ATLAS INTERNATIONAL REFEREED JOURNAL ON SOCIAL SCIENCES
Open Access Refereed E-Journal & Refereed & Indexed
ISSN:2619-936X

Vol:5, Issue:22	2019	pp.651-658
Article Arrival Date: 03.07.2019		Published Date: 24.09.2019

MULTIFACTOR PRODUCTIVITY AND FINANCIAL DEVELOPMENT: EVIDENCE FROM D-5 COUNTRIES

ÇOKLU FAKTÖR VERİMLİLİĞİ VE FİNANSAL GELİŞME: G-5 ÜLKELERİ İÇİN ANALİZ

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Doi Number : http://dx.doi.org/10.31568/atlas.348
Article Type : Research Article

ABSTRACT

Multifactor productivity is a data set that has been published by Organization for Economic Co-operation and Development (OECD) and it harbors the variables such as management practices, brand names, organizational change, general knowledge, network effects, spillovers from production factors, adjustment costs, economies of scale, the effects of imperfect competition and measurement errors that affect the productivity of labor and capital. According to this, the part that cannot be explained in the growth with labor productivity and capital efficiency is belonging to the index of multifactor productivity. In other words, the part that cannot be explained in the growth has originated from the variables that may be called as institutional capacity such as management practices, brand names, organizational change, general knowledge, network effects, spillovers from production factors, adjustment costs, economies of scale, the effects of imperfect competition and measurement errors. Since the institutional capacity will influence the financial decisions of people, it has been estimated that there is a close tie between multifactor productivity and financial development. In this regard, in the study, the relationship between multifactor productivity and financial development has been established in 5 developed countries (Germany, USA, France, Japan, and Canada) for the period of 1990-2018. For the period of 1990-2019, whether the aforementioned countries has been affected from multifactor productivity and the way of causality between financial development and multifactor productivity have been researched with panel VAR analysis. As a result of the study, the existence of a relationship from multifactor productivity to financial development and a long-termed relationship between multifactor productivity and financial development in the aforementioned countries were detected.

Key Words: Financial Development, Multifactor Productivity (MFP), Institutional Capacity, Panel VAR Analysis.

ÖZET

Çoklu faktör verimliliği ekonomik kalkınma ve işbirliği örgütü (OECD) tarafından yayınlanan bir veri seti olup içerisinde emek ve sermayenin verimliliğini etkileyen yönetim uygulamaları, markalaşma, yönetim değişiklikleri, ölçek ekonomileri, eksik rekabet etkileri, uyarlama maliyetleri yayılam etkileri, genel bilgi düzeyi ve iş ağı etkileri ve ölçüm hataları gibi değişkenleri barındırır. Buna göre büyümede emek ve sermaye verimliliği ile açıklanamayan kısım çoklu faktör verimliliği endeksine aittir. Bir diğer ifade ile büyümenin açıklanamayan kısmı kurumsal kapasite diyebileceğimiz yönetim uygulamaları, markalaşma, yönetim değişiklikleri, ölçek ekonomileri, eksik rekabet etkileri, uyarlama maliyetleri yayılam etkileri, genel bilgi düzeyi ve iş ağı etkileri ve ölçüm hataları değişkenlerinden kaynaklanmaktadır. Kurumsal kapasite kişilerin finansal kararlarını da etkileyeceğinden çoklu faktör verimliliği ile finansal gelişme arasında yakın bir bağ olduğu tahmin edilmektedir. Bu bağlamda çalışmada 1990-2018 dönemi için, gelişmiş 5 ülkede (Almanya, ABD, Fransa, Japonya, Kanada) multifactor productivity ve finansal gelişme arasında ilişki kurulmuştur. 1990-2019 dönemi için ilgili ülkelerde

finansal gelişmenin çoklu faktör üretkenliğinden etkilenip etkilenmediği ve finansal gelişme ile çoklu faktör verimliliği arasındaki nedenselliğin yönü panel VAR analizi yöntemi ile araştırılmıştır. Çalışma sonucunda ilgili ülkelerde çoklu faktör verimliliği ve finansal gelişme arasında uzun dönemli, çoklu faktör verimliliğinden finansal gelişmeye doğru ilişkinin varlığı tespit edilmiştir.

Key Words: Finansal gelişme, Çoklu Faktör Verimliliği (MFP), Kurumsal Kapasite, Panel VAR Analizi.

1. INTRODUCTION

Acemoglu and Robinson (2010) sought for an answer to the question why some countries are not rich, while some of the countries are rich and they argued that this is simple as a question but it has a complicated response as an answer. According to this, because social, political, economic and cultural institutions of some countries have acted within a coordination, the problems of growth and development have been removed and the problems such as poverty and unfair distribution of income have occurred less. Besides that, if the functioning institutional structure and reforms in one country were tried to be applied or constituted in different country, the same impact would not be obtained generally. The reason is that the accumulation and political, social and cultural structure of one country are unique to that country and one size cannot fit all the countries (Acemoglu and Robinson 2010: 2). In other words, the present institutional quality of one country has significance for explaining the basic economic problems such as productivity, growth, development, poverty, income distribution in that country. In this regard, the productivity difference that forms the welfare difference among the countries emerges due to the impact of institutional capacity as well.

The concept of productivity was articulated as an exogenous variable into the economic equation for the first time with Solow (1956). The main reason of growth differences between the countries is the difference of factor endowments and the constant reduction of the marginal productivity of capital. The impact of increases in real capital on the developed countries in the transition periods will decelerate due to the reducing productivity and growth rate will be drawn into a period that is expressed as a stationary state. According to the theory, a capital flow will accompany to this process from developed countries, where the reducing productivities have not occurred yet, to developing countries, where the returns on capital are still high. However, the impact of aforesaid capital flows will be disappeared in the long term and the differences of growth rates between developing and developed countries will be decreased and therefore, the countries will converge to each other. The non-realization of Solow's convergence hypothesis caused new approaches to rise to the surface. The economists such as Romer (1986), Lucas (1988), Grossman and Helpman (1991), Rivera-Batiz and Romer (1991), and Barro, Mankiw and Salai-I-Martin (1995) were the pioneers of this new approach in 1980s, and it was called as endogenous growth model. This new approach held forth that the driving force of growth is not depending on real capital, unlike the neo-classical theory.

The endogenous growth theory suggests that the return on capital might be the increasing factor but this will be possible with the inclusion of human capital, so that the growth of countries will not decrease in the long term with increases in total factor productivity. Theory propounds that the main key variables such as human capital investments, R & D activities, innovation, the creation of fixed capital and total factor productivity have created the economic growth dynamics of countries. Therefore, the approach of endogenous growth has attached great importance to technological development and human capital in economic growth. It has been considered that increasing human capital not only quantitatively but also qualitatively will enable the development of new technologies, the increases of productivity and by this way, the economic growth. The increase of R & D, innovation activities and human capital depends on the information and innovation that have been obtained as a result of these increases to increase production efficiency (Demirli, 2014). Thus, the amount of real

and human capital is not effective alone on the economic growth. In addition to these two factors, the other elements that have influence over productivity should be evaluated as well.

Productivity expresses the relationship between the output that has been produced by a production or process of service and the input that has been used for creating that output. Concept of productivity bases the production of goods with cheapest costs (the minimal cost) and it has been explained with other set of variables nowadays. In other words, the concept of productivity was expressed previously as the most output with the least effort or the minimal resource consumption but now, it includes the concepts such as management practices, brand names, imperfect competition and market influences as well.

Multifactor productivity reflects the total productivity that labor and capital inputs have used together during the production process as well as the influences of management practices, brand names, organizational change, general knowledge, network effects, spillovers from production factors, adjustment costs, economies of scale, the effects of imperfect competition and measurement errors. The growth in multifactor productivity has been measured as a part of GDP growth that cannot be explained with the changes of labor and capital inputs. Hence, in simple terms, if the labor and capital inputs unchanged, any change in output would reflect the changes in multifactor productivity.

Multifactor productivity not only explains the productivity of labor and capital but also qualitative indicators such as management practices, organizational change, general knowledge, network effects, spillovers from production factors, adjustment costs, economies of scale, the effects of imperfect competition and measurement errors. In one sense, it involves the indicators that one might considered as the impact of institutional capacity. These variables that Organization for Economic Co-operation and Development (OECD) anticipates to affect the labor and capital productivity will inevitably affect the financial development as well. In this regard, the impact of multifactor productivity will be analyzed for the economy of 5 developed countries (Germany, USA, France, Japan, and Canada) in this study. In the study, the relationship between financial development and multifactor productivity will be approached in the aforesaid economies for the period of 1990-2019.

2. LITERATURE

In the studies that theoretically established the relationship of financial development and financial development, this topic was approached among the total factor productivity that expresses the labor and capital productivity with financial development. According to the some studies that established the relationship between financial development and total factor productivity (Graff: 2001, Kumbhakar and Mavrotas: 2008, Xu and Pal: 2011, Serdaroğlu: 2013, Mutlugün: 2014, Machek: 2014, Mitra: 2016, Ezzahid and Elouaourti: 2017, Tandoğan: 2017), there is a long-termed and positive relationship between total factor productivity and financial development. On the other hand, in the study of Uzay and Koçak (2018), a significant relationship between financial risk and total factor productivity was not discovered.

Although there has not been studies in the literature that established a relationship in an empirical level between multifactor productivity, which has been comprised of the variables such as general knowledge, network effects, spillovers from production factors, adaptation costs, scale economies, the effects of imperfect competition and measurement errors, and the level of financial development, the obtained information from the studies that analyzed productivity and financial development can be expressed as below:

In his study, Spiegel (2000) examined the financial development and investments. He discovered that financial development has increased the productivity over labor and capital

and the increase of total factor productivity affects investments positively. Moreover, he discovered that the some social characteristic features of countries (like investment environment, brand and management) have affected financial development.

Ark et al. (2008) explained the productivity differences between Europe and USA with knowledge and structure of innovation in their studies. They also analyzed that multifactor productivity has shaped the financial structure.

In their studies, Dabla-Norris et al. (2010) analyzed the firm productivity in the level of innovations and financial development. In the study that examined the effects of the information network structure of firm and innovations on the financial development level of firm, they came to the conclusion that the expansion of innovation network and well-run of this network will improve the financial sector.

In the analysis that Guillaumont Jeanneney et al. (2011) used for the 29 cities of China, they researched the relationship between financial development and productivity. As a result of the analysis, they discovered that the increase of productivity affected financial development positively for the period of 1993-2001.

Ayadi et al. (2013) analyzed the effects of financial development over qualitative and quantitative growth indicators in the Mediterranean countries for the period of 1985-2009 in their studies and they researched the distribution of used credits and the effects of them on financial development. In the study, it was emphasized that the management mentality in stock market has caused the financial system to become strong or weak.

Han and Shen (2015) used panel data analysis in the study that they analyzed regional factor productivity and financial development in the Chinese economy for the period of 1990-2009. As a result of analysis, they discovered that the information-oriented productivity increase has supported the financial development.

Kim and Loayza (2017) correlated innovation, education market activity and institutional fragilities with productivity in their study and they applied analyses to selected 65 countries for the years of 1985-2011. They discovered that productivity has affected from the qualitative indicators such as innovation, education, market activity and institutional fragilities.

3. DATASET AND METHOD

Panel VAR analysis was preferred in the study as an analysis method. Panel data estimation is superior in terms of gathering both time series and horizontal sections. Panel VAR approach is the adapted version of causality approach into the panel data analysis. With this analysis, the relationship between multifactor productivity and financial development was established in the 5 developed countries (Germany, USA, France, Japan, and Canada) for the period of 1990-2018 in the study. One of the variables that was used in the analysis is multifactor productivity and it has been estimated as a part of GDP growth that cannot be explained with the changes of the labor and capital inputs of growth. Therefore, in simple terms, if the labor and capital inputs unchanged, any change in output would reflect the changes in multifactor productivity. Multifactor productivity was accessed from the dataset of OECD. For another variable, the financial development, DAX, NASDAQ, CAC-40, Nikkei225 and S&P's index values of stock market were used for the countries of Germany, USA, France, Japan and Canada.

3.1. The Results of Analysis

Before the panel causality test, stagnation analyses were used to the series as the first step of model. In this regard, Augmented Dickey-Fuller (ADF) unit root test that has been used

commonly in the literature for both multifactor productivity and financial development was applied. According to the unit root test results, the series were found stationary in the level values. Unit root results can be seen in Table 1 and Table 2.

Table 1: Panel Stationarity Test for Multifactor Productivity (It is Stationary in the Level Value)

Panel unit root test: Summary				
Series: Multifactor Productivity				
Exogenous variables: Individual effects				
User-specified lags: 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Balanced observations for each test				
Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.31957	0.0000	5	135
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.87267	0.0000	5	135
ADF - Fisher Chi-square	52.8566	0.0000	5	135
PP - Fisher Chi-square	79.1184	0.0000	5	140
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.				

Table 2: Panel Stationarity Test for Financial Development (It is Stationary in the Level Values)

Panel unit root test: Summary				
Series: FINDEV				
Exogenous variables: Individual effects				
User-specified lags: 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Balanced observations for each test				
Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.04771	0.0000	5	135
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.25863	0.0000	5	135
ADF - Fisher Chi-square	55.6085	0.0000	5	135
PP - Fisher Chi-square	104.368	0.0000	5	140
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				

Johansen-Fisher cointegration test was developed to research whether the stationary series in the level values have moved. The issue whether variables have been affected from similar shocks has been researched by the help of Johansen-Fisher cointegration test. The obtained evidence indicated that there are two cointegrated equality in the 0,05 level of significance. The results of cointegration test can be seen in Table 3.

Table 3: Johansen-Fisher Panel Cointegration Test between Multifactor Productivity and Financial Development

Johansen Fisher Panel Cointegration Test				
Included observations: 145				
Trend assumption: Linear deterministic trend				
Lags interval (in first differences): 1 1				
Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
None	88.68	0.0000	51.83	0.0000
At most 1	70.46	0.0000	70.46	0.0000
* Probabilities are computed using asymptotic Chi-square distribution				

Individual cross section results

	Trace Test		Max-Eigen Test	
Cross Section	Statistics	Prob.**	Statistics	Prob.**
Hypothesis of no cointegration				
Canada	33.2833	0.0000	21.7583	0.0027
USA	21.3595	0.0058	16.0686	0.0257
Japan	46.7731	0.0000	30.0646	0.0001
France	23.5765	0.0025	13.6432	0.0625
Germany	29.5940	0.0002	17.4262	0.0153
Hypothesis of at most 1 cointegration relationship				
Canada	11.5250	0.0007	11.5250	0.0007
USA	5.2909	0.0214	5.2909	0.0214
Japan	16.7085	0.0000	16.7085	0.0000
France	9.9333	0.0016	9.9333	0.0016
Germany	12.1678	0.0005	12.1678	0.0005

**MacKinnon-Haug-Michelis (1999) p-values

According to the results of panel causality test that has been made to determine the direction of relationship between variables, there is a one way-oriented causality from multifactor productivity to financial development. The results of Dumitrescu-Hurlin panel causality test can be seen in Table 4.

Table 4: The Results of Dumitrescu-Hurlin Panel Causality Test Pairwise Dumitrescu Hurlin Panel Causality Tests

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
MFP does not homogeneously cause FINDEV	3.37411	3.11212	0.0019
FINDEV does not homogeneously cause MFP	0.55103	-0.72923	0.4659

4. EVALUATION AND CONCLUSION

Multifactor productivity refers to the improvement in the variables that affect growth but have been out of labor and capital productivity such as management practices, brand names, organizational change, general knowledge, network effects, spillovers from production factors, adjustment costs, economies of scale, the effects of imperfect competition and measurement errors. This qualitative indicators have been affecting financial development as well by influencing financial decision processes. On the basis of this thought, whether there is a relationship between multifactor productivity and financial development has been researched in this study. For that purpose, panel causality test has been used into the five developed countries that have the best dataset. The first discovery of analysis is that there is a cointegrated relationship between financial development and multifactor productivity for the valid period. In other words, financial development and multifactor productivity have been affecting each other in long term. The second discovery of analysis is that there is a one way-oriented causality from multifactor productivity to financial development. In other words, the improvements in multifactor productivity affect financial development positively. Based on these results, the improvement of productivity in the aforesaid countries affects financial development positively.

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