172	17	189
		% of Total	17.3%	1.7%	19.0%
	3 middle 20%	Count	144	25	169
		% of Total	14.5%	2.5%	17.0%
	4 fourth 20%	Count	169	36	205
		% of Total	17.0%	3.6%	20.6%
	5 richest 20%	Count	176	91	267
		% of Total	17.7%	9.1%	26.8%
Total		Count	812	183	995
		% of Total	81.6%	18.4%	100.0%

Source: own elaboration.

The odds ratios (Table 3) are all statistically significant at the 5% level and lie within the respective 95% confidence intervals. The results indicate that respondents who completed tertiary education or more had approximately eight times the odds of having a mobile money account than respondents with primary education or less. Similarly, respondents who completed secondary education had approximately three times the odds of having a mobile money account than respondents with primary education or less. Concerning the within-economy income quintile, respondents who are

in the second and middle 20% income quintiles had approximately the same odds of not having mobile money account ownership based on the statistically insignificant z-statistics.

Table 3. Odds ratios for mobile money account ownership

Logis ic regression					No. of obs = 995	
					LR chi2 (3) = 86.94	
					Prob > chi² = 0.000	
Log likelihood = –32704.664					Pseudo R² = 0.110	
Mobile money ownership	Odds Ratio	Robust S. E.	Z	P>|z|	[95% Conf. Interval]	
Education level[a]						
Secondary	2.805	0.862	3.36	0.000	1.536	5.124
Tertiary or more	8.00	2.853	5.84	0.000	3.982	16.102
Income quintile[b]						
Second 20%	1.040	0.404	0.10	0.918	0.486	2.227
Middle 20%	1.737	0.623	1.54	0.124	0.859	3.510
Fourth 20%	1.995	0.684	2.01	0.044	1.018	3.907
Richest 20%	3.500	1.121	3.91	0.000	1.867	6.558
__cons	0.039	0.015	–8.14	0.000	0.184	0.086

[a] The primary education or less group was used as the reference category for education level

[b] The poorest 20% group was used as the reference category for the within-economy household income level

Source: own elaboration.

The respondents who are in the fourth 20% quintile had approximately twice the odds of having a mobile money account than respondents with primary education or less. Similarly, respondents who are in the fourth 20% quintile had about three times the odds of having a mobile money account than respondents with primary education or less. The LR test statistic indicates the significance of the full model with a predictor; while the Pseudo R^2 indicates about 11%. Variation in mobile money account ownership was accounted for by education level and the within-economy income quintiles.

The results regarding model sensitivity indicate that 21.86% of respondents with mobile money account were correctly classified. Similarly, the results regarding specificity indicate that 95.57% of respondents surveyed with no mobile money account were correctly classified. Technically, the model yielded the predicted p = 0.05 for 995 respondents, from which 40 respondents (positive predicted value = 52.63% (40/76)) had a mobile money account. Proceeding further, the model predicted that out of the 812 surveyed respondents, 776 of them (predicted negative value = 84.44%) did not have a mobile money account. Overall, the model's correct classification rate was 82.01%, with 98.09% of the respondents who did not have a mobile money account correctly classified but only 21.86% of the group with a mobile money account correctly classified.

Table 4. Classification summary statistics for the model

Classified	True		Total
	D	~ D	
+	40	36	76
-	143	776	919
Total	183	812	995
Classified + if predicted Pr(D) > = 0.5			
True D defined as mobile money account ownership !=0			
Sensitivity		Pr (+I D)	21.86%
Specificity		Pr (-I ~D)	95.57%
Positive predictive value		Pr (DI +)	52.63%
Negative predictive value		Pr (~DI -)	84.44%
Correctly classified			82.01%

Source: own elaboration.

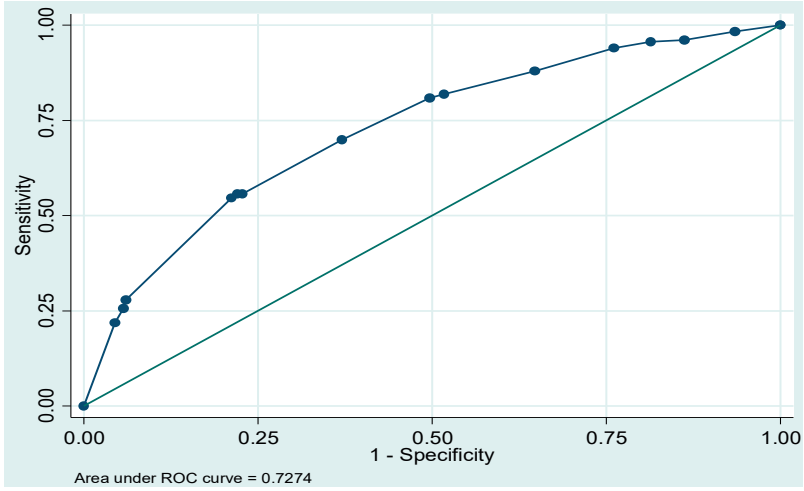

Figure 1. Area under the Receiver Operating Characteristic (ROC) curve[a]

Null hypothesis: true area = 0.5
Source: own elaboration.

To examine the predictive power of the model, the area under the ROC curve was statistically calculated. Given that a model with no predictive power would be a 45° line with an area = 0.5, the estimated area (= 0.727) under the curve indicates that the model indeed had some predictive estimation power.

Conclusions

The results of the study confirm the existence of a relationship between the level of education on the one hand and the level of income on the other. The results show that the higher the education level, the greater the odds for one to have a mobile account. The results also show that the higher the income level, the greater the odds of one having a mobile banking account.

In the context of South Africa, a country that experienced Bantu education over a very long period, it is imperative for the government of that country to prioritize basic education to enhance literacy levels that may trigger an increase in the use of mobile banking devices. The results of the study are useful to both governments and financial institutions as far as financial inclusion is concerned.

The government of South Africa has an obligation to bring its population up to speed on the usage of mobile devices. This can be achieved through a variety of strategies and policy positions, among which may be the adoption of local languages in the marketing process of these banking devices

Overall, from a government policy perspective, this information will assist policymakers in making more informed decisions with respect to education, and from the banking fraternity point of view, it will help them in the development of products that are more suited to the population's education and income levels.

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Streszczenie

Poziom wykształcenia i różnice dochodowe: implikacje dla włączenia finansowego związanego z wprowadzeniem pieniądza mobilnego w Afryce Południowej

Problem włączenia finansowego stał się w ostatnim czasie przedmiotem troski zarówno rządów, decydentów, organizacji pozarządowych (NGO), jak również instytucji finansowych i niefinansowych na całym świecie. McKinnon (1973) i Shaw (1973) w swoich najważniejszych pracach zwrócili uwagę świata na znaczenie efektywnego systemu finansowego dla rozwoju gospodarczego.
W ostatnich latach coraz więcej prac teoretycznych i empirycznych wskazuje na silne związki między rozwojem finansowym a wzrostem gospodarczym i ograniczaniem ubóstwa.

Po przeprowadzeniu analizy statystycznej przy użyciu programu Stata w wersji 14 dla systemu Windows z zastosowaniem modelowania wieloczynnikowej binarnej regresji logistycznej (*multivariate binary logistic regression modeling*), w niniejszym artykule wykazano, że istnieje statystycznie istotny związek między poziomem wykształcenia z jednej strony i poziomem dochodów z drugiej strony, a prawdopodobieństwem posiadania konta bankowości mobilnej przez mieszkańców Afryki Południowej. Z punktu widzenia prowadzenia polityki, informacje te mogą być przydatne decydentom w podejmowaniu bardziej świadomych decyzji dotyczących edukacji, a sektorowi bankowemu mogą pomóc w rozwijaniu produktów, które będą lepiej dostosowane do poziomu wykształcenia i poziomu dochodów ludności.

Słowa kluczowe: włączenie finansowe, poziom wykształcenia, poziom dochodów, bankowość mobilna