

CHANGES IN THE MANUFACTURE OF AGRICULTURAL MEANS OF PRODUCTION IN LIGHT OF THE AUSTRIAN SCHOOL THEORY

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A b s t r a c t. This work aims to verify the hypothesis which states that cyclical changes in the manufacture of agricultural means of production are more dynamic than changes in the production of foodstuffs. This stems from the Austrian School theory. In the theoretical part of this work the time-structure of production theory and its application to agribusiness is discussed. Whereas in the empirical part researches on the directions and dynamics of changes in the manufacture of selected means of production for agriculture and foodstuffs in the Polish economy have been conducted. They have shown that during the research period most production changes of the analysed means of production destined for agriculture were in line with the Austrian School hypothesis. During that period changes which are not consistent with the hypothesis also took place.

INTRODUCTION

The means of production and services for agriculture industry is one of the three components of the foodstuffs economy. It is also the part least referred to in Polish literature pertaining to agribusiness economics. However, it plays a leading role in the development of agriculture. Technical progress is first introduced in the means of production for agriculture industry. Machines and devices are becoming ever more modern and specialised. Mechanisation of work in agriculture is a natural process of moving away from labour intensive processes. This results in an improvement in productivity and efficiency, and consequently economic effectiveness of the means of production used in agricultural production [see Mrówczyńska-Kamińska 2012]. The production in the industry supplying agriculture with productive means and services, just the same as production in other agribusiness areas and industry in the entire economy is subject to cyclical fluctuations.

The work is of a theoretical - empirical nature. It aims to verify the hypothesis which states that cyclical changes in the manufacture of agricultural means of production are more dynamic

than changes in the production of foodstuffs. The hypothesis stems from the Austrian School business cycle theory, where the primary role is assumed by time-structure of production.

In the work, deduction and statistical indicators have been used as the research methods.

The research period covers 2002-2012. In that period, three (two complete and one almost complete) Kitchin cycles have been observed in the Polish economy.

TIME-STRUCTURE OF PRODUCTION IN AGRIBUSINESS

According to economists of the Austrian School the basis for understanding economic growth as well as cyclical fluctuations is theory of capital based on time-structure of production. This theory was proposed by Eugen Böhm Ritter von Bawerk [1891] and is still valid today. The time-structure of production means production stages ordered in accordance with the technical process of manufacture and sales of the product. In each and every one of these stages production has to last a certain time. Subsequently the goods being processed end up in the next phase of the production structure, where a certain time dedicated to changing and improving them must also elapse. Thus the manufacture of every good intended for consumption, starting with the initial stages always lasts a certain amount of time. Its practical determination is not possible due to the complexity of processes taking place in the modern economy. Despite the fact that this is a problem in analysing changes to the economy for researchers used to being able to measure and calculate everything, it is not a problem slowing down or preventing the operation of economic entities and growth. The evident phenomenon of the passage of time during a production process is accepted by economists from all schools of economics. However, only the Austrian School economists emphasise the significance of this change in the time-structure of production for processes occurring in the economy.

The rejection of a temporal structure of manufacturing by modern mainstream schools of economics stems from the adoption of the neoclassical theory of capital. It was founded by J. B. Clark and developed and fully formed by F. H. Knight [1934]. The Austrian School economists make a distinction between capital and capital goods. Capital is defined as the market value of capital goods [Huerta de Soto 2009]. It is an abstract concept used as a tool for economic calculations. Whereas capital goods are physical goods used at every stage of the consumption good production process. However, for mainstream economists these concepts are synonymous. Thus they do not see a need to differentiate between them. Neoclassical theory considers capital to be a uniform, permanent fund of values, which is not used up over time. It also assumes that capital goods are homogeneous. And thus the primary division of goods in the economy is into investment and consumption goods. And investment goods are treated as one whole. Thus they can be added and freely swapped and combined with other capital goods.

For the Austrian School the take on capital goods proposed by Clarke and Knight is one of the biggest errors in the entire theory of economics. Economists from that school also subdivide goods into consumption (end products or lower order) and investment (capital goods, intermediate or higher order) which are used for the production of the former goods. However, in accordance with reality they assume that capital goods are heterogeneous. Thus the use of every type of these goods should be analysed individually as their economic effects differ. Ever since Böhm-Bawerk, Austrian School economists have been subdividing intermediate goods in accordance to their distance from consump-

tion good [Skousen 2011]. Thus amongst those there are goods of a higher order further away (machines, devices) and closer (components, almost finished goods) to consumption. Also durable consumption goods should be treated as intermediate goods [Skousen 2011]. The division of capital goods stems from the existence of time-structure of production. At its particular stages other goods are used and processed in the productive process which lasts a certain period of time. Thus it may be said that the intermediate goods are at certain time distances from the end product.

“The fact that roundabout production methods yield bigger effects than direct methods, is one of the most important and fundamental statements in the whole theory of production” [Böhm-Bawerk 1891, s. 20]. The phrase “roundabout production methods” is often misunderstood. It does not mean that businesses aim to artificially complicate the consumption goods production process. As it is natural that they wish to achieve a given result using the simplest methods. “Roundabout methods” should be understood as a more developed production structure, i.e. one comprising of more productive stages. This is called extending (deepening) of the production structure. The aim of this process are benefits to businesses. The new methods are more effective economically. More stages means that more intermediate goods have to be used. This is only possible if businesses are able to finance that larger amount, and as such have more financial means at their disposal. The Austrian School emphasises that to ensure stable growth these means should originate from voluntary savings of entities in the economy. A developed production structure is very capital intensive. This has two primary consequences. Firstly, the use of more capital with the same amount of labour and land increases the production of consumption goods. Secondly, the production time is extended, and therefore the waiting time for increased consumption. The Austrian School economists consider, that a necessary condition for more lower order goods is the adoption of more complicated manufacturing methods and thus extending the production time. The time-structure of production as established by companies is not an independent entity but stems from its adjustment to the time-structure of consumption.

The classical structure of the foodstuffs economy (agribusiness) – the sector of the economy where entities conduct business operations directly or indirectly associated with the production of foodstuffs and the raw materials for its production – is oversimplified (as most models of the economy used by economists), but nonetheless is a good example of time-structure of production. It comprises of three main units aligned in accordance with the manufacturing process of the end foodstuffs product: 1) the industry supplying

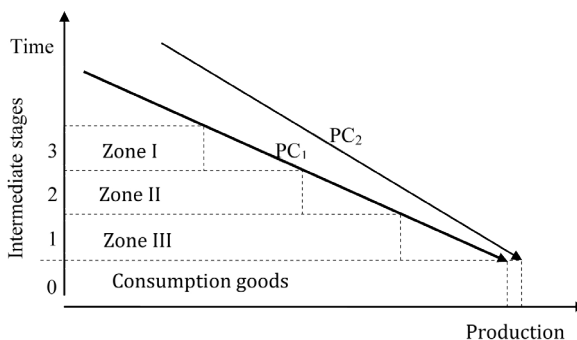


Figure 1. Structure of production in the foodstuffs economy.

Source: in-house materials prepared based on [Skousen 2011] and [Woś 1996].

agriculture with the means of production and services (zone I); 2) agriculture (zone II); 3) the foodstuffs industry (zone III) [Woś 1996]. Products manufactured by foodstuffs companies are closest to the consumer, whilst industries manufacturing agricultural means of production are furthest (Fig. 1). Today, vertical integration is a significant phenomenon pertaining to the structure of production in agribusiness. It aims to improve the profitability of foodstuffs production and establish a competitive advantage.

According to the Austrian School theory, in today's economy the main cause of cyclical fluctuations is the expansive monetary policy [Hayek 1967, Garrison 2001, Mises 2007]. The system based on fiat money and fractional reserves is also conducive to it. Loosening of this policy usually assumes the form for the central bank reducing interest rates. A decrease in interest at commercial banks allows companies to take out larger loans and due to the creation of money its supply is increased. Businesses do not differentiate between real or forced savings. And thus this is the starting point for errors in their calculations and decisions. The created money "(...) hammers a wedge between savings and investments" [Garrison 1986, p. 440]. The expansion phase of the business cycle begins. However the invested means do not grow uniformly at various branches of the economy. The dynamics of changes to production and prices of manufactured products in branches is proportional to their distance from the end consumption product and their durability. This happens because businesses attempting to reduce production costs first have to invest and obtain more efficient machines, devices and technological lines which will be used for direct production of the end product. They also expect an increase in the demand for the capital goods already being manufactured. These processes lead to the lengthening of the production structure and its widening, or the development of existing stages [Tempelman 2010]. In the agribusiness structure in accordance with the Austrian School theory the largest production growth should pertain to the agriculture means of production supply industry and the smallest to the foodstuffs industry. Graphically this can be represented as a transformation of the PC_1 production curve into a new curve PC_2 (Fig. 1). The depicted relations may be disturbed by various factors.

An expansive monetary policy enticed businesses to lengthen the end product time-structure of production. However the time-structure of consumption was not extended. The lack of compliance must lead to a breakdown in the economy [Jędruchiewicz 2012, 2013]. Consumers increase their demand at a moment when production of new goods has not been completed yet. The consumers do not want to wait! An increase in the interest rate and banks curbing financing for investments mean that businesses have no choice but give recognise their failure. A downturn phase begins which should be considered to be the period for ordering the manufacturing structure [Rothbard 2008]. Now production should decrease the fastest in zone I of the foodstuffs economy and slowest in zone III.

THE MONETARY POLICY AND BUSINESS CYCLE IN POLAND

The fiscal policy in Poland is subject to the attainment of its final goal. "The fundamental aim of the operations of the NBP is the maintenance of a stable price level with a simultaneous support for the economic policies of the Government as long as that does not obstruct the fundamental aim of the NBP" [The Act 1997, art. 3]. Price stability is understood as maintaining a low annual rate of inflation. Mainstream economists consider a low rate of inflation as the most conducive for the accumulation of wealth, as high infla-

tion, as well as inflation which is too small causes costs which exceed benefits to occur in an economy [Błaszczuk 2010]. They consider the optimal level of inflation to be in the 2-3% range. Since 2004 the National Bank of Poland, using these calculations has been setting an annual inflation target at a level of 2.5% with an acceptable deviation of ± 1 percentage point [*Strategia polityki...* 2003].

The Monetary Policy Council conducts its policy with the aid of the direct inflation target strategy as it is best suited to the performance of the fundamental aim formulated in such manner in a short time. The main characteristic of this strategy are public announcements of the mid run, quantified inflation target. This means that in the event of unforeseen disturbances, the monetary policy will be conducted in such a way as to allow the return of the inflation rates to a level compliant with the defined target in the mid run. Determining the achievement of the target in the mid run will allow the bank to minimise fluctuations in production and employment in the short run. The most recent recession also strengthened another target of the central bank, being the stability of the financial sector.

The contemporary Polish monetary policy is conducted primarily by changes to interest rates. The reference rate which is shaped by open market transactions is the most important. Also, for most of the Austrian School economists its changes are a primary cause for cyclical fluctuations in the economy [Garrison 2001, Huerta de Soto 2009]. However, some representatives of this school are critical of its central role in the evolution of the production in the business cycle. Their arguments are convincing [Hülsmann 2011, Murphy 2013]. Therefore changes in the money supply should be considered to be the primary cause of changes in the economy. Whereas changes in interest rates only cause changes in the quantity of money. In 2002-2012 in addition to the monetary base the National Bank of Poland was using three measures of money supply. The level of M3 aggregate is almost identical to that of M2. Changes to the M1 measure were the most dynamic (Figure 2). This stems from the association of current deposit levels with changes in the economic situation.

The business cycle oscillations in economic activity characterized by their relative regularity. A classical cycle consists of four phases: recovery, expansion, recession and depression, and is based on the analysis of changes in the absolute levels of a category which describes the economy well [Estey 1959]. Contemporary research of cyclical fluctuations pertain to the aggregate rate of change of the selected category. This is the so called growth cycle. The empirical values are compared with the values of the estimated trend line. And so today, economists are of the opinion that the cycle consists of only two phases, namely a relatively high and low growth rate [Drozdowicz-Bieć 2012].

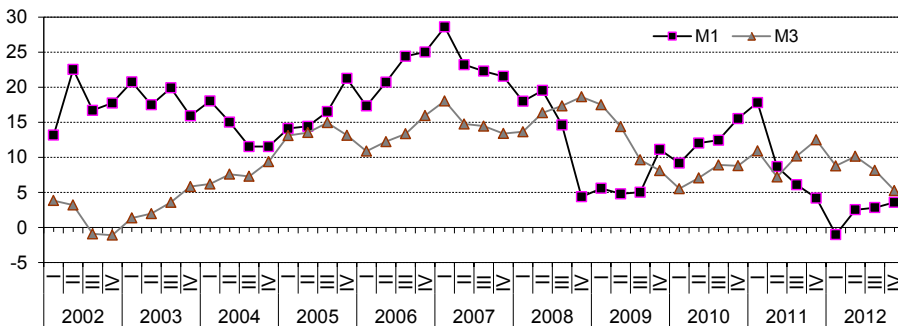


Figure 2. Annual changes to the money supply in Poland [%]

Source: own simulations based on www.npb.pl.

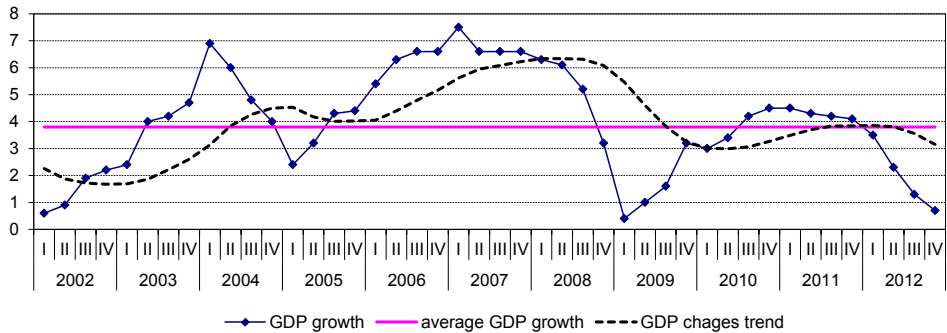


Figure 3. Annual changes to the real GDP in Poland [%] and their trend
Source: [*Biuletyn statystyczny* 2006-2012] and own calculations.

The main morphological feature of the economic cycle are its phases, that is, the periods between the lower and upper turning points or in other words points of improvement and deterioration of the economic situation. Determination of the phases of the cycle in Poland will be made on the basis of the rate of growth of gross domestic product. Hence the use of a method based on the changes trend in this category has been used. The annual average calculated from the 2- and 3-year floating average growth of the domestic product was adopted as the basis for determining the trend in GDP changes. On this basis, in 2002-2012 three growth phases were determined in Poland: Q3 2002 – Q3 2004, Q3 2005 – Q2 2008, Q4 2009 – Q4 2011 and three downturn phases: Q4 2004 – Q2 2005, Q3 2008 – Q3 2009, and from Q1 2012 (Fig. 3). The end of the second growth phase was arbitrarily delayed due to high and similar to the previous quarters GDP dynamics.

GROWTH OF MEANS OF PRODUCTION FOR THE AGRICULTURE

The supply agricultural means of production and services is an extensive and highly varied machine. It includes the production of 1) fixed assets, such as: buildings, tractors, agricultural machinery and equipment, etc., 2) current such as: certified seeds, means of protection, fertilizer, energy, etc., and 3) services, such as: veterinary and advisory services. The conducted analysis of the changes in the development of the production of goods used in agriculture is based on the data pertaining to the individual means, as there is no data describing means of production and services industry for agriculture as a whole.

According to the theory of the Austrian School the most dynamic changes relate to the production of goods which are at the beginning of the time-structure of production. Economists of this school attribute the same importance to durable goods. The more durable the good, i.e. the longer it is used in the economic processes, the larger the changes in its production. From among the goods constituting supply for agriculture structures and buildings are the most durable. During the period under analysis these also constituted the largest share in total investment outlays performed by farmers. The largest share was observed in 2003 – 40.5% and the smallest in 2010 – 34.5%, [*Rocznik statystyczny przemysłu* 2007, *Rocznik statystyczny rolnictwa* 2007].

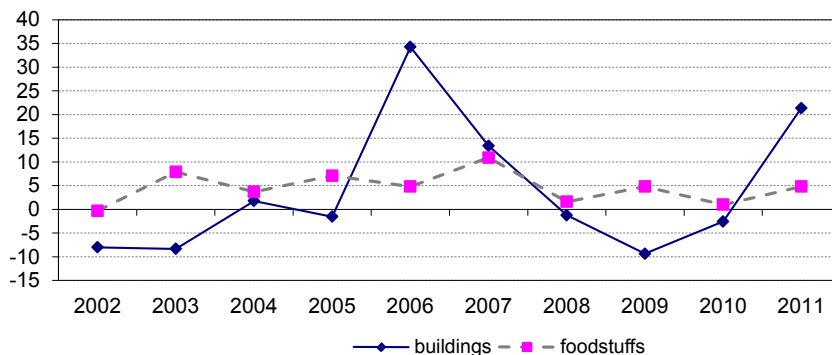


Figure 4. The annual changes in the production of buildings for agriculture and foodstuffs in Poland [%]

Source: [Rocznik 2006-2012b, Rocznik 2006-2012a] and own calculations.

An analysis of annual absolute changes in the production of buildings and structures used in agriculture, after excluding price changes by the use of the construction and assembly output indicator, shows that they were largely in line with the phases of the business cycle in the Polish economy (Fig. 4). The years 2003 and 2010 are exceptions. During that period, the economy continued the growth phase of the cycle, while investments in buildings in agriculture decreased. In both cases, these are the years immediately after periods of strong economic downturn. The low growth and weak financial condition of the did not encourage nor enable to undertake expensive investments.

The Austrian School business cycle theory predominantly pertains to relative changes. Thus changes to investments in buildings will be compared with changes in the production of foodstuffs, or those at a stage closest to the goods purchased by consumers. The comparison of the changes in the manufacture of these products confirms the thesis of that school in the lion's share of the cycle phases in Poland (Fig. 4). This is particularly evident after 2005. Then in the full growth years of 2005-2008 and 2011 the annual rates of growth exceeded the changes in the production of foodstuffs goods. Whereas during the crash (2009) the relationship was reversed. Then already in 2011 investments in buildings rose faster than the manufacture of foodstuffs. From the point of view of the Austrian School the most problematic are the investment changes during the growth phase in 2002-2004. This is a result of a number of factors. Firstly, the first full year of that phase is 2003. Secondly, the financial factor is the most important in influencing changes in production, but it is not the only one. In some situations the effects of other factors are stronger. Here as already mentioned the low growth and weak financial condition of the farmers were important. Thirdly, Poland then was not part of the European Union and thus farmers were not able to use Union funds intended for farmstead investments. Their ability to borrow money was weaker than after accession.

Across the entire period subject to analysis the differentiation of the rate of investment in agricultural buildings and structures confirmed the statements made by the Austrian School. Changes in the monetary policy affected the dynamic changes in building investments. Production structure widening and narrowing processes ensued. In 2002-2011 the standard deviation for the annual changes in construction investments amounted to 14.5 pp whereas foodstuffs industry production 3.4 pp. Thus the difference in these values was

four fold. Manufacture of buildings for the needs of agricultural production was significantly more varied than production of foodstuffs. This is confirmed by the coefficient of variation. For investments in buildings it was 365% and for foodstuff goods in was 73%. Thus it was exactly five times bigger. The data comply with the thesis of the Austrian School, which states that changes to the production of the end product are insignificant as compared to the changes in the production of capital goods.

There are many movable fixed assets for agriculture produced by the Polish economy. It is not possible nor purposeful to discuss the changes in the production of all of them. The tractor is of key importance on farms. In 2002 there were almost 46 tractors per 100 farms, whereas in 2010 almost as many as 65 [Rynek środków... 2013]. Thus changes in its production constitute significant information to verify the thesis of the Austrian School pertaining to the changes in the vertical structure of agribusiness.

In 2002-2012 changes in the production of tractors in Poland were in accordance with the business cycle phases (Fig. 5). During the growth period their production increased whereas during the downturn it decreased. Absolute changes are significant. However most important from the point of view of the Austrian School economists are relative changes. A comparison of the changes in the production of tractors and the changes in the production of foodstuffs articles, other words goods being the nearest to the end consumption confirms the claims of that school. During the period under analysis the variation in the production of tractors is significantly more than foodstuff products. The standard deviation of annual changes for tractors was 22 pp, where as for consumption goods it was 3.3 pp. Thus the difference is very large. It is even bigger for the coefficient of variation. For the production of tractors this coefficient was 890.3%, and for foodstuffs articles only 74.6%.

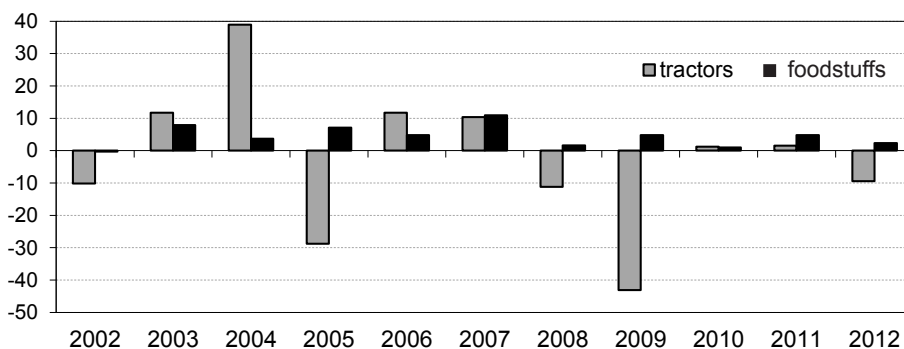


Figure 5. Annual changes in the production of tractors and foodstuffs products in Poland
Source: own simulations based on [Produkcja wyrobów... 2003-2012, Pawlak 2012].

The analysis of the entire process confirmed the accuracy of the Austrian School thesis. However in some years of the two growth years the rate of increase in the production was less than or close to the rate of change for foodstuffs articles. This was observed in 2007 and the entire growth phase of 2010-2011. Such a situation clearly corresponds to the changes in production of the analysed goods in the growth phase of 2002-2004. A rate of change in the production of tractors in Poland which is less than or close in Poland during those periods predominantly stems from an increasingly more difficult situation of the producers on the

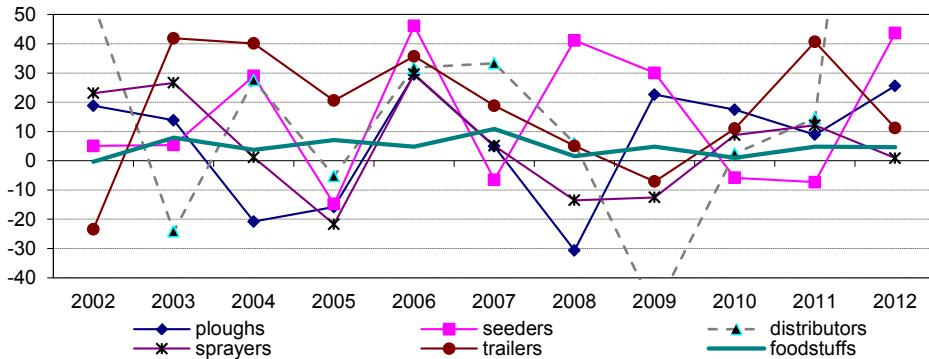


Figure 6. Annual production rates of agricultural machinery and foodstuffs products in Poland
Source: own simulations based on [Produkcja wyrobów... 2003-2012].

domestic tractor market. Polish companies were systematically losing their market share to imported tractors. Even in 2004 the share of tractors manufactured in Poland was circa 42%, whereas in 2010 just 12% [Pawlak 2012]. Thus in the periods of growth, in foreseeing the difficulties with sales businesses did not risk large increases in tractor production.

Apart from tractors the means of production industry also manufactures many other machines and devices used in agricultural production. Changes in the production of five agricultural machines was analysed: 1) ploughs, 2) field crop seeders, 3) mineral or chemical fertiliser distributors, 4) filed sprayers, and 5) agricultural trailers and semi-trailers. Figure 6 shows that the changes in the production of the analysed machines did not always run in the same direction. Also sometimes the directions of these changes did not comply with the directions characteristic for the phases of the business cycle development. However most changes and their dynamics were in accordance with the Austrian School theory pertaining to changes in time-structure of production phases. In the growth phases the production of most agricultural machinery was exhibiting strong growth, whereas during the downturn periods it decreased significantly.

The Austrian School theory states that an expansive monetary policy causes non uniform changes to production at particular stages in the production structure. It also recognises, but from time to time – and particularly with respect to specific goods and those with a small share in overall production – the relation in production changes as depicted by it may be disrupted by other factors, such as political changes in a country, changes in foreign trade or new agricultural production methods. An example are the rapid production increases in 2012 despite the fact that this was a year of deteriorating conditions for the entire economy. This is explained by increased demand by agricultural farms for machines and devices due to the Rural Area Development Programme which was coming to an end in 2013.

In analysing the production rates across the entire period under analysis it is evident that the changes in the production of agricultural machinery were decisively more dynamic than the changes in the production of foodstuffs articles (Tab. 1). This is primarily seen in the vales of the standard deviation and coefficient of variation. The largest standard deviation pertained to changes in the production of fertiliser distributors – 74.8 pp. Whereas the coefficient of variation reached its highest value for changes in the production of field crop sprayers – 311.8%.

Table 1. Statistical indicators describing production changes of machines in 2002-2012

Item	Average [%]	Standard deviation [pp]	Coefficient of variation [%]
Ploughs	6.8	20.3	300.0
Field seeders	15.1	23.2	153.6
Fertilizer distributors	29.7	74.8	251.9
Field crop sprayers	5.4	16.9	311.8
Agricultural trailers	17.7	21.2	120.0
Foodstuffs articles	4.6	3.2	69.6

Source: own simulations based on [*Produkcja wyrobów...* 2003-2012].

An example of a current means of production for agriculture, whose production changes will be analysed is the area of agricultural plant filed qualification area. The rate of change in the production of that good, which consists of the area of numerous plants, was large, but in most years was not in accordance with the business cycle phases (Fig. 7). Up to 2007 their area did not show even a single annual growth. Whereas in 2009 and 2012, or in years of worse economic situation an increase in the crops was observed. A comparison of the changes in the agricultural crops cultivation land area with changes in the production of foodstuffs does not confirm the Austrian School theory which says that changes to production at an earlier time-structure of production phases are more dynamic than changes to the production of goods which are closer to the consumer. In 2002-2012 the standard deviation for plant production (12.4 pp) was more than for foodstuffs products (3.2 pp). However this is not sufficient to consider that the Austrian School theory was not confirmed. The rate of change must also be confirmed by the directions of changes to production. Such changes in the crop area may be explained by: 1) the effect of farmer demand on qualified material; 2) in accordance with the views of the Austrian economists changes in the production of a good are also dependant on its durability. More durable goods will be used for a longer period of time and as such it will be possible to use them in more profitable possibilities for various production processes. Plants are not durable. They can only be used once in agricultural production. Thus monetary expansion has a small effect on production changes.

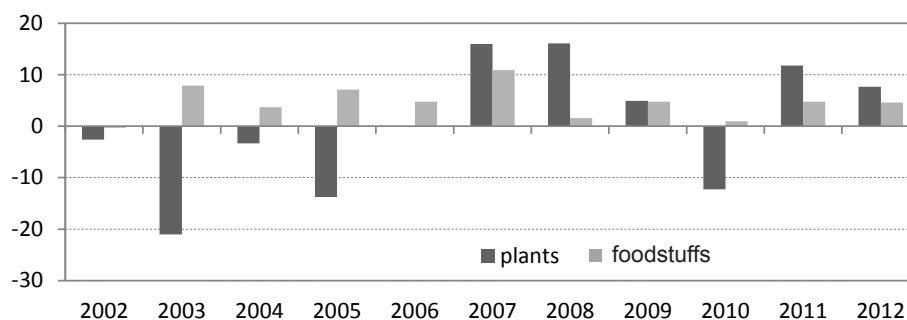


Figure 7. Annual changes in areas of qualified plants and production of foodstuffs articles in Poland [%]

Source: own simulations based on [*Rynek wyrobów...* 2013].

CONCLUSIONS

The Austrian School economists consider that the foundation for the understanding of cyclical production fluctuations is the time-structure of production theory. This means production stages ordered in accordance with the technical process of manufacture and sales of the consumption good. At each and every stage production can increase or decrease depending on the business cycle phase, the main cause of which is an expansive central bank policy. However the changes are not identical. Manufacturing production at stages far away from the end products should change more dynamically than that in stages closer to the goods designated for consumption.

The conducted analysis allowed for a positive, whereas not an unambiguous verification of the Austrian School hypothesis that the manufacture of means of production for agriculture changes at a faster rate than production of foodstuffs articles. In growth stages the agribusiness production structure was widened, whereas during the downturn stages it was narrowed (the initial stages of the structure). This is attested to by the majority of annual changes in constructing buildings and structures for agriculture, production of tractors and agricultural machinery such as fertiliser distributors, trailers and sprayers. However some of the observations were inconsistent with the hypothesis. In the 2003 - 2004 growth rate building manufacture was slower than the production of foodstuffs articles. The same changes applied to the rate of production of tractors in 2010 - 2011. Whereas in the analysed period most of the changes to the crop areas of qualified plants was not consistent with the Polish economy cycle phases. Such behaviour was affected by significant economic factors other than the monetary policy.

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ZMIANY W WYTWARZANIU ŚRODKÓW PRODUKCJI DLA ROLNICTWA W ŚWIETLE
TEORII SZKOŁY AUSTRIAKIEJ

Streszczenie

Celem opracowania jest weryfikacja hipotezy, że cykliczne zmiany w wytwarzaniu środków produkcji dla rolnictwa są bardziej dynamiczne niż zmiany produkcji artykułów spożywczych. Wynika ona z teorii szkoły austriackiej. W teoretycznej części opracowania omówiono teorię czasowej struktury produkcji i zastosowano ją do agrobiznesu. Natomiast w części empirycznej przeprowadzono badania kierunków i dynamiki zmian w wytwarzaniu wybranych środków produkcji dla rolnictwa oraz żywności w polskiej gospodarce. Wykazały one, że w okresie badawczym większość zmian produkcji analizowanych środków przeznaczonych dla rolnictwa potwierdziła hipotezę szkoły austriackiej. W tym czasie wystąpiły także zmiany, które nie były zgodne z postawioną hipotezą.

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