Roles of Investment and Innovation in Business Cycle from Kalecki's Perspective with a Schumpeterian Approach: An Empirical Analysis for Turkey and Greece

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Abstract: *Business cycles are one of the best sources to understand current situation of a country's economy. Michal Kalecki denotes investment as the best explanatory for the dimension and reason of cycles; on the other hand Schumpeter considers that innovation should be placed in a different position in this regard. In addition, both Kalecki and Schumpeter verify that investment and innovation are related with each other because innovation is also an important subject for investment. It is expected that investment and innovation have the effect in the same direction on output. In this study, business cycles have analyzed for 1971-2009 period by using the yearly data in Turkey and Greece and it has been dealt effects of investment and innovation on cyclical fluctuation. In this paper which growth rates have been discussed, ordinary least square estimation method has been used. In this respect firstly, it has been examined that the effect of innovation on investment and income. After that examined that effect of investment on output and finally innovation and investment have been evaluated by considering the effects on the output. It has been found that the obtained results support the views of Kalecki for both of the countries.*

JEL codes: *E12, E22, O31*

Introduction

Business cycles are the one of the important topic which macroeconomics has focused on. In this context, it has been seen that emphasis on balance results. Some of the neo-classical economists' perspective on this issue is how output and price act together throughout the cycle (Sawyer, 1985). In spite of these dominant views, it is seen that Post-Keynesians consider differently for the business cycles. In contrast to the main economic streams which see the all macroeconomic cycles as a function of external powers, Post-Keynesians think that business cycle is derived from internal powers (Snowdon and Vane, 2005; Harvey, 2011).

It is seen that Kalecki who is one of the precursors of Post-Keynesian economics shares this view and creates a difference along with his views on business cycles. Kalecki refers specifically a central role for investment because of the effect on demand and output. According to him, the main reason of these cycles is resulted from the differences in investment. The determiner role of investment upon output presents his opposite views about Orthodox economic streams. Besides, it is seen that innovation has a significant place in the subject of investment. Whereas innovation has a positive effect on investment, herein the output has an effect in the same direction as well. Whilst Joseph Schumpeter deals with the effect of innovation upon output as a different topic all by itself, Kalecki shows investment as the main source of the shifts of output. However, there are some ideas which supports both investment and innovation have an effect on output together as dependent on conditions in current period (Courvisanos and Verspagen, 2004).

In this study, it is addressed that the issue of cyclical fluctuations. In this regard, it has been examined relationships of investment and innovation with output for Turkey and Greece. Firstly, it will be given some information about primarily role attributed to investment as to Kalecki. Then, the connection of this topic with innovation will be placed. Afterwards, taking the topic as investment and innovation together, their relationship with business cycles will be handled. Lastly, after examining the effect of innovation for Turkey and Greece separately for both

investment and output, the effect of innovation and investment upon output will be dealt as being combined. The contribution of our study to the literature is composing an application upon Turkey and Greece by analyzing a concept within Kalecki perspective together with a Schumpeterian innovation idea.
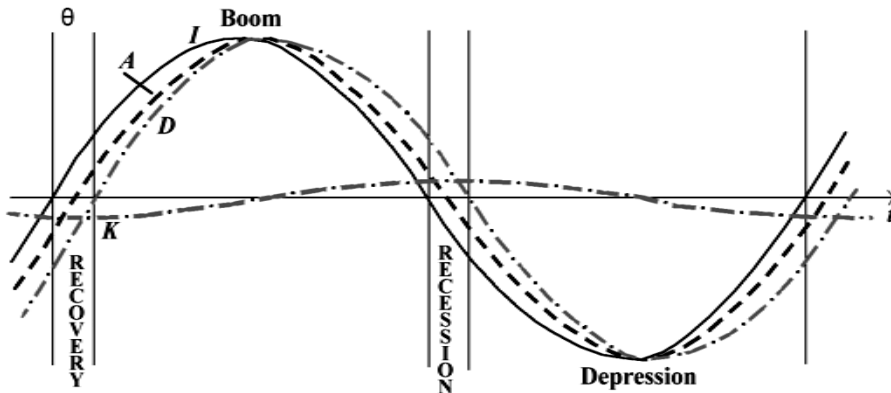
Theoretical Explanations

It is seen that Kalecki, who is one of the leaders of Post-Keynasian economics, shows a difference with his views on business cycles. According to him, the growth models of today tend to be solving this problem being away from controlling stability. In addition, these models do not adopt the approach which is applied in the business cycles theory. Business cycles theory is composed with the foundation of two relationships. The first one depends on the effective demand effect which is created by investment. Here, investment is investigated within its role upon profit and national income. This relation does not include complicated problems. The other relationship is related with the way of determination of investment decisions to show the exchange ratio and level of economic activity. According to Kalecki, it is the most central topic of economics (Kalecki, 1968). In the approach presented by Kalecki to explain the business cycles, it is stated that cycles in investment expenditures is the basic factor, which created the macroeconomic change. The changes in investment have to be dealt in the respect of a growing economy. Because of the additional investment made upon the capital stock, an improvement occurs in economy and a growth expectation creates a net investment demand (Sawyer, 1985).

The analysis of Kalecki takes the total levels into consideration and gets the conditions together which are not applicable only in firm level but also in total levels. The marginal efficiency of capital subjects to general demand level which depends on investment expenditures. If the firm plans more investment in the future period, demand and hence profit will be higher, due to the increased investment. Then the marginal efficiency of capital will be increased and the firms will therefore begin to plan to increase the investment again. This cumulative perspective towards the investment has been overlooked by not only Keynesians but also Neo-Classicals (Sawyer, 1985).

Kalecki, who developed many models about investment, gave the final shape to the investment model in 1968. Kalecki has improved a model in which consistently movement exists via a short-term and semi balanced sequence. Moreover, this movement will not return to any point of ultimate equilibrium and be cyclical because the business cycles continuously occur. According to this, it is supposed that the demand extending is a needed condition for growth in a long term and a sufficient one in the model of Kalecki. Indeed, the long term effective demand theory of Kalecki is the long term investment decisions theory. According to him, investment under capitalism is the main determiner of aggregate demand (Lopez and Assous, 2010).

The proceeding of business cycles mechanism presented by Kalecki could be seen in Figure 1 (Kalecki, 1990):

Figure 1. The Mechanism of the Business Cycle

Source: Kalecki, 1990

θ : The time-lag between investment orders and obtaining of new equipment

D : The curve of obtaining of new equipment

I : The curve of investment orders

A : The curve of the production of investment goods

K : Volume of capital equipment

t : Time

In the Figure 1., investment orders (I) shows deviations from the average to produce of investment goods which is equal to gross capital accumulation (A) and obtain of new equipment (D); that is, $I-I_0$, $A-A_0$, $D-D_0$. The all averages (I_0, A_0, D_0) are equal and also equal to the need of renewal. While the D curve is positive, K will increase throughout this cycle (D ↑ K ↑ ; D↓ K ↓).

In the current mechanism, it is accepted that the production of investment goods is equal to the gross capital accumulation. This is possible when the investors stay in a constant ratio. The obtaining of new fixed assets results in an enlargement in the volume of capital accumulation. This case can be illustrated in the shape as D-U. Herein U shows the need on renewal. This need stays fix in the course of business cycles. While the investment orders (I) is an increasing function of gross capital accumulation (A), the size of capital equipment is a decreasing function. When the D curve which shows the delivery curve is shifted within a course of time in an amount as θ to the place where the investment orders curve is I, the investment goods production curve-A catches the investment orders curve -I within a course of time as the half of θ (Kalecki, 1990). Kalecki states that there is a sharp line between investment decisions and realized investment expenditures. This difference is derived from the fact that there is a time difference between them. It takes time that goods are prepared for using. At the same time, firms can reschedule or cancel their investment orders in return of the change in the economic and political conditions.

Therefore, why the most of investment goods are not achieved immediately is clarified in this sense (Laramie et al., 2004; Sawyer, 1985).

The process generally operates in following way (Kalecki, 1990): An increase in the order of investment goods results in another increase in the production of investment goods. This production increase is equal to the gross capital accumulation. As a result of this, a rise in investment activities occurs. Yet, after a course of time when investment orders exceed the need on renewal, the volume of capital equipment begins to increase. Initially, this case restricts the investment activity which is already increasing. On the other stage, it causes a decrease in the investment orders. It is actually impossible to stabilize the investment activity in a ratio that exceeds the need on renewal. Indeed, if the investment orders stay in a constant level, the production of investment goods, which is equal to gross capital accumulation, will stay unchanged. In addition to this, while the capital equipment is increasing, the investment will be greater than the need on renewal. However, under these sorts of situations, the investment orders will begin to decrease and move away from a fixed investment level.

During the depression, the process will reverse. The investment orders are far away from the need on renewal. This case affects negatively the volume of capital equipment. As a result, a process in which an increase in the investment orders is taken back occurs. Stabilizing the investment in a lower ratio than the level, which establishes a sufficient renewal, is as impossible as stabilizing in a ratio, which exceeds the renewal need.

In the recovery period, the investment orders are above the renewal need. Yet, the need on capital equipment has not begun to increase because the delivery of new equipment is still below the need on renewal. The production of investment goods (A) is equal to gross capital accumulation and increasing, but there is still a reduction in the size of equipment (K). When all of these occur, the investment orders increase rapidly.

Throughout the boom period, the obtainment of new equipment has already begun to exceed the need on renewal. As a result, the capital equipment (K) begins to increase. The increase on K restricts the rate of increase on investment orders at the beginning. This results in the diminishing of investment orders after all. In the second half of revival period, this is followed by a decrease in the production of investment goods.

During recession, the investment orders take place below the need on renewal. However, the volume of capital equipment still continues to increase because the new equipment deliveries still above this level. In this whole process, the production of investment goods which is equal to gross capital accumulation continues to decrease. This decrease occurs together with an increase in K. In this case, a sharp decrease happens in the investment orders.

Within the depression period, the new equipment deliveries are still below the need on renewal. As a result, the capital equipment decreases. This decrease in K reduces the velocity of decreasing of investment orders firstly. Hence it results in the increase of investment orders. It is followed by an increase in the production of investment goods in the second half of depression period.

As can be seen, the investment orders, capital accumulation and capital equipment are the elements, which make up the business cycle. Here, changes of the above-mentioned factors are taken into account correlated with each other. In addition to all these, the capital accumulation exists within the concept of innovation (Courvisanos, 2005). The concept which is handled within the context of innovation is the technology (Kalecki, 1962). Technology is the stimulator of the change and economic growth. The contribution of Post-Keynesians in this context is a technological innovation concept which is demand centred. This mentioned innovation helps the increase of volatility which is created by the economic growth and modern neo-liberalism. Actors for Post-Keynesians have a central role on determining the technological innovation. It is accepted that those actors are capitalist. These capitalists set a relationship between innovation and the determinacy of investment decisions. Indeed, the items belonging to shifts in

effective demand and cycle are related with the cumulative process in all shapes of innovation at the firm/industry level on the broad base (Courvisanos, 2005). The classical proposal of an investment model which contains innovation is come up with Schumpeter. According to him, it is seen that wave action, namely the cycle, is embraced on an economic development base under capitalism. Real economic development[1] and growth depend basically on the increase of productivity which is based on innovation. For Schumpeter, this view covers many steps: presenting a new good or bringing a new quality to a good; switching on a new production method, opening a new market, obtaining the new supply sources and finally actualizing a new activity type, which will be realized in any industry. The person who will make these all is the entrepreneur. This discussed person is the same actors whom a central role by Post-Keynesians is given, and the economic growth will begin when an entrepreneur applies an innovation which presents to him an extra monopolistic income. One of the reasons of in terms of imperfect competition outlook of Schumpeter on this topic can be considered as if pure competition does not result in high profitability. In such case, new reasons for innovation is out of question as well. Another reason is that the pure competition can not provide an inducement for capitalist, and the entrepreneur takes on the risk and uncertain projects because this type of competition can not guarantee an award in the form of extra income. What is more certain is that switching on the new technologies and new activity types, the innovations create a surplus of income on the costs. Competition is prone to eliminate these excess returns, but the diffusion of monopolistic structures and the power of large enterprises on enlarging ability about innovation recreate constantly these incomes again (Schumpeter's study as cited in Michaelides etc, 2010; Ferlito, 2011). The analysis of Kalecki is composed under a different roof from a free competition hypothesis. According to this, imperfect competition and oligopolies structures dominate the market (Sardoni, 2011). As understood from these structures, Kalecki states that business cycles are derived from the cycles in private industrial enterprises in a capitalist economy. Capitalists receive their expenditures. The expenditures made upon investment are cyclical (Osiatynski, 1992).

According to investment-profit relation presented by Kalecki, two determiners of the real profit increase of new investments are discussed. The first determiner appears in such a case that technical process is overlooked for a moment when new investment catched the yearly increase of profit in only a small part. Kalecki builds his arguments on imperfect competition due to the tendency on being held by market forces, old equipment and the previous profit in the market. The second determiner emerges in the existence of the technical process. The new equipment which is more productive than the old one includes a new income. In the mean time, the profits gained from old equipment for given total volume of profit drop with the same amount because the real cost of using these goods increase, as a result of using the new ones (Lopez and Assous, 2010; Sawyer, 1985). If the investment is put forward in order to maintain the profitability, there will be both a positive expansion effect and a negative "kickback effect". If the positive effect is embraced as to the demand, it is the one, to increase the profitability of investment. The negative effect presented by Kalecki reveals at the supply side. As to this, if a demand increase occurs, the risk of decreasing profitability will be engaged (Lopez and Assous, 2010; Asimakopulos, 1971; Driver, 1994; Toporowski, 2003).

A risky profitability and even a decreasing profitability ratio make the investments more fragile. Investment is more intensive towards a collapse case. If it is looked at in the historical context, this sort of a high sensitivity can be identified with the increasing financial costs and gearing ratios and decreasing utilization ratios. In the Post-Keynesian analysis, one of the main factors of intensivity is innovation. This factor associates with investment decisions (Courvisanos and Verspagen, 2004).

As it is seen the susceptibility relation between the investment and innovation as to the perspective of Schumpeter, an investment function is drawn attention in response to the cycles of optimism and permission defined by him. This function causes an innovation cluster. Therefore, a bunch of investment arises. This case generates susceptibility towards unstable investment activities and actually develops a trigger mechanism to start new innovation systems which have long cycles. Herein, it should be stated that the thing which results in long cycles in economy is the results of the innovation cluster (Courvisanos and Verspagen, 2004; Courvisanos, 2003).

In order to analyze the relationship among the Schumpeterian and Kaleckian dynamics, a differentiation between the three stages of Schumpeterian basic innovation life cycle and the high and low intensivity cases in Kaleckian cycle. This situation can be seen more clear in the following table (Courvisanos and Verspagen, 2004):

Table 1. The relationship among Schumpeterian and Kaleckian dynamics

The Basic Stages of Innovation's Life	The Low Intensity of Investment	The High Intensity of Investment
The Primitive (Undeveloped) Period	The most appropriate conditions for the "take off paradigm", which are fragile and sensitive rises, being formed with the diffusion of new technological system at the beginning stages.	The possible obstacles in the diffusion of new main innovation.
Middle (Early or Developing) Period	Long, fast, and strong rises, the fast diffusion of new technological system.	Short, weak falls, the slow diffusions of new technological system.
Maturement Period	The rapid development of intensivity: Short and weak improvement, the pressure for the crash of old paradigms.	Strong and rapid declines, possible long straits "sailing ship effect" as the most appropriate conditions.

Source: Courvisanos &Verspagen, 2004.

As it is seen in the Table 1., the increase of innovation has an important place in the early and matureness stages. The abundance of technological opportunities (scarcity) shows a difference as the early (matureness) periods. An old basic innovation's matureness period generally overlaps with a new basic innovation's primitive (undeveloped) period, because of the "creative destruction". Therefore, the differentiation of the first and last stages is hard in practice.

The Kaleckian and Schumpeterian cycles are fed by different extensions throughout the periods different from each other. When the basic innovations are new and newly made, they generate a cluster of innovation. At this point, the Schumpeterian cycle is strong. When the cycle is weak periods, the basic innovations will be exhausted. These types of different pressures in business cycles affect directly the investment decisions process. Disappearance of low susceptibility, strong strategic competitive pressures and investment obstacles encourages the technological innovation. In spite of this, high susceptibility prevents the technological innovation by way of largely prevent the diffusion of innovation and increase the pressure for the postponement of investment decisions (Courvisanos and Verspagen, 2004).

The amount of innovation will not only affect the enhancement of investment cycles but also change the trend growth line, via vicious circle if it is hard and severe, otherwise via a productive circle. The effect generated by the productivity of cycle exists when the density of innovation increased. This increase reveals with the increase of investment activities and the shift of trend line upwardly (Courvisanos, 2003). According to Kalecki, innovation has a cyclic trend effect on the investment function. This important factor is the innovation effect on the investments which generates an increase in the productivity owing to the technical process[2] (Courvisanos, 2003; Kalecki, 1968). Kalecki who admits the innovation as a development factor also accepts that this factor is an explanatory for the long- term upward trend (Richardson and Romilly, 2008). This positive effect of technological innovation on growth reveals because of its positive relation with employment in the meantime. This effect involves a common perception for not only Schumpeter but also Kalecki (Gamulka, etc., 1989). Being one of the main components of autonomous expenditures, a high investment means a high total demand and output level. Output's being at a high level will reflect a high profitability and capital

utilization ratios. In this case, for the next period, it will generate a tendency towards stimulating high investment ratios and output. If the investment decisions are indifferent to capital utilization and the changes in the profitability relatively, the time path followed by the output will converge to the long term equilibrium (Skott, 2003).

Conversely, if there is the high sentiment of investment, this situation makes it difficult to reach long-term equilibrium. Economy can not turn into the equilibrium, but move into a more point (Skott, 2003). The effect of a hard and severe cycle will show itself in the downward movement. A low technical process will mean a low investment inducement. For instance, the firms which can not compete with new firms and make innovation will be harmed and new investment will be limited. Therefore the facilities presented by innovation will be exhausted. According to Schumpetter, this downward tendency coincides the same period with recession. This decrease continues because of optimism excess and faults. Indifferent, faithless and other unsuccessful enterprises occur in the excess of optimism. This discussed type of entrepreneur can not engage in successful activity during the recession periods. This kind of enterprises is eliminated and eventually a status panicus will exist. Due to firms' not maintaining out of action pressure, a decrease in their activities will occur. This case pushes them under the balance level they exist. This case coincides with depression in Schumpeterian cycle. This case on being at the bottom will continue until all investments will be rectified. When this point is reached, there will be a new movement towards the balance (more precisely towards a point, which is near to the equilibrium) and this stage will correspond to the "revival" in Schumpeterian model (Schumpeter's study as cited in Michaelides etc, 2010; Courvisanos and Verspagen, 2004; Courvisanos, 2003; Sawyer, 1985; Michaelides etc, 2010).

Innovation changes the types of susceptibility as to whether it is internal or external. The internal and external innovation determines how the innovation passes into the process of cumulative causality (Courvisanos and Verspagen, 2004). The concept used by Kalecki in order to show the given capital investment level with the density of innovation is the "external innovation". As to this, any shift in the density of innovation is derived from the basic business opportunities which are defined as the source of a scientific invention or innovation. Indeed, a decrease in the density of innovations will cause a deterioration in business cycles at first. Therefore, it will be

suggested that a collapse case has occurred.   Eventually, a lower long-term investment level will occur (Kalecki's study as cited in Courvisanos, 2005). This condition will result in a downward shift in the long term. Because, if an increase in the density of innovation occurs, the line followed by the economic growth in the long period will be upward. As to Kalecki, a stable growth ratio is an increasing function of the density of innovations. In the contrary case, downward swings will occur. This kind of an approach has a close relation with Schumpeter's "clust-bun" effect[3] (Kalecki, 1962; Courvisanos, 2005). Moreover, the internal innovation has also similar meanings for Kalecki and Schumpeter.

The concept considered as internal innovation by Kalecki seems as the increasing innovation for Schumpeter. The development period seen as the second phase of a basic innovation in Table 1 provides appropriate conditions for this innovation type. This type of innovation is rather seen in entrepreneur activities and involves new investment expenditures. When Kalecki is dealt with in relation to investment cycle, this kind of an innovation is named as internal. In the perspective of Kalecki upon innovation the internal innovation has a secondary importance regarding the scientific aspect. This situation is arisen from three reasons. The first one is the insignificant condition of adapting the previous capital equipment. The second one is the esthetic improvement of the old goods. And the last one is related with the improvement of the sources of previous raw material. This kind of innovations is named as internal. Because this is a cycle in which it stimulates innovation and the increase of investment order level by itself. The analysis with the internal innovation occurred in a Kaleckian macro economy, focuses on how this kind of innovations with will increase at the firm or industry level and eventually affect the economy. When a firm decides to increase the investments at a relatively low sentiment level under competitive pressures and higher suspension costs, the research-development (R&D) investments in the past gets ready to realize these innovations. R&D expenditures have an important place in the internal innovation process in which strong firms with great profits exist. These profits provide the increase of R&D expenditures. R&D investments increase the strategic profitably capacity of firm effectively. In an industry in which the innovation has a regular competition strategy, R&G expenditures will be great and change under susceptibility pressures like capital expenditures. When the innovation is made occasionally in an industry, R&D expenditures will be small and relatively fix on the investment cycle. Nonetheless, firms at the high susceptibility level are under the pressure of the

suspension of investment orders. This state includes the same process for the internal innovations. Nevertheless, the R&D activities which generates the patents are meant, and the decrease of these activities is possible in respect of process (Courvisanos and Verspagen, 2004; Courvisanos, 2003).

In our study, Kaleckian and Schumpeterian cycle for the two Balkan States as Turkey and Greece is analyzed. According to this, after the effect of internal innovations on the investments and income is handled separately for both countries taking the decisiveness of investments on business cycle into consideration, the investment-national income relation will be tested. In this way, the effect of investment and internal innovation upon national income for both Kaleckian and Schumpeterian perspective will be primarily tested separately, and included into the model in an aggregated manner.

Related Literature

Klette and Kortum (2004) have attempted to present the relationship between innovation and growth in their articles in which it was stated that Schumpeterian "creative destruction" concept diffuses into all of their studies. The measurement of the innovation output is made according to the patent data about which it is stated that it has a positive correlation with productivity and research-development. According to this, it is stated that firms are getting bigger with making innovation, and economy is getting bigger, because the quality of innovation product set increased (Klette and Kortum, 2004). In the study of Aghion and Howitt (1992), they emphasize that a successful innovator will have a patent exists. It is stated that this bellowed right can be used in order that the innovators keep the intermediate goods in their monopolies. In the available their studies, it is stated that growth is derived from technological process at a large scale. The developments in the technology are seen as a result of the competition among the firms which make innovation (Aghion and Howitt, 1992). Supporting this argument in their studies, Lentz and Mortensen (2008) shows that the more productive firms grow more rapidly and eventually in the steady state, they are excluded from the less productive firms. A more innovator firm, namely the one which got its good involved into a qualified development process can set the higher price and will be in a more profitable status. As a result of this, the firm invests more on innovation and relatively gets bigger more rapidly (Lentz and Mortensen, 2008). It is seen in the

study of Allred and Park (2007) in which they have dealt with the relationship between patent and innovation in both national and firm level, two different results for the developed and developing countries exist. According to this, there is a positive linear relationship between research-development and getting patent. Yet as this result is proved in the countries in which patent system is developed very well, because innovation of patent right stimulate at a large scale, this kind of a case is not valid for developing countries. Andres and Goel (2012) tests inversely the effect of items which affect the innovation like patent on growth. In their study which examined effect of software piracy on economic growth for the in the medium-term, they found negative relationship between the two variables. Great computer software reduces the economic growth. However, the relationship among these factors is not linear. Decrease in the economic growth reduces piracy. The low piracy ratios, slows down the growth, due to decreasing investments (Andres and Goel, 2012). By obtaining a result, which is reverse to the general, Gangopadhyay and Mondal (2012) state that intellectual property rights which represents patent in our study might not always stimulate the innovation or economic growth. The key point in these findings the assumption that the free circulation of the right of which license is given might prevent the diffusion of scientific knowledge and the reveal of the talents of researches on the previous studies. According to the findings obtained, the intellectual property rights of which license was taken are increasing the benefit which is expected from innovation and because of the limited knowledge diffusion, they are complicating the innovation future (Gangopadhyay and Mondal, 2012).

While the elements effecting on innovation and the effect of these factors on output with innovation are generally in this way, in the recent periods, it presents with the production function of neoclassical statement, it is seen that a different result is focused on. According to this standard function, output is taken as a function of labor, capital and technological innovation. Looking at the recent studies, it is seen that the relationship between fixed capital investments and output has been dealt. The studies of De Long and Summers (1992) seems to us as a study in this sense like a sample and provision study. Their analysis is set on the assumption that there is a strong relationship between the machine-equipment investment and growth. According to this, the equipment investment is a pushing force in a role for economic growth (De Long and Summers, 1992). Temple concluded in his study in

which he dealt with the relationship between machine-equipment investment and growth that the social bring out of the fixed capital investment for the developing countries is at very high levels. According to this, it is detected that in this set of countries, the machine-equipment investments has a central role on the growth of countries (Temple, 1998). Madsen's study (2002) in which he questioned the causality relation between investment and economic growth supports this finding. Madsen has a result that machine-equipment investment is heavily effected by supply and as well demand factors when he has also concluded that demand items only effect the investments in the structures. For the latter, the direction of causality is from income towards investment. Both demand and technological process are effective on machine-equipment investment. According to this, it is concluded that there is no feedback from growth to investment in effect (Madsen, 2002). In Crowder and Jong (2009)'s investigations in the continents as Asia, Africa, Europe and America, they have found two-way relationship generally between output and fixed investments. As Kalecki supports as well, the causality relationship which is from investment to output keeps the validity at %19 for all the countries included in Crowder and Jong's studies (Crowder and Jong, 2009). In Herrerias and Orts' analysis (2012) for the machine-equipment investment and growth, the long-term causality relation is valid for China. This case is true of all models predicted. Along with it regarding the period dealt, it is mentioned that the investment usually increases more rapidly that GDP. It is seen that the equipment investment is obtained via the positive relationship between both the output and productivity (Herrerias and Orts, 2012).

Data and Empirical Methodology

For the model to be used in the article, the study done by Courvisano and Verspagen (2004) is followed. In the discussed study, as to Schumpeterian and Kaleckian dynamics, an effort of study, which covers the years 1870-2000 for United States, United Kingdom, Japan, Germany and France, has done. At the end of the study, getting the approaches of Kalecki and Schumpeter together an aggregated application has done. The way followed in our available study is an application which has been done by both composing Kaleckian and Schumpeterian dynamics and separately using them. When Kaleckian cycle is integrated Schumpeterian innovation it can seen that there is a strong relationship between life cycle of innovation and susceptibility of investment. Thus, they influence together to length of wave. However, in our study there are two differences. Firstly, in the aim of using gross domestic product (GDP), a different path has followed. While Courvisanos and Verspagen (2004) take GDP data as a profitability indicator, we included the data as a real national income, along with its meaning represented, into our applications. Because, looking at the aim of the handling style of article in Kaleckian and Schumpeterian business cycles approaches, it is seen that GDP is evaluated by regarding its self-significance. Secondly, it can not been analyzed a long period in the followed article. Because fixed capital investment and gross domestic product data are not available for Turkey. Meantime, being appropriate to the followed model in our study, the patent serial has taken representing the internal innovations, and the fixed capital investments have used representing the investments.

The sample period covers quarterly data from 1971 to 2009. The raw data have been collected from OECD (Organization for Economic Co-operation and Development) data set. Being studied in different countries, taking the data from the same source has paid attention. All variables have been included in the analysis in terms of growth ratio. Gross domestic product and fixed capital investment variables are used with 2005 based prices. In this paper used variables which are gross domestic product (GDP), fixed capital investment (FC) and patent numbers (PT) is consistent with Kalecki and Schumpeter's approaches. According to this, patent numbers are

efficient on fixed capital investment and length of cycles. On the other hand, fixed capital investment influences size of business cycles. After all these effects are handled separately for both Turkey (TR) and Greece (GR) being aggregated a gathered evaluation will be done.

The Ordinary Least Square (OLS) estimation method has preferred, as series are constant at the level and testing the average relation among variables in a sense being mostly real-alike. Therefore, OLS method has used to be on the point of patent explanatory variable in order to show the relation between investment-patent and GDP-patent. In addition to this, in order to see the effect of investment upon GDP and in respect of presenting the relationship of investment with GDP in a way by embracing it with innovation, again the same method has applied. In this study, auto correlation, heteroscedasticity and normality tests have done, and any problem has not met.

Empirical Results

In this part empirical results are given in order. In the first section unit root test results are given. Second section presents the ordinary least square test results.

Unit root test results

The results from unit root tests are given in Table 2 and suggest that all the variables are integrated of the same order, i.e. I(0).

Table 2. Unit Root Test Results

Variables	Level					
	ADF		*ADF_Prob.*		**KPSS**	
	Turkey	Greece	Turkey	Greece	Turkey	Greece
GDP	-5.6057 [0]*	-4.6138 [0]*	(0,0000)	(0,0007)	0.0866	0.182
FC	-6,5636 [0]*	-5,2418 [0]*	(0,0000)	(0,0001)	0.0615	0.1046
PT	-5,6586 [0]*	-5,9044 [0]*	(0,0000)	(0,0000)	0.0628	0.1374

The critical values with constant for the ADF and KPSS are from Davidson-MacKinnon (1993) and Kwiatkowski, etc. (1992). Lag length in [ ], Asterisk (*) shows significance at 5% level.

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Ordinary least square test results

The results from ordinary least square tests are given in Table 3-4-5-6.

Table 3. Patent-Fixed Capital Investment Relationship

Independent Variable	Coefficient		Std.Error		t-Statistic		Prob.	
	Turkey	Greece	Turkey	Greece	Turkey	Greece	Turkey	Greece
C	0.0738	0.0288	0.0261	0.0176	2.8201	1.6314	0.0077	0.1113
PT	-0.2295	-0.0223	0.0829	0.0237	-2.7689	-0.9403	0.0087	0.3531
R-squared	0.1716	0.0233						
Adjusted R-squared	0.1492	-0.0030						
F-statistic	7.6668	0.8842						
Prob (F-statistic)	0.0087	0.3531						

Model 1: $\Delta FC = \beta_0 + \beta_1 PT$

$$\Delta FC_{TR} = 0.0738 - 0.2295 PT$$

$$(0.0261)\ (0.0829)$$

$$\Delta FC_{GRC} = 0.0288 - 0.2223 PT$$

$$(0.0176)\ (0.0237)$$

According to this result, the positive relationship between innovation and investment was not validated for both countries. Moreover, it is seen that the force on explaining the shifts in the fixed capital investment with patent is considerably weak.

Table 4. The Effects of Fixed Capital Investment and Patent on Gross Domestic Product

Independent Variables	Coefficient		Std. Error		t-Statistic		Prob.	
	Turkey	Greece	Turkey	Greece	Turkey	Greece	Turkey	Greece
FC	0.1831	0.2454	0.0264	0.0315	6.9188	7.7813	0.0000	0.0000
C	0.0303	0.0200	0.0048	0.0034	6.2508	5.7664	0.0000	0.0000
R-squared	0.5640	0.6207						
Adjusted R-squared	0.5522	0.6104						
PT	-0.0540	-0.0028	0.0203	0.0074	-2.6519	-0.3866	0.0117	0.7012
C	0.0444	0.0268	0.0064	0.0055	6.9154	4.8141	0.0000	0.0000
R-squared	0.1597	0.0040						
Adjusted R-squared	0.1370	-0.0228						

Model 2: $\Delta GDP = \beta_0 + \beta_1 FC$

$$\Delta GDP_{TR} = 0.0303 + 0.1831FC$$

$$(0.0048) \quad (0.0264)$$

$$\Delta GDP_{GRC} = 0.0200 + 0.2454FC$$

$$(0.0034) \quad (0.0315)$$

Model 3: $\Delta GDP = \beta_0 + \beta_1 PT$

$$\Delta GDP_{TR} = 0.0444 - 0.0540 PT$$

$$(0.0064)\ (0.0203)$$

$$\Delta GDP_{GRC} = 0.0268 - 0.0028 PT$$

$$(0.0055)\ \ (0.0074)$$

According to Table 4, there is a positive relationship between fixed capital investment and output which supports Kalecki's argument for Turkey and Greece. It is seen that while the 56% of GDP changes in Turkey is explained with fixed capital investments, this ratio for Greece is found as 62%. Conversely, the positive relationship between innovation and GDP which is confirmed by literature is not validated for both countries. It is seen that the force on explaining on changes in GDP with patent is considerably weak.

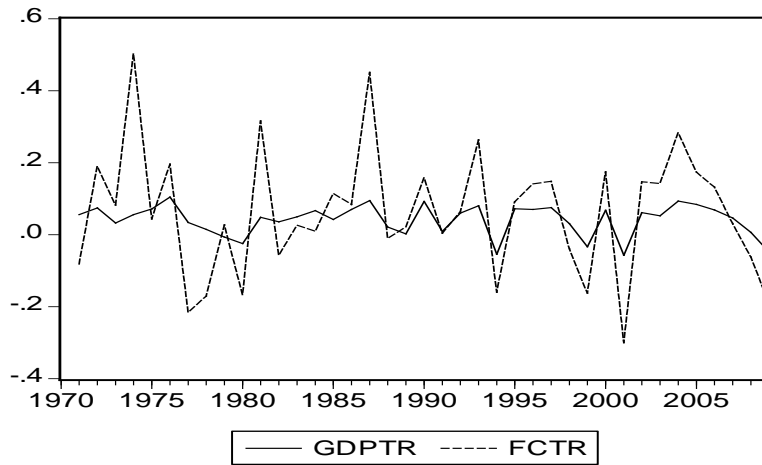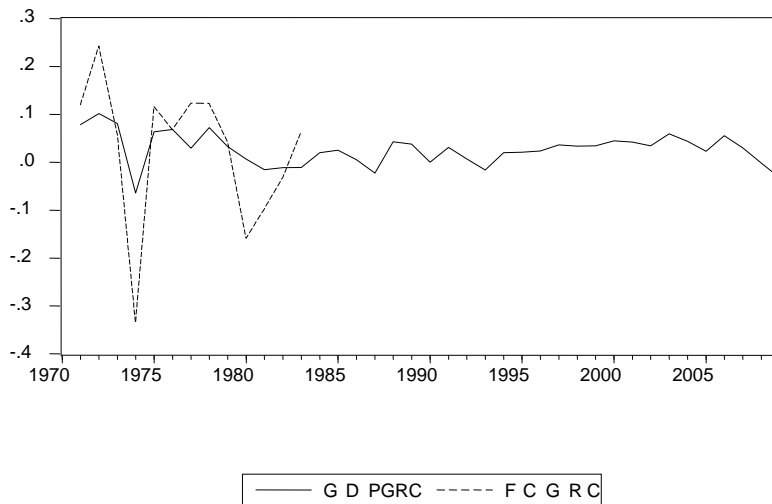Figure 2. The Path Followed by Fixed Capital Investment and GDP Together for Turkey

Figure 3. The Path Followed by Fixed Capital Investment and GDP Together for Greece.

The significant relationship between investment and GDP can be seen in the figures numbered as 2 and 3, in the path they followed. As to Figure 2, in the periods in which the investment in Turkey is highly sensitive that is excessively in the tendency about falling, output shows a similar trend. The same positive relationship keeps on its validity in the conditions in which the investment is lowly sentiment. As is seen in Figure 3, the effect of investment on GDP supports the results in Table 4. According to this, being as to the cases in which the investment is high or low susceptibility the output collaterally moves.

Table 5. Fixed Capital Investment and Patent-Gross Domestic Product Relationship

Variables	Coefficient		Std.Error		t-Statistic		Prob.	
	Turkey	Greece	Turkey	Greece	Turkey	Greece	Turkey	Greece
C	0.0317	0.0196	0.0051	0.0035	6.2006	5.4690	0.0000	0.0000
FC	0.1723	0.2482	0.0291	0.0322	5.9098	7.7049	0.0000	0.0000
PT	-0.0144	0.0026	0.0161	0.0047	-0.8932	0.5637	0.3777	0.5764
R-squared	0.5734	0.6240						
Adjusted R-squared	0.5497	0.6031						
F-statistic	24.2033	29.8755						
Prob (F-statistic)	0.0000	0.0000						

Model 4: $\Delta GDP = \beta_0 + \beta_1 FC + \beta_2 PT$

$\Delta GDP_{TR} = 0.0317 + 0.1723FC - 0.0144PT$

       (0.0051) (0.0291)   (0.0161)

$\Delta GDP_{GRC} = 0.0196 + 0.2482FC + 0.0026PT$

       (0.0035) (0.0322)   (0.0047)

As to the Table 5, the 57% of GDP shifts in Turkey is explained with the variable involved in the model, and for Greece this ratio is found as 62%. As can seen, fixed capital investment is a significant determinant on output for both countries. In spite of that, explanatory of patent is weak for GDP.

Conclusion

A business cycle, which exists in the primary topics of macro economy, has also a great importance for Post-Keynesian economics in a central role. It is seen that, Kalecki correlates this subject with investment. The perspective of Schumpeter towards the business cycles is mostly upon innovation. In addition to this, both economists present that investment and innovation are related with each other in the mean time. In addition, while Kalecki draws attention on the determiner position of investment on output in relation to investment-innovation-output, Schumpeter gives important essentially upon innovation.

In the current paper, these all relationships have been estimated by using the OLS method for both Turkey and Greece. Gained results show that the innovation has no significant relationship with investment and output for both countries and the explanatoriness of innovation upon investment and output is considerably low. On the other hand, the explanatory power of investment upon output is at the high levels. At same direction movements in the business cycles because of a positive correlation between investment and output present reasonable results for both Turkey and Greece in accordance with Kalecki's argument.

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Notes

1. Herein it has to be highlighted that he embraces the development as an evolution.
2. It caused that profits change direction from the old equipment to the new one.
3. According to this effect, effective demand should be stimulator via the diffusion of clustering case. Clustering can be achieved through availability of the funds belonging to public sector or profits for investment. At this point, the investment analysis of Kalecki explains how the triggering mechanism works (Corvisanos & Richardson, 2008).