edited by
Jan Jacek Sztaudynger

ECONOMIC GROWTH

Social Capital, Family, Inequality of Income, Quality of Life, Bottlenecks

Selected papers from 2018 to 2022

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Introduction

Economic Growth The Modification of the Solow Model

Jan Jacek Sztaudynger

This book, „Economic growth… ", summarizes my scientific work from the last 20 years. It contains six articles published between 2018 and 2022. From the very beginning – since 2003 – I have dealt with the impact of wage inequality on economic growth (Chapter 2). As part of this research subject, two doctoral dissertations were written by Paweł Kumor (2010) and Damian Mowczan (2021), which looked for optimal, in terms of GDP, wage inequality. Optimal wage (income) inequality is defined as inequality that best harmonizes the interests of members of society and strengthens cooperation between workers and, in more general terms, social capital.

Another research topic was the link between family, i.e., family social capital (marriages, fertility, and divorces), and economic growth (Chapters 4 and 5). This topic was dealt with in the doctoral dissertations of Ewa Ambroziak (2018) and Mowczan, among others.

The impact of social capital on the economic growth of European countries is the theme of Chapter 3 (co-authors Ambroziak and Paweł Starosta). Social capital is widely defined as trust, helpfulness, and fairness.

The last paper is devoted to GDP growth (Chapter 6). According to the hypothesis that I proposed along with Jan Marek Sztaudynger, GDP fluctuations are irregular. However, the path to equilibrium has a feature of

regularity – fixed capital investment efficiency depends on past bottlenecks characterized by the lag of GDP growth. The empirical nature of the paper confirms the irregular description of economic fluctuations in Poland.

The first paper contains general remarks on the quality of life. It describes the consequences of the „happy productive worker" hypothesis. A happy employee works better, earns more money, and as a result, his quality of life goes up. This feedback loop of productivity and happiness means that on the road to effective economic growth and development, man and his quality of life must be taken into consideration as a very important causative factor.

In order to increase the quality of life, it is necessary:

- to strive for optimal income inequality,
- to support family social capital (more marriages and fertility, fewer divorces, at least in Poland),
- to support trust, fairness, and helpfulness.

This book deals mainly with economic growth and its interdependence with social capital. This interdependence can be interpreted as a happy, productive worker concept because a happy worker is one with strong social capital. Analogously, a happy society is one characterized by high social capital.

We will consider social capital (trust, helpfulness, fairness), family social capital (marriage, divorce, fertility), as well as income inequality as characteristics of society's harmonization. They are all social aspects of sustainable development. This book describes the links between the quantity of economic growth with the quality of economic development. In particular, these links will be considered in the context of the quality of life. We hope that such an approach will help to reduce the danger of the so-called fetishization of economic growth.

This economic book includes fields close to sociology and, to some extent, psychology. Most of the hypotheses will be verified using econometric methods.

I was a student of professors Władysław Welfe and Nobel Prize winner Lawrence R. Klein. In all my investigation presented in this book, I was supported by Paweł Baranowski. I would like to thank Michał Majsterek and Wojciech Zatoń for their fruitful discussions and significant

remarks on economic development and applied econometric methods. I would also like to thank my co-authors, Ewa Ambroziak, Paweł Baranowski, Paweł Starosta, and my son, Jan Marek, for their cooperation. Many thanks to dean Rafał Matera for his extraordinary support and the good word always. I would like to express my special thanks to Mark Muirhead for the proofreading. Without all their help, this book would not have been possible.

Finally, I would like to thank my wife, Filomena, and my sons, Jan, and Marcin, for reading the papers, especially those related to family problems. All errors are my responsibility.

We will look at the production process and economic growth in the context of a crucial analysis tool, the Cobb–Douglas (CD) production function (Cobb and Douglas 1928; Douglas 1976).[1] This function forms the basis of the neoclassical, long-term Solow growth model. We will use the dynamic version of the CD production function:[2]

$$G\dot{D}P_t = \dot{B}_t + \beta_1 \dot{L}_t + \beta_2 \dot{K}_t, \tag{1}$$

where:
$G\dot{D}P_t$ is the Gross Domestic Product growth rate;
$\dot{L}_t$ is the labor growth rate;
$\dot{K}_t$ is the fixed capital growth rate, and
$\dot{B}_t$ is the total factor productivity (TFP) growth rate;[3]
dots mean growth rates.

TFP express man's development and improvement when creating new value in the production process.

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1 For simplicity of recording, the random term is omitted.

2 Also called the Solow–Swan model.

3 Because the only factor that creates new value is a person, instead of calling total factor productivity TFP, it would be better to rename it "total labor productivity" or "indirect labour productivity" as opposed to labor productivity. TFP measurement problems are described by, e.g., Tokarski (2009, pp. 27–37) and J.J. Sztaudynger (2005, pp. 17–18).

Due to the significant, empirical difficulties in calculating the value of physical capital at constant prices, we will modify production function (1) and replace the fixed capital growth with the investment to GDP ratio:[4]

$$G\dot{D}P_t = \dot{A}_t + \alpha_1 \dot{L}_t + \alpha_2 \left(\frac{invest}{GDP}\right)_t \tag{2}$$

where:
*inves*t is the investment in gross fixed capital;
invest/GDP is the investment rate; gross fixed formation as a percentage of GDP;
and $\dot{A}$ is the modified total factor productivity (TFP) growth rate.

Alternatively, the economic growth will be examined by similar to (2) the labour productivity function:

$$(\dot{GDP/L})_t = \dot{A}_t + \beta(invest/GDP)_t \tag{3}$$

where:
L labor (number of persons employed);
GDP/L labour productivity - GDP per person employed.

The production function (2) or productivity function (3) will be extended by variables interpreted as social capital or, alternatively, quality of life. These variables are components of *A*. We will consider: the inequality of income, the social capital (trust, helpfulness, fairness), the family social capital (marriage, divorce, fertility).

In the sixth chapter, we will try to show the extent to which macroeconomic growth depends on the supply bottleneck (disequilibrium), which existed before the investment, and which is eliminated by this investment. The bottlenecks occur irregularly. We will verify the hypothesis that the irregular appearance of bottlenecks leads to irregular (not cyclical) GDP fluctuations.

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[4] Replacing the rate of fixed capital growth with the rate of investment is a common practice (for details see Appendix, p. 141).

Chapter 1

Family, Quality of Life, Growth and Economic Development[1]

Jan Jacek Sztaudynger

Abstract

Thesis: one of the key determinants of the subjective quality of life is the family (i.e., marital status, children,… *Social Diagnosis*). The quality of life determines work productivity and income, which in turn have an influence on the quality of life.

The basis of the interdependence between a happy worker and an efficient worker – a „happy, productive worker" – is the family. If the man-worker is happy in his family life, he achieves high productivity and remuneration, which in turn increases his quality of life.

According to *Social Diagnosis*..., the highest quality of life is achieved by married people, and the lowest by divorcees (widowed people and singles of both sexes are in the middle). Poles declare the greatest satisfaction with their children, their marriage, and their relationships with relatives. More than a dozen other aspects of life (e.g., work, housing conditions, health, financial situation, and family income) are placed further down the list. The role of the family is crucial for the subjective quality of life.

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[1] This chapter was published in Polish in „Rodzina – wyzwania na XXI wiek", 2022, III Kongres Demograficzny, Rządowa Rada Ludnościowa.

I would like to thank my wife Filomena for editing and proofreading the Polish text.

Quality of life is a goal of the European Union. Article 2 of the European Treaty (2007, Lisbon) states: „The Union's aim is to promote peace, its values and the well-being of its peoples."

At the Congress on the occasion of the 100th anniversary of Polish statistics (Poznań 2012), Professor Janina Jóźwiak said that the most important task of statistics is to improve the methods of measuring economic and social development, as well as the conditions and quality of life (Congress resolution).

Since 2013, Eurostat has been measuring and publishing data on subjective quality of life broken down into nine components (including material living conditions, health, education, leisure, and social relations). The quality of family life is not distinguished, which I consider a fundamental deficiency.

It is necessary to measure the quality of life in the family, the factors that determine it, and how it changes over time. Thanks to this, it will be possible to answer questions on how to increase the family component of the subjective quality of life and labour productivity, including on the macroeconomic scale.

Keywords: economic growth, family, quality of life, social capital, Eurostat

JEL Classification: J11, O43, O47, Z13

1.1. Family and the Quality of Life in *Social Diagnosis* and Eurostat Surveys

Thesis: one of the key determinants of the subjective quality of life[2] is the family (marital status, children,… *Social Diagnosis,* Janusz Czapiński 2009, 2015). Quality of life affects labour productivity and earnings, and these, in turn, affect life satisfaction.

The vital role of the family is more or less obvious to its members, to all of us. It is hardly surprising that the father of economics, Adam

[2] The terms subjective quality of life, life satisfaction, well-being, and happiness will be used interchangeably.

Smith, wrote that the family is „naturally the [object] of [man's] warmest affections."[3]

The family creates the basis for the interdependence of a happy employee and an efficient employee – *a happy – productive worker*. If the man-worker is happy in his family life, he achieves high productivity and wages, increasing his well-being.

According to subsequent editions of *Social Diagnosis*, the highest satisfaction with life in Poland was achieved thanks to children, marriage, and family relationships:

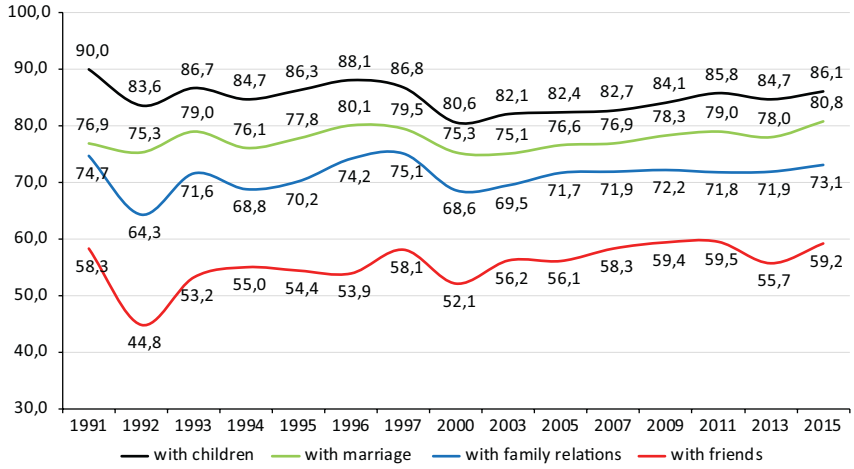

Chart 1. Percentage of people aged 18+ „very satisfied" or „satisfied" with family relations, relationships with colleagues, their marriage, their children

Source: (Czapiński, 2015, p. 197)

More than a dozen other aspects of life (e.g., work, housing conditions, health, financial situation, and income of one's own family) are placed further down the list. Therefore, it can be assumed that the role of the family is crucial for the subjective quality of life.

[3] Smith formulated this thought as follows: For man "[after] himself, the members of his own family, those who usually live in the same house with him, his parents, his children, his brothers and sisters, are naturally the objects of his warmest affections" (1759, p. 198).

One of the categories of family life is marital status. The highest quality of life is achieved by married couples, and the lowest by divorcees (widowed people and singles of both sexes are in the middle) (Czapiński, 2009, p. 173).[4]

Article 2 of the European Treaty (Lisbon, 2007) makes the quality of life a fundamental goal of the Union: „The Union's aim is to promote peace, its values and the **well-being of its peoples**."

At the Congress organized on the occasion of the 100th anniversary of Polish statistics (Poznań 2012), I had the opportunity to listen to a speech by Prof. Janina Jóźwiak, who said that the most important task of statistics is to improve the methods of measuring economic and social development as well as the conditions and **quality of life.**[5]

Why is so much attention paid to life satisfaction? How important is the quality of life to me? My answer and that of many (most?) people is: the aim is to be satisfied with one's life and the life of my relatives and family… Prosperity and incomes are a means to this end. The economy should serve people and their happiness. Questionnaires devoted to researching the subjective quality of life make it possible to measure it directly and indirectly in terms of earnings, income, work, unemployment, etc.

Naturally, simple generalizations should be avoided. People set different goals. Czapiński attempted to divide the respondents into hedonists and eudaemonists, asking, inter alia, the following question: „…what is more important in life: pleasure, abundance, stress lessness, or rather a sense of meaning, achieving important goals despite difficulties, pain, and sacrifices." It turned out that a higher quality of life was declared by eudaemonists, who constituted in Poland around 42% (compared to 22% of hedonists) (Czapiński, 2009, p. 163 and 167).

The first Eurostat survey of the quality of life was carried out in 2013, and the next one in 2018. Subjective quality of life is reported for the 27 EU countries broken down into nine components (including material living conditions, health, education, leisure, and social relations).

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[4] Also Małolepsza (2016); the conclusion from the polynomial logit model of an ordered variable estimated at over 20,000 observations *Social Diagnosis.*

[5] Cf. ue.poznan.pl/pl/uniwersytet,c13/instytut-informatyki-i-ekonomii ilosciowej,c13043/katedra-statystyki,c3316/konferencje,c5314/kongres-statystyki-polskiej-2012,a38057.html (accessed: 26.04.2022).

The quality of family life is not distinguished in the Eurostat survey. There is one collective question about **social relations**: satisfaction with personal relations with relatives, friends, and colleagues,[6] which I view as a drastic simplification – equating family relations with colleagues and professional relations. Each country can extend the scope of the survey. In the Polish version of the survey, there is an additional question about satisfaction with the family situation (PW240). This improves the scope of information, but in *Social Diagnosis,* there were three questions about satisfaction with children, marriage, and family.

As shown in Table 1, the Eurostat survey does not identify the family situation when the spouse or partner lives in another household;[7] their relationship is then statistically invisible. For example, it is not possible to distinguish „real" singles from those living in a partnership with someone from another household. This makes it impossible to obtain information for the research on more and more frequent LAT (living apart together) families (cf. Szukalski 2018, p. 69). Similarly, the survey does not distinguish between single divorcees and those living in partnerships.[8]

This makes it difficult to, among other things, answer whether an increase in the percentage of partnerships leads to an improvement or a deterioration in the quality of life.[9] In short, it can be said that if a person does not live with a person from his/her own household, it is not known whether he/she is married or in a partnership, or if he/she is single (he/she does not live in a new relationship with a person from another household).[10]

---

6 This is question PW160 of the EU-SILC-I questionnaire Statistics on Income and Living Conditions, Module on Well-Being, p. 18.

7 According to a CBOS study, in Poland in 2017, 41% of people in a permanent, informal relationship did not live with their partners (*Unmarried people in Polish families*, 2017, p. 3).

8 The research of *Social Diagnosis*… was much more detailed in many other aspects, e.g., life satisfaction before and after getting married was studied.

9 *Social Diagnosis*… clearly indicates that a higher quality of life was achieved by married couples (Czapiński, 2015, p. 229).

10 Since the respondents assess the quality of life subjectively, I believe they should subjectively define their family situation, with the exception of marital status. For example, if someone claims to be married, the interviewer

Table 1. Questions from the EU-SILC-G survey on marital status [11]

	Is the person currently living in a relationship with someone in that household?		
Legal status	Yes Formal	Yes Informal	No
Single	X	Partnership	Single 100% or partnership*
Spouse	Marriage	Partnership Marriage is not functioning	Marriage* or separation or partnership * or single – not in a new relationship
Divorced	X	Partnership	Partnership * or not in a new relationship
Separation	Formal separation	Partnership	Partnership * or not in a new relationship
Widowed	X	Partnership	Partnership * or not in a new relationship

* The spouse or partner lives elsewhere.

Source: the author's own study

Summing up, the Eurostat EU-SILC survey does not include the question of satisfaction with family life (the only exception is the survey conducted in Poland; however, it does not distinguish between satisfaction with children and marriage). Questions about marriage and cohabitation are also omitted by the increasingly common model of the LAT family. As a result, the answer „no" to the question, „Does he/she currently live with a person from this household?" is ambiguous – it is provided by people in very different family situations (see the last column of Table 1). The *Social Diagnosis* survey seems to be more accurate.

This inaccurate study of family life has very significant repercussions. We lose precision in drawing conclusions about what family model is

should register it, and not make registering this statement conditional on living together.

[11] form.stat.gov.pl/BadaniaAnkietowe/2015/Ankiety/EU-SILC-I.pdf (accessed: 27.04.2022). I would like to thank Tomasz Piasecki from WUS in Łódź for consultations.

conducive to life satisfaction. Do the ongoing changes in the family model lead to happiness, which is essential for labour productivity, and thus for the efficiency of the entire economy!

1.2. The Impact of the Quality of Life on Work Efficiency – a *Happy – Productive Worker*

The precursor of research on the relationship between the quality of life and work efficiency is considered to be Elton Mayo, an Australian psychologist and sociologist who, in the 1920s, studied, inter alia, the impact of workplace lighting and the quality of informal contacts between employees on productivity. Among the many studies on the impact of quality of life, it has been found that „less happy employees are more sensitive to threats, more defensive around co-workers, and more pessimistic" (Cropanzano and Wright, 2001). „Happier employees are sensitive to opportunities, more helpful to co-workers, and more confident," more optimistic, and less aggressive (Isen and Baron, 1991; Zelenski, Murphy, and Jenkins, 2008).

Happier workers are more pragmatic, less absent, more cooperative, and friendly (Bateman and Organ, 1983; Judge, Thoresen, Bono, and Patton, 2001). They change their job less often and are more accurate and willing to help others (Spector, 1997). Happier people are more engaged in their work, earn more money, have better relationships with colleagues and clients (George and Brief, 1992; Pavot and Diener, 1993; Spector, 1997; Wright and Cropanzano, 2000) and are more productive and more satisfied (Judge and Watanabe, 1993; Judge et al., 2001; Keyes and Magyar-Moe, 2003; Russell, 2008).

As mentioned above, the highest quality of life is achieved by married couples and the lowest by divorcees. This is the premise for introducing to the economic growth model the variables that characterize the frequency of marriages and divorces (Baranowski and Sztaudynger, 2019).

As Helliwell (2011) writes, „Many studies have shown that it is possible to take concrete actions to support and promote people's well-being beyond the traditional sphere of economic policies" (cf. Bartolini,

2013). In particular, it seems that enhancing individuals' freedom and autonomy, self-expression, social participation, feeling of belonging, and control over their own time and space would significantly contribute to people's well-being and productivity.

Easterlin (1995) showed that even though the average level of reported happiness is higher in richer countries, economic growth is not followed by happiness growth (a result known as the „Easterlin Paradox"). Many economists (e.g., Piekałkiewicz, 2017) state that because people compare their incomes with others, raising the incomes of all will not increase the happiness of all. It can be added that income can grow without limits, but the quality of life cannot – because it is measured on a certain scale, e.g., a 10-point scale. Thus, relative, not absolute, income affects the quality of life.

1.3. Conclusions

Each of us has had the opportunity to see many times that the increase in income positively influences the quality of life and vice versa. Above, we presented a number of arguments showing that the quality of life positively affects people, their work, and their income. So, we can observe an interdependence, a spiral: quality of life – work efficiency – income – quality of life… An increase in these categories drives growth, a decline causes a decline, and the spiral can go both ways.

Very generally, it can be said that economic development consists of economic growth and quality of life. **Sustainable economic development is development where economic growth is in harmony with the quality of life and the factors that determine it, especially with the family. Sustainable economic development is development that protects the family, social, and natural environment.**

This is the main outline of our perception of economic development. Let us try to apply a formalized notation, bearing in mind the econometric models presented in this book.

We will consider total factor productivity as a function of QL quality of life:

$$\dot{A}_t = f(\dot{QL}_t \ldots)$$

By introducing the function of QL to equation (2, p.12), we get:

$$G\dot{D}P_t = f(\dot{QL}_t \ldots) + \alpha_1 \dot{L}_t + \alpha_2 \left(\frac{invest}{GDP}\right)_t \quad (1)$$

We do not have the times series of QL, but we know that it depends on the increase of social capital and family social capital:

$QL = f$ (trust, helpfulness, fairness, marriage, divorce, fertility, inequality of income).

Hence we get:

$$G\dot{D}P_t = f(\text{trust, helpfulness, fairness, marriage, divorce, fertility, inequality of income}) + \alpha_1 \dot{L}_t + \alpha_2 \left(\frac{invest}{GDP}\right)_t \quad (2)$$

We will consider trust, helpfulness, and fairness in Chapter 3, fairness, marriage, divorce, and fertility in Chapters 4 and 5, and income inequality in Chapter 2.

Unfortunately, we are unable to conduct macroeconomic research on the direct impact of production (GDP), labour productivity, wages or income on the quality of life in Poland because we currently do not have the appropriate QL time series (in *Social Diagnosis*…, it occurred every 2–3 years until 2015; in CSO, in 2013 and 2018). Thus, instead of examining the impact of economic growth (wage increases) on the quality of life, in Chapter 4, we examine its influence on marriage, divorce, and fertility. To put it simply, for example, an increase in the number of marriages accelerates the GDP dynamics, which in turn has a positive impact on the marriage rate. This type of correlation also occurs in the case of fertility and divorce. Behind this feedback is a statistically unregistered quality of life.

It is necessary to measure the quality of life in the family, the factors that determine it, and their changes over time. Thanks to this, it will

be possible to determine how to protect the family component of the subjective quality of life and increase work efficiency, including on the macroeconomic scale.

The family is a specific flywheel of the economy. The flywheel or brake wheel. We will be looking for further psychological and sociological arguments to support the thesis that personal and individual happiness should not be built without family happiness, and that researching the economy and economic growth against the background of family problems may be considered the most spectacular manifestation of the fetishization of the economy. Sometimes it can be expected that an economy vehicle can speed up and develop on three wheels, and we do not need a fourth one, but this is a different story. Well, omitting the fourth and probably the most important wheel is a mistake. This situation is known to every person who knows that his/her life consists of work (or study) and being in a family. Of course, the importance and role of these two aspects of life are an individual matter and, to some extent, an individual choice. On the other hand, no one has a full choice to break the chain of family, protection, and species-preservation instincts. On the contrary, to think that I am the master of myself, that I can turn family and social instincts on and off like a light in a room, looks like a pipe dream.

There is a conflict between work and family, but at the same time, their roles are strengthened. Economic growth at the expense of the family leads to a decline in the quality of life, which has a negative effect on the economy.

Finally, let us recall Abraham Maslow's hierarchy of needs:

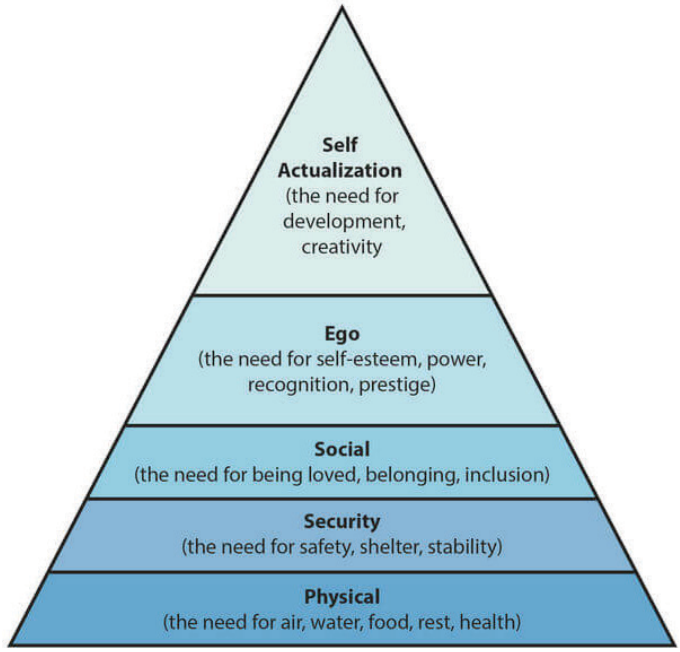

Chart 2. Maslow's hierarchy of needs

Source: www.productboard.com/blog/product-management-hierarchy-of-needs/ (accessed: 28.04.2022)

All these needs are partially or wholly satisfied in the family. They are satisfied to a greater extent in families with a developed willingness to help, faith in mutual honesty, trust, keeping commitments and contracts, long-term thinking, and striving to achieve important goals despite difficulties and sacrifices. In families where the main emphasis is on the lack of stress and pleasure in the coming weekend, the needs of Maslow's hierarchy are satisfied to a lesser extent and, as Czapiński (2009) shows, the quality of life is lower.[12] Family seems to be the main arena in the struggle for happiness. The family is a kind of training ground where successive generations gain experience on how to reconcile the pursuit of happiness with the aspirations of other members, and how to find their happiness in giving happiness to others. This psychological and sociological function of the family is of great economic importance, in line with the thesis of the „happy, productive worker."

[12] Cf. Ref. 7.

Michalski (2018), following the research of Sachs, Ringen, and Beckers, wrote that families are small factories of goods and services.[13] At the same time, they are the key to well-being and prosperity.[14]

Family – challenges for the 21st century: protect marriage and fertility and reduce divorces ranges from 40 to 50 percent because this will increase the quality of life.[15] At the same time, it will contribute to economic growth, neutralizing the conflict between work and family in order to balance these two main elements of human life.

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[13] Let us add – the values of which are most often not recorded by the statistics.

[14] These studies also show that "the value system, sometimes referred to as 'traditional', produces the best results in terms of socialization and human capital development" Michalski (2018, p. 14).

[15] See chapter 5: the labour productivity parabola reaches maximum for the divorce rate in the range 4. The observed values are near double higher.

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Chapter 2

Economic Growth and the Optimal Inequality of Income[1]

Jan Jacek Sztaudynger

Abstract

Inequality of income is one of the significant factors forming social capital. Two views dominate among economists dealing with the influence of income inequality on economic growth.

On the one hand, a too low level of income inequality does not motivate people to increase their labour productivity. Low inequality of income might result from an extended social care system and a GDP burdened with social transfers. A good example may be a situation when an unemployed person refuses to accept a job offer and prefers unemployment benefits to a slightly higher salary. Moreover, a lack of incentives for an employee who fails to acknowledge the economic sense of increasing the productivity of his or her work might lead to slower growth of the economy.

On the other hand, a contrary view suggests that an increase in inequality of income has a negative impact on the economy. The accumulation of wealth by a small number of citizens raises doubts about the good

[1] This chapter was published in „Annales. Ethics in Economic Life" 2018, Vol. 21, No. 8, Special Issue, pp. 89–99.
The article contains excerpts from the paper of Pawlak and Sztaudynger (2008).

use of that wealth for the investments necessary for the growth of the economy. Excessive income inequality is confronted with the disapproval of a significant part of society and is regarded as unfair and unjustified. It may also increase the crime rate, decrease trust and, more generally, lead to the weakening of social capital.

The arguments presented above lead to the hypothesis that the influence of income inequality on the growth of the economy has a non-linear, parabolic character.

We have confirmed this hypothesis in growth models of the US and Swedish economies. We assess the historically optimal inequality of income measured by the Gini coefficient at 46% and 24% for the US and Sweden, respectively. The optimal inequality of income for Poland was assessed previously at 29%. The dissimilarities may result from differences in culture, society, educational level and diligence.
Keywords: income inequality, economic growth, optimal inequality
JEL Classification: O15, O47

2.1. Introduction

Social capital, alongside the classical factors—physical capital and human capital—is an important factor in economic growth. The social capital resource consists of many social and economic phenomena, such as the level of interpersonal trust, trust in institutions, crime, or a sense of belonging to a community.

A sense of belonging to a community depends on whether the community provides security, access to education, and the belief that my income is fair compared to the income of the people I encounter on different planes, not only at work but also in the commercial (seller-buyer) sphere, within the family or in the neighbourhood. A subjective sense of income fairness depends to a large degree on income differentiation. Although income inequality, as such, is not considered to be part of social capital, in our opinion, it is a significant indicator of this capital.

We are interested in the results of the verification of the hypothesis that income inequality, socially recognized as relatively „fair", positively influences economic growth. This relative „fairness" will be sought by means of the optimal income inequality model. The selection of the optimum criterion is the key in this respect. In the described research, it was the standard maximisation of economic growth—the growth rate of labour productivity (GDP per employee). One can, however, imagine other criteria of optimality, e.g., maximising the employment growth rate (minimizing unemployment) or maximizing the quality of life. The latter is unfeasible due to too short a time series, but what is most intriguing is how to divide income so that society is most satisfied.

This article will compare the results of separate surveys for several countries. They are the United States, where income differentiation is one of the highest among developed countries, Sweden, with one of the lowest levels of income inequality, and Poland.

I will justify the view that the optimal income inequality due to the GDP growth rate is different in the countries studied, which makes it difficult or impossible to use panel data.

The approach used an econometric model of economic growth to which a synthetic measure of income inequality was introduced in a non-linear way. There are two seemingly contradictory views on the direction of the influence of income inequality on economic growth. One of these views presents the positive impact of income inequality, while the other indicates that as the income gap increases, the growth of the economy slows down. An extensive list of several dozen publications confirming one or the other point of view is included in the doctoral thesis of Paweł Kumor (2010).

We believe that obtaining statistically significant assessments of the model to which income inequality has been introduced in a non-linear way makes it possible to reconcile the two views. We think that with insufficient income differentiation, its increase will, through increased labour productivity, accelerate the economy. On the other hand, any further increase in income inequality, when it is already high, will have a negative effect, slowing the economy down.

The following hypotheses were verified:

(1) income inequality has a significant impact on economic growth;
(2) optimal income inequality exists, which is related to both economic efficiency and social justice, and a deviation from this value will bring measurable economic losses—a slowdown in economic growth;[2]
(3) optimal income inequality varies from country to country.

2.2. Income Inequality and Economic Growth

I analyse economic growth using the dynamic labour productivity function. Taking into account the influence of two variables: the investments/GDP ratio as well as the technical and organisational growth, this function has the following form (see Introduction, p. 12):

$$(\dot{GDP/L})_t = \dot{A}_t + \beta(invest/GDP)_t \qquad (1)$$

where:
L – labor (number of persons employed),
GDP/L – labour productivity – GDP per person employed,
I/GDP – investment rate (investments in relation to GDP at current prices),
$\dot{A}$ – growth rate of total factor productivity analogue,
where dots over the variables denote growth rates.

The growth model may include several other growth factors: technical and organisational progress, the inflation rate, convergence, as well as social capital or human capital. These variables have not been introduced into model (1); hence they are represented by the growth rate of total productivity denoted by $\dot{A}_t$, also known as the Solow residual.[3]

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[2] The first two hypotheses have been confirmed for Poland (cf. Kumor, Sztaudynger, 2007a; 2007b).

[3] It is worth noting that the size of this residual decreases as the number of other growth factors not previously taken into account increases (Solow, 1963).

In the analyses of factors of economic growth, social capital is becoming increasingly important. Social capital is defined is defined as the degree to which the organisation of society is characterised by a network of organisations, a set of norms and trust, all of which aid cooperation and provide benefits as well as create the potential to solve social problems (Sirianni, Friedland, 1995). To the aforementioned trust, Sztompka (2002, pp. 222–224) adds solidarity and loyalty created by connections and networks of contacts. Defining social capital, he emphasises the fact that these organisations are often developed in the process of forming self-governing, voluntary associations and informal groups. He also stresses that mutual benefits not only have an economic and financial dimension but are also related to power and prestige (p. 368).

Gracia (2002, pp. 189–201) defines social capital as:

> *the ability of society to coordinate social entities in the framework of a joint project. Such coordination capacity can only be based on shared social values: on the culture of the common good.*

In the definitions quoted, it is emphasised that social capital serves cooperation, organisation or the coordination of society.

Research on social capital has been conducted since the mid-1980s by, among others, Putnam, Coleman, and Bourdieu (Sirianni, Friedland, 1995). Social capital is not directly scalar measurable. The factors that determine it are difficult to measure, which is probably why the variables which indirectly represent this capital started to be introduced into econometric growth models only from the beginning of the 1990s. One such variable is income inequality.[4] Research on the impact of income inequality on economic growth[5] was initiated in 1993 by Galor and Zeira (Ferreira, 1999, p. 8) based on the following model:

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[4] An extensive collection of data on income inequalities in more than a dozen countries can be found on the World Bank website: http://databank.worldbank.org/data/source/world-development-indicators (accessed: 30.11.2022).

[5] The following quasi-reverse dependence is also the subject of interest of economists: the impact of the level of income on income differentiation which can be described by the Kuznets curve (Ferreira, 1999, p. 2). I will not deal with this issue.

$$\dot{GDP/L} = \dot{A} + f(I/GDP, Gini), \tag{2}$$

The Gini coefficient is the measure of income (wage) inequality.

There are two views in the literature regarding the influence of income inequality on economic growth: one with a negative impact and the other with a positive impact.

The view about the negative impact of initial income inequality on the rate of economic growth prevails. The mechanism of this impact can be explained as follows:

(1) the poorer the average (median) voter, the higher the taxes, the stronger the political pressure on the redistribution of income, and the greater the disruptions (the grey zone that violates trust and social capital);
(2) an increase in income inequality leads to social and political conflicts, which negatively affects social capital;
(3) poor people have fewer life opportunities than the rich, and they do not fully realise their economic potential, as they usually do not receive a proper education or bank loans;
(4) progress above a certain level (cf. Persson, Tabellini, 1994, pp. 602–604; Ferreira, 1999, pp. 9–13; Morrissey, Mbabazi, Milner, 2002, pp. 5–7, 17).

A negative impact of the initial income inequality on the rate of economic growth was confirmed by, among others, Persson and Tabellini (1994, pp. 607–608) as well as Barro (2000, pp. 41–42)[6] for developing countries (low GDP per capita).

Some studies, especially those concerning developed countries, show the positive impact of income inequality on economic growth in the medium and short-term (e.g., Barro, 2000; Dollar Kraay, 2002, pp. 195–225[7]; Morrissey, Mbabazi, Milner, 2002, p. 7;).

A positive impact may occur when there is insufficient remuneration (or excessive taxation) for the most industrious and effective individuals

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[6] Barro assumed that the income inequality parameter would increase along with the GDP logarithm. On a panel data sample, he obtained a negative income inequality parameter estimate which grows with an increase in GDP.

[7] Dollar and Kraay refer to Forbes (2000) and Zou (1998).

in the process of GDP creation. Small income differentiations would suppress any motivation for more efficient work. Therefore, increasing income inequality, when it was too small in the base period, will result—in my opinion—in productivity growth.

"Reconciling" these divergent results of econometric research is possible if we use a non-linear function with the maximum to describe the relationship between income inequality and economic growth. It will then be possible to determine the optimal level of income inequality $Gini_{opt}$, in terms of maximising economic growth—GDP growth per employee (Cornia, Court, 2001; Sztaudynger, 2003, pp. 76–77).

2.3. Justice and Efficiency

Income inequality in a market economy seems to be obvious and natural. For example, it is generally accepted that a better-educated employee with specialist knowledge, more professional experience or a managerial job is better paid than an employee without an education or specialisation, with shorter seniority or who is in a job not connected with accepting a great deal of responsibility.

This situation motivates the personal development of individuals. Employees interested in improving their financial situation devote more time to expanding their professional competences, acquiring specialist knowledge, developing new skills, or learning about modern technologies. By doing so, they are able to do the same job in a shorter time or achieve better qualitative results. On the macroeconomic scale, this means an increase in labour productivity in the economy and, as a result, also a higher level of domestic product, even when employment remains unchanged. It seems, therefore, that optimal income inequality can have a significant impact on bringing the economy closer to the level of potential output.

What happens, however, when income inequality is not seen as fair? Can the unfair— in social perception—distribution of income in the economy be effective on a macro scale? These questions lead to seeking methods for their empirical verification.

We believe that both too low and too high income inequality causes economic losses, deviating the economy from its potential growth. This situation can be seen in the figure 1.

Figure 1. Economic growth as an income inequality function

Note. Adapted from Cornia and Court (2001), and Sztaudynger (2003).

Increasing income inequality when it is smaller than $Gini_{optimal}$ helps to accelerate the economy. In turn, increasing income inequality when it is greater than $Gini_{optimal}$ has the opposite effect. When income inequality is lower than optimal, employees with high development potential, well-educated specialists, feel that they are not remunerated well enough. The income they receive does not differ significantly, in their opinion, from the income of employees with lower professional qualifications. As a result of the lack of sufficient motivation, they will not use their full potential, and therefore aggregate production in the entire economy will be lower than the potential production.

This situation may be caused by a tax system that is too restrictive in relation to people earning the most, which will limit their production and investment activities. The effect is similar, as the domestic product will remain at a level lower than the potential GDP it is possible to achieve when there is fair (optimal) income inequality.

Now let us consider the situation when income inequality is higher than optimal. Employees with lower incomes begin to feel psychological discomfort. In their opinion, income inequality is unfair. The difference in earnings between the group of the worst and best earners is so great that it cannot be explained by the difference in the level of education, predispositions or professional qualifications. Therefore, income inequality ceases to be a motivating factor to increase labour productivity in this group of employees.

This may mean that the tax system is too liberal, and the group of the least-paid is a beneficiary of transfers of public funds to an insufficient degree. This causes unrest, social conflicts, and makes populist parties opt for the quick equalisation of income. In the economic sense, this leads to the situation when the group of least-paid earners is not involved enough in the creation and distribution of the domestic product.

What is optimal in terms of the economy, and at the same time socially just, is the differentiation of income in which all individuals—the less able and professionally active as well as the most entrepreneurial—participate to a similar, high degree in the economic development, engaging their physical and mental capabilities.

The level of social acceptance of income inequality may vary from country to country.

Figure 2 presents income inequality measured by the Gini coefficient in the United States and Sweden as well as income inequality in Poland.

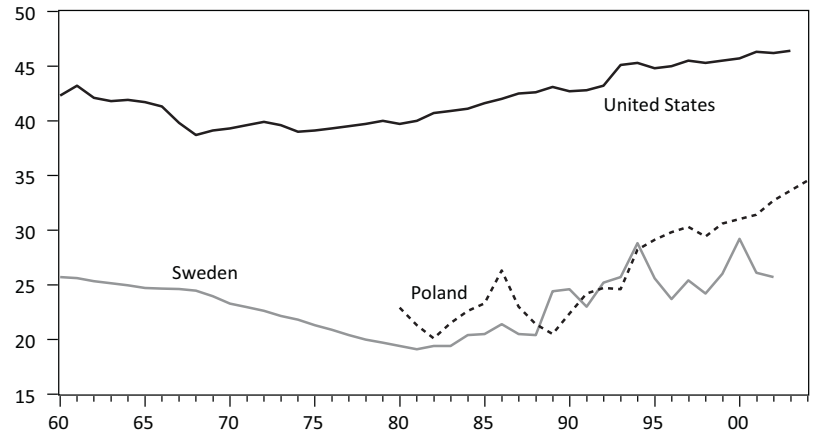

Figure 2. GINI income inequality in the United States and Sweden, wage inequality in Poland

Note. Adapted from World Income Inequality Database V 2.0a by United Nations University (2005) (for USA and Sweden), and Kumor (2006) (for Poland).

2.4. Optimal Income Inequality

In model (2), estimated for the United States, Sweden and Poland (Pawlak, Sztaudynger, 2008), we have confirmed the hypothesis about the non-linear, parabolic impact of income inequality on economic growth.

It turns out that the optimal income inequality for Sweden is almost twice lower than the optimal income inequality for the US economy. This situation is presented in the figure 3.

In the case of Sweden, the optimal income inequality, measured by the Gini coefficient, is 23.9% over the period 1964–2002. For the United States, the income inequality at the level of 45.7% should be considered optimal over the period 1964–2002. In Poland, the optimal wage inequality was estimated at approx. 29% (1985–2007) (Kumor, 2010, p. 145).

We believe that such wage inequalities best correspond to the social sense of pay differentiation justified by differences in effort and contribution (education, qualifications, work complexity and diligence) in the creation of GDP.

Income inequality, measured by the Gini coefficient, for developed countries, is usually within the range of 25% to 40%. The United States and Sweden are therefore unusual in this respect.

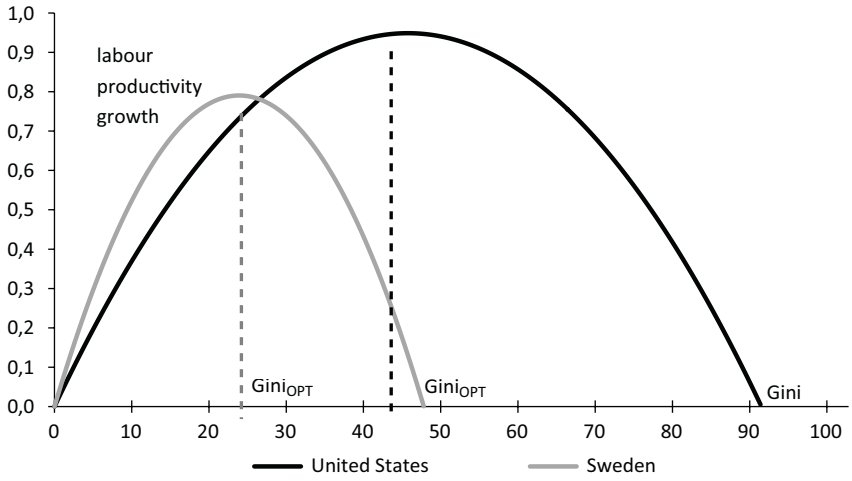

Figure 3. The rate of labour productivity growth and income inequality

Why is there such a disproportion between the optimal income inequality in the United States and Sweden? We think that this results, first and foremost, from cultural and social differences. Sweden is known for its social equality policy, while the United States is a country where there is a significant hierarchical order of society.

In the United States, although equality formally exists, there are still significant differences between white and non-white citizens in the sphere of education and wealth. These differences are largely inherited by subsequent generations. Sweden is a more homogenous country when it comes to the colour of the skin or the origin of its inhabitants. Immigrants appeared when a strong attitude towards the equality of citizens had already developed in society.

With the optimal income inequality, we can estimate the losses incurred by the US and Swedish economies due to the deviation of income inequality from the optimum.

2.5. Conclusions

The research results confirm the hypothesis about the influence of income inequality on economic growth. By introducing income inequality into the model of economic growth in a non-linear, parabolic way, the value of the optimal income inequality for the economies of the United States, Sweden and Poland was calculated.

If we conclude that the research results are reliable, we can say that the analysed economies, due to their suboptimal income inequality, lose almost 1 percentage point of their growth rate annually. On average, this means a slowdown in the economies of approx. one third. It is worth realising what a big loss the economy incurs if the economic policy of a country does not take into account such a significant measure of social capital as income inequality.

Our research shows that the optimal income inequality in the United States is almost twice as high as in Sweden. The optimal inequality in Poland is a few points higher than in Sweden. The reasons

for these differentiations are to be found in educational, cultural and social differences.

To a large extent, such large differences hinder research on the basis of panel data samples, and in many cases even undermine their rationale.

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Chapter 3

Generalized Trust, Helpfulness Fairness and Growth in European Countries Revised Analysis[1]

Jan Jacek Sztaudynger, Ewa Ambroziak
Paweł Starosta

Abstract

This research is an attempt to assess the impact of trust, helpfulness, and fairness on economic growth in Europe. The first part of the paper highlights the concept of social capital and the related concept of trust, while the second part gives an overview of selected research hitherto conducted on the subject. The third part presents an econometric growth model based on a modified Cobb-Douglas production function. The model we propose includes three interrelated variables: generalized trust, helpfulness, and fairness, which can be combined into an aggregated variable, called 'cooperation capital'. The pooled sample covers the years 2006–2018

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I would like to thank Piotr Kębłowski for his significant remarks on unit root tests and the stationarity in panel data. We do not test variables of social capital because they are limited to the interval [0, 10] and the period is too short.

and includes 22 European countries. European Social Survey data provides a chance to examine the previously inaccessible measurement of the impact of bridging social capital increase on economic growth. The results suggest that approximately 1/8 of economic growth (measured by the GDP growth rate) may be ascribed to the effect of an increase in cooperation capital. In addition, 86% of this effect occurs with a 1–4 year lag. The three-component cooperation capital explains economic growth better than generalized trust exclusively. The estimated model suggests that an increase in helpfulness among people has the largest impact on economic growth. As the outcomes of this research also clearly show, fairness and trust are key factors for economic growth in Europe.
Keywords: bridging social capital, trust, helpfulness, fairness, economic growth, Europe
JEL: A13, C31, C33, O47, P24, Z13

3.1. Introduction

In social sciences, the importance of the relationship between social capital and the economy is widely recognized. The significance of social capital to the economy is generally interpreted in terms of the impact of social cooperation and institutional factors on economic phenomena. One of the main conditions for a more effective economy, and simultaneously an important component of bridging social capital, is generalized trust.

In this paper, we treat trust as an essential component of the capacity for social cooperation (Axelrod, 1984). However, the effectiveness of collaboration is also based on the fair value of rewards received in the exchange process, the internalization of social norms (Blau, 1964) and, to some extent, individuals' biological predisposition (Fehr, 2009). These norms include credibility through fairness, which is expressed in the mutual conviction of both partners that they will observe the rules of fair play and will not deviate from either the mutually recognized principles or the general desire to cooperate. Along the same line, Coleman (1994), Cook and Cooper (2003), and Herreros (2004) underline fairness and a general desire to help others as principal factors in laying the

foundations of trust. They have been incorporated into our present study as complementary factors to social capital and cooperation.

Credibility is a characteristic that relates to the partners involved in an interaction and represents their wishes and capabilities to respect the 'rules of the game' (norms) in the social milieu. As noted by Herreros (2004, p. 8), „*trust reflects one's expectations concerning the credibility of other social partners*". A general inclination to help others means that helping each other can thus be treated as a type of cooperative orientation (Cook and Cooper, 2003), rooted in various socialization processes, which can either facilitate or weaken a general atmosphere of trust. The review of the surveys and experiments conducted by Cook and Cooper convincingly demonstrates the positive relationship between partners' credibility and orientation toward cooperation and willingness to engage in some form of collaboration (Cook and Cooper, 2003).

The literature on the correlation between social trust and growth begins with Putnam's 1993 study in which he suggested that the substantial differences in economic performance between northern and southern Italy could be explained by differences in social trust (see also Bjørnskov, 2017).

At the end of the 20th and the beginning of the 21st century, there were attempts to assess the relationship between trust and long-run economic growth by means of econometric models. The first models by Knack and Keefer (1997), Whiteley (2000), and Zak and Knack (2001) combined data from international survey studies with macroeconomic data on GDP, fixed capital investments, and employment.

In these models, cross-sectional data (an average of 20–30 years) from the final three decades of the 20th century and a single measurement (related to one year) of trust were combined according to the values from social surveys. They made it possible to explain the differences in average economic growth for particular countries by means of varying trust levels. Hence, these models make it possible to analyse long-term differences in GDP growth.

In this article, we try to develop a thesis regarding the impact of trust on economic growth. As shown in Table 1, we analyse the level or increase in social capital variables and lags thereof. It seems that such an approach was not employed in either the early or recent literature.

Table 1. Comparison of initial econometric research with our present research

	Initial	Present
Bridging social capital	Trust (mainly generalized)	Cooperation capital: Generalized trust Helpfulness Fairness
Social capital measurement	One for each country	Several for 2002–2018 for each country
Data	Approx. twenty years average, cross-section	2002–2018 Pooled
Possible definition of social capital variables	Level	Level or increase
Possible analyses	Long term	Long term or short term
Time lags	Not possible	Up to 3 years

Source: authors' own considerations

Pooled European Social Survey (ESS) data from 2002–2018[2] allow us to examine the impact of changes in trust on short-term fluctuations of economic growth; something that was previously impossible due to the lack of relevant data.

The study was conducted for 22 European countries. It involved three related components: generalized trust (most people can be trusted), helpfulness (people mostly try to be helpful), and a sense of fairness (most people try to be fair). The combined variable containing all three components will be called **cooperation capital**. With respect to social interaction, we assume that helpfulness and the conviction about the trustworthiness of other individuals are generally the basis for trust and fairness (Coleman, 1994).

Our definition of cooperation capital is related to the theory of rational choice as well as to the theory of attitudes. We focus on three components: trust toward others, willingness to help others, and adopting an attitude of fair play. These attitudes constitute the foundation for building a social network, bridging social capital, and constraining individuals from acting toward others solely based on egoistic motivations.

[2] This is not panel data because samples are newly selected, and the set of countries varied over time.

Cooperation capital can be considered a significant part of bridging social capital. By limiting egoism, resources are created with a necessary level of intensity to engage in social interaction (Hechter, 1988).

We consider the following general hypothesis:

Cooperation capital has both long-term and short-term positive impacts on economic growth.[3]

Based on the above hypothesis, we can formulate three sub-hypotheses:

- The three-component cooperation capital explains economic growth better than the most commonly used measure – generalized trust.
- Taking into account lags in the weights of generalized trust, willingness to help, and sense of fairness estimated in the model of economic growth allows one to better specify the role of cooperation in economic growth compared to a variable with equal weighting.
- An increase in helpfulness has the greatest importance for economic growth (due to the essential role of help in cooperation and economic activities), while trust and fairness have a smaller but still significant impact.

This article describes the meaning of generalized trust and gives examples of three initial econometric models of trust's impact on the economy. In the first section, we discuss the concept and meaning of generalized trust as well as cooperative capital. The second section focuses on reviewing the literature on the impact of trust on economic growth. The methodological part characterizes the operationalization of the main concepts and database. Next, we present our own econometric model of the impact of cooperation capital (generalized trust, willingness to help, sense of fairness) on economic growth based on the ESS survey, while the last section is dedicated to the results of the model estimations.

[3] From a theoretical perspective, we cannot find any basis for a determination on whether the level or the increase in cooperation capital influences economic growth.

3.2. Theoretical Background

3.2.1. The concept and meaning of generalized trust

Psychologists and sociologists, as well as economists, note the importance of trust in social life. Psychologists treat trust as one of the cornerstones of interpersonal relationships, which allows for cooperation and, consequently, the maintenance of social and economic interactions. Sociologists see trust as one of the main sources of social integration beyond dyadic relationships, enhancing the durability of social order (Simmel, 1997).

Economists consider trust to be an important non-economic factor for economic development. Marshall, recognized as the founder of neoclassical economics, noted early on that trust „*permeates all life, like the air we breathe*" (Marshall, 1920, p. 165). However, Marshall's reflections, as well as Polanyi's (2001) subsequent suggestions, which highlight the importance of non-economic factors in economic development, have been omitted in mainstream neo-liberal analysis, which has been dominant since the mid-1970s.

With regard to the utilitarian concepts of neo-liberal analyses, it is worth mentioning the debate concerning the model of the under-socialized man (Granovetter, 1985). It is mainly oriented toward achieving personal material benefits, choosing from the array of available alternatives the solution that leads to the maximization of individual benefits, and placing personal interest above the interests of the social group.

Views on the role of non-economic factors in economic development changed slightly following the publication of Schultz's article „Investment in Human Capital" (Schultz, 1961), focusing on the importance of skills and education in the multiplication of wealth. Later on, the theory of institutional economics (North, 1990) emphasized the significance of different types of social institutions, particularly the rules of law for economic efficiency.

The concept of social capital was reintroduced into academic discussion by Bourdieu (1986). It was then popularized in the 1980s and 1990s by Coleman (1988; 1994), Putnam (1993; 2000) and Fukuyama (1995),

who provided further stimulus for analysing the relationship between the degree of societal organization – characterized by a network of organizations, a set of norms, and in particular, the level of social trust – and economic development. As an integral component – and in some cases, even a synonym – of social capital, trust has become a subject of analysis to explain economic growth.

The essence of trust is the assumed relationship of reciprocity and expectation, reflected in the interaction parties respecting each other's interests. In this case, mutual expectations are a kind of platform for mutual understanding and sharing semantic meanings communicated by the interaction parties.

It can therefore be concluded that trust is A's positive attitude toward B, arising in situation X, resulting from A's knowledge or belief that B will not work to A's disadvantage. This approach is consistent with the position of Misztal, who stated that „*to trust is to believe that the result of somebody's intended action will be appropriate from your point of view*" (Misztal, 1998, p. 24), as well as that of Gambetta (2010, p. 277), who writes that „*trust (or, symmetrically, distrust) is a particular level of subjective probability with which an agent assesses that another agent or group of agents will perform a particular action, both before he can monitor such action […] and in a context in which it affects his own action*." Mutual help „*and our expressions of gratitude are social rewards that tend to make doing favours enjoyable, particularly if we express our appreciation and indebtedness publicly […] Besides, one good deed deserves another. […] The fact that furnishing benefits to others tends to produce these social rewards is, of course, a major reason why people often go to great trouble to help their associates*" (Blau, 1964, p. 16).

Therefore, trust is a consequence of ongoing or implied social interaction. It is an attitude in which the constitutive role is played by information about the subject or object of trust, together with the limited control of the agent who is trusting of the action and their assessment of the situation.

Information is the basis for describing and understanding the trusting agent's situation. The attitude of trust can result from verified knowledge (personal and/or expert) and established social stereotypes, as well as beliefs built on them. Information can also be the subject of trust in

the case of confidentiality, i.e., keeping obligations and secrets, or even in the case of acts of treachery (see Simmel, 1908). The ability to control is the result of the power resources available in particular social relations. They are the basis for the formation of credibility. The credibility of entities may, therefore, result from the application of sanctions, both through the use of external coercive measures and through possessed authority and social recognition. It may also be the result of direct experience, as suggested by proponents of the theory of self-contained benefits (Hardin, 2006) and socialization processes (Watier and Markova, 2006).

The assessment of a situation is based on shared norms and values. It is worth noting (Knight, 2001) that the category of 'sharing' can relate to both knowledge of the content of norms and to an attitude of approval, ambivalence, or rejection thereof.

These arguments do not, however, lead us to reduce trust purely to knowledge. For the same reason, we do not treat it as an attitude based solely on rational calculation, or as an action. According to the general theory of attitude, we assume that trust is more a disposition to take an action rather than an action itself. We agree with the argumentation of Ahn and Ostrom (2008, p. 80) that „*[t]rust itself is a kind of belief but not an action per se*". Trust or belief, therefore, may, and often does, stimulate an action, but it is not a precondition for its undertaking.

In the literature, there are find proposals to distinguish different forms of trust: horizontal, vertical and generalized (Fukuyama, 1995). In the analyses of the relationship between trust and economic development, authors most commonly treat the generalized form of trust as being synonymous with trust as such.

Its specificity lies in the fact that it is not generated on the basis of personal experience or exchange processes but on a belief in the existence of a positive human nature (Uslaner, 2008), shaped by socialization processes (Simmel, 1908) and/or the social processes of identification (Braithwaite, 1998).

Generalized trust is an orientation that we adopt toward entities, outside of the field of direct experience. It is more an attitude toward the social setting, one that expresses our need to have bonds beyond attaining an individual interest. In other words, generalized trust „*refers to the confidence in the credibility of others*" (Macek and Markova, 2006, p. 176).

The attitude toward generalized 'others' is a good premise upon which to assess the extent of a culture of trust or a culture of cynicism in a society (Sztompka, 2007). If trust is shown *a priori*, it is more likely to lead to cooperation and is certain to reduce social tensions. It also facilitates overcoming prejudice and intolerance. However, too much of this optimism, not based on social experience, may lead to naivety and being easily manipulated. A good example of the consequences of excessive trust is society's misplaced confidence in quasi-banks and their various activities or in institutions that provide instant, on-the-spot loans. In an era of growing risks in the countries of Central and Eastern Europe, generalized trust, or the lack thereof, sometimes becomes, in the absence of access to information, a substitute for cognitive competence.

3.2.2. The impact of trust on economic growth in the literature

Since the late 1990s, social capital has been considered a variable of the econometric growth model. Existing empirical research results lead to the conclusion that there is a positive relationship between the level of generalized trust in a given society and economic growth measured by GDP per capita growth. Knack and Keefer (1997) were the first to find a strong correlation between trust and the long-run growth rate. Their research utilized data taken from the 1981 and 1991 World Value Surveys (WVS) for 29 countries from different continents operating within market economies, and it led to some interesting conclusions. First, they stated that „*a ten-percentage-point rise in [the trust] variable is associated with an increase in growth of four-fifths of a percentage point*" (Knack and Keefer, 1997, p. 1260). Second, they admit that the impact of trust on GDP growth is stronger in poorer countries than in wealthier ones. This is explained by the importance of non-formal and non-legal transactions made through informal agreements and the weakness of financial institutions in such countries. They also noted that a seven-point increase in the trust variable increases the share of investment in GDP by one percentage point.

The relationship between economic development dynamics, measured by GDP per capita, and the level of trust was also researched by Whiteley (2000). Starting with Barro and Sala-i-Martin's (1995) neoclassical model, he directly introduced the level of the trust variable into the analysis. In his work, the concept of trust assumes two forms: generalized and particularized trust. The indicator for the former is based on answers to the classic question, „*Can most people be trusted?*" The indicator for the latter is based on answers to questions about trusting members of one's own family and trusting fellow nationals (Whiteley, 2000, p. 453). Based on an analysis of the main components, he concludes that what is most important for economic development is trust toward one's compatriots, followed by trust toward one's family, with trust toward people in general being the least important.

Whiteley's study of the relationship between trust and economic growth was based on data from the European Social Survey (ESS) in 34 countries in 1992. Furthermore, based on estimates, he concluded that social capital measured by the trust index is more important to economic growth than human capital, which is included in the classical growth models alongside investment rate, population growth, and the initial level of GDP.

Along the same lines as Whiteley, Zak and Knack (2001) also studied the effect of trust on the growth of GDP per capita in 41 countries, averaged over the period 1970–1992. They estimated that an increase of 10 percentage points in trust would increase the annual growth rate of income per capita from 1.9% to 2.4% (i.e., by approx. 0.5 pp). This means an approximately one-quarter increase in the average dynamics of economic growth in the countries surveyed.

Econometric studies on the impact of trust on economic growth were thus initiated by Knack and Keefer (1997), Whiteley (2000) and Zak and Knack (2001). They confirmed the impact level of generalized trust on economic growth (see also Sztaudynger, Ambroziak, Starosta, 2022 also chapter 3).

Having investigated a later period and a bigger sample size than the previous studies, Berggren, Elinder, and Jordahl (2008) found that, on average, the trust coefficient is half as large as that indicated in previous

findings. This also confirms Zak and Knack's results – that a growth in trust by 10pp facilitates GDP growth by as much as one quarter.[4]

Tabellini (2010), pioneering the use of composite measure questions, utilized answers to four WVS items: trust, respect for others, confidence in individual self-determination and obedience. He shows that the principal component variable[5] constructed from the four indicators of individual values and beliefs introduced above is strongly correlated with economic development in regions of Europe.

Gorodnichenko and Roland (2011) analysed Schwartz Values Survey variables. Among them, embeddedness is significant, with a negative effect on long-run growth. Affective autonomy, intellectual autonomy, and egalitarianism are jointly positively significant in models of long-run economic growth. The survey variables influence growth through innovation.

While macro-level research on the national scale confirms the importance of the impact of trust on GDP per capita dynamics, the results of research conducted on the regional level are not as consistent regarding the significance of the relationship between these two variables. Beugelsdijk and van Schaik (2005), who analysed 54 European regions based on the European Value Survey database for 1990, found a very high differentiation in the level of trust in European regions, from 5.5% in Sardinia in southern Italy to 64.6% in the eastern Netherlands. However, they state that the extent, or level, of residents' membership in a variety of social associations and organizations, explains economic growth in regions, in terms of GDP per capita, to a greater degree than trust.

Treating trust as a factor that explains economic growth can be justified by four arguments related to the ; investment activity, human capital, quality of institutions, and financial intermediation (Boulila, Bousrih, and Trabelsi, 2008).

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[4] Zak and Knack (2001) confirmed the hypothesis that there is a reverse causal direction in the low-trust/poverty trap. Poor societies are characterized by a low level of trust, which, in turn, slows economic growth and makes it difficult to escape poverty.

[5] In our opinion, the principal component method eliminates the causal character of analysis.

The essence of the first argument lies in reducing transaction costs and the reduced propensity to invest when there is a misleading level of trust. As Whiteley notes, „[…] *when transaction costs are low, actors will be able to negotiate solutions to collective action problems more efficiently than could be achieved by outside regulations*" (Whiteley, 2000, p. 451).[6] The greater the trust, the greater the likelihood of cooperative action by members of a society. The translation of trust and cooperation into economic benefits usually occurs in two ways. First, as Warren (2008, p. 136) writes, „A relationship of trust enables the truster to benefit from the resources of the trustee and vice versa." Thus, trust extends access to others' resources, thereby increasing the chances of achieving additional benefits. Second, it encourages the establishment of all sorts of companies, initiatives and projects by merging small financial capital into larger financial institutions, capable of more complex tasks and competing more effectively in the market.

The second argument refers to the impact of trust and social capital on the growth of human capital and thus on a higher level of economic development Bjørnskov (2009). However, the phenomenon of „squaring the circle between effects of competition and cooperation in the educational system as well as allowing firms in countries with high social trust to demand a more educational workforce" should also be underlined (Bjørnskov, 2012, p. 1347).

The third argument refers to the relationship between trust and institutions that provide economic growth. The greater the trust, the greater the tendency to legitimize the existing social inequalities, and the lesser the inclination to initiate conflicts, which weaken the effectiveness of the existing socio-economic system. As Knack and Keefer stated, „*government officials in societies with higher trust may be perceived as more trustworthy and their policy pronouncements as thus being more credible*" (Knack and Keefer, 1997, p. 1253). Moreover, this greater trust leaves

[6] See also Gur and Bjørnskov (2017). In a set of cross-country regressions, they note that delegation is a low-cost option when management decisions can be implemented without monitoring. Delegation is, however, risky and more likely to be profitable in higher-trust environments. High-trust environments will be characterized by a less formal hierarchy (Bjørnskov, 2017).

greater freedom of action to the state bodies responsible for economic policy, even if some decisions are not beneficial to society in the short term. Thus, greater trust facilitates policies aimed at long-term objectives. Economic growth – building human potential, as well as human and physical capital – is inherently a long-term phenomenon. This is why economic policy requires long-term objectives, which are facilitated by trust. A positive correlation between institutions and social trust has also been found in China. Cui stressed that a „*higher level of social trust is conducive to economic growth. A one standard deviation increase in trust is associated with the increase in growth of 0.225 units of standard deviation, which is 0.638 percentage points. […] the effect of social trust depends on the quality of the institution, and this effect decreases with institutional strength*" (Cui, 2017, p. 1256).

The fourth argument refers to the relationship between financial market development and trust. Guizo et al., (2000) found trust to have a strong influence on financial development. Their study from Italy discovered that „*in regions with high level of trust, individuals have more access to credits, more participation in the stock market and less resort to informal sources of finance*" (Boulila, Bousrih, and Trabelsi, 2008, p. 406). Meanwhile, Calderon, Chong, and Galindo (2001) found evidence of a significant association between a higher level of trust and financial deepening ratios.

The multitude of measures of social capital has encouraged researchers to search for the best instrument for explaining economic growth. Beugelsdijk and van Schaik (2005) found that economic growth is better explained by citizens' participation in various social associations and organizations than by trust. This is an argument for entering both variables into the model simultaneously, or for a combined variable. Several variables, which represent trust in family members, compatriots, and people in general, were accounted for in the model employed by Whiteley in the form of a combined variable. We can thus infer that there is a more widespread conviction as to the need to analyse the impact of several variables representing social capital on economic growth. We will explore this further below.

The main research problem is encapsulated in the following question: To what extent does **cooperation capital**, including helpfulness, fairness, and generalized trust, have an impact on economic growth?

If the answer to the above question is positive, we can formulate three more detailed research questions:

1. Which component — trust, helpfulness or fairness — plays the most important role in economic growth? In other words, what weights should be assigned to the three components?
2. How does this impact break down over time? In other words, what time lags of trust, helpfulness or fairness should be used?
3. Is economic growth determined by the level of or the increase in cooperation capital? Is this a short-term or long-term determination?

3.3. Data and Method

The study included 22 countries: Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Switzerland, Sweden, and the United Kingdom. The analysed period covers the years 2002–2018. Due to the three-year lags, our model was estimated for the period 2007–2018 and 212 observations.[7] The macro data come from the Eurostat database. The survey pooled data were taken from the European Social Survey.[8] Because the variables of the cooperation capital were reported in even years, it was necessary to interpolate observations for the odd years (an arithmetic average of the surrounding years was applied).

The cooperation **capital** was measured by the respondents' choice:

1. *People mostly look out for themselves (0) –> People mostly try to be helpful (10)* – (**helpfulness**).

[7] The Referee drew our attention to the weights recommended for ESS data (ESS Weighting Guide, https://www.europeansocialsurvey.org/docs/methodology/ESS_weighting_data_1.pdf (accessed: 15.05.2021). We will apply these weights at the next stage of research.

[8] "One possibility in developing more persuasive evidence of social capital effects is a broader use of survey data" (Durlauf and Fafchamps, 2005).

2. *Most people try to take advantage of me (0) –> Most people try to be fair (10)* – (**fairness**).
3. *You can't be too careful (0) –> Most people can be trusted (10)* – (**generalized trust**).

These questions were formulated for the first time by Rosenberg in 1956 (Paxton, 1999, p. 105). The foundations on which respondents' relationships with fellow members of the community and region rest and are created characterize these choices. Fairness and helpfulness are treated here not only in altruistic terms but also in terms of investments, for which may pay back at a later date.

These three choices were recorded using the same 11-point scale (0–10), with 10 points meaning that the respondent fully agrees with the opinion that most people can be trusted, that most people act fairly, and that most people are helpful to others.

The correlation coefficients between levels of trust,[9] helpfulness and fairness are so high, and the variables are multicollinear (correlation coefficients above 0.9) that it is not possible to distinguish their impact on GDP growth. In addition, they are negatively correlated with GDP growth. We conclude that GDP growth should not be linked with the level of trust, helpfulness, or fairness.

Comparing correlation coefficients for levels and increases, we can note that the coefficients between increases of the variables (with lags) are lower. The correlation coefficient increases of helpfulness, and two other components of cooperation capital (particularly compared with GDP growth coefficients) are still relatively high.

A panel EGLS (cross-section weights) method was used to estimate the model for all the analysed countries.[10]

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[9] There are several models with the level of trust variable related to GDP growth, i.e., Knack and Keefer (1997), Whiteley (2000), and Zak and Knack (2001).

[10] The main aims of the ESS are to chart stability and change in social structure, conditions, and attitudes. It assumes that newly selected, cross-sectional samples are comparable. Based on this justification, we used panel estimation methods. Additionally, we assumed that the impact of social capital on economic growth is equal (the same) over both time and the 22 analysed countries. We partly reject the constant over time assumption.

3.4. The Model and Hypothesis of Cooperation Capital's Impact on Economic Growth in European Countries

To study the effects of the three measures of cooperation capital – helpfulness, fairness and trust – on economic growth, the neoclassical, constant returns to scale, augmented Cobb-Douglas production function was applied:

$$GDP_t = A_t L_t^{1-\beta} K_t^{\beta}$$

where:
GDP_t – product (GDP) in constant prices, in year t,
K_t – physical capital in constant prices,
L_t – labor,
t – time,
A_t – Total Factor Productivity.

We will use the dynamic version of the CD production function:

$$\overset{o}{GDP}_t = \overset{o}{A}_t + (1-\beta)\overset{o}{L}_t + \beta\,\overset{o}{K}_t.$$

After approximating the rate of physical capital by investment output ratio[11], we obtain the following function:

$$\overset{o}{GDP}_t = \overset{o}{A}_t + \alpha_1 \overset{o}{L}_t + \alpha_2 (investment/GDP)_t,$$

where:
$\overset{o}{GDP}_t$ – GDP growth rate,
$\overset{o}{L}_t$ – labour growth rate,
$\overset{o}{A}_t$ – analogue total factor productivity growth rate.

[11] This is a common practice mainly due to considerable difficulties in calculating the statistical value of fixed assets at constant prices.

We assumed that $\overset{o}{A}_t$ depends on three variables representing cooperation capital CooperationC (level or increase) and constant:

$$\overset{o}{A}_t = \alpha_0 + f(CooperationC_t)$$

and get the following general growth model:

$$\overset{o}{GDP}_t = \alpha_0 + f(CooperationC_t) + \alpha_1 \overset{o}{L}_t + \alpha_2 (invest/GDP)_t. \quad (1)$$

There is no convergence variable in the model. In the world economy, we can observe a growing disproportion, growing divergence. Hence, the functioning of the real economy suggests that the assumptions of a long-term equilibrium and convergence are not appropriate. It can only be viewed as a club convergence. In some models of Romer and Lucas, convergence does not appear, or at least its incorporation in the model is dependent on a shortage of physical or human capital.

The current models analysed cross-sectional data from the last three decades of the 20th century and single, one-time measurements of trust level. They make it possible to explain the long-term differences in the average rate of economic growth by means of different generalized trust levels.

The available pooled data from the European Social Survey from 2002 to 2018 provide a previously inaccessible opportunity to explore how the changes in trust (as well as changes in fairness and helpfulness) over time translate into short-term fluctuations in economic growth.

We use model (1), in which the GDP growth rate is dependent on the employment rate and the investment output ratio. An average annual rate of inflation was also added to the set of explanatory variables.[12] We also added a zero-one variable for the „crisis" years (2008 and 2009).

Based on existing models, including the ones described above, we tried to confirm the positive impact of the level of cooperation capital indicators on economic growth, which resulted in complete failure (wrong signs or insignificant structural parameters). Therefore, we did

[12] See, for example, research on the negative impact of inflation on economic growth, e.g., Sidrauski (1967), Sarel (1996), and Barro (2013).

not confirm that, at the beginning of the 21st century, countries with a higher level of cooperation capital attained „permanently" higher economic growth.[13] According to the main research questions, we provide the general hypothesis:

Economic growth is positively affected by an increase in cooperation capital (generalized trust, helpfulness, fairness). It is a short-term impact.[14]

Based on the above hypothesis, we can formulate three sub-hypotheses:

1. The three-component cooperation capital explains economic growth better than the traditional one-element indicator of generalized trust. Employing all three variables better reflects the integrity of others, the mutual moral obligation, and thus the complex cooperation phenomenon (Axelrod, 1984; Paxton, 1999) than one component of trust.
2. Based on a two-stage estimation, the weights of the cooperation capital components can be determined, taking into account the lags. It means that weights of trust, willingness to help, and a sense of fairness, are not arbitrary (as is common practice) but estimated in the growth model. The variable determined in this way allows one to better specify the role of cooperation in economic growth compared to the variable with equal weights.
3. An increase in helpfulness has the greatest importance for economic growth (due to the essential role of help in cooperation and economic activities), while trust and fairness have a smaller but significant impact. Helpfulness may then be a necessary but insufficient condition for building trust and fairness. We assumed that the effects of trust, helpfulness, and fairness could be different and show, in the empirical section, that they are indeed different. There is no reason that such different phenomena should have equal effects. The other

[13] Different levels of social capital in such a case would have a divergent effect.

[14] Adopting the first hypothesis would lead to the question of whether the difference in the social capital impact on economic growth in the 1990s and the beginning of the 21st century does not mean that previously an impact of the level of social capital determined economic growth while currently there is an impact of the increase of social capital.

argument is that trust, fairness, and helpfulness are not simultaneous in time.

4. Help usually comes first, followed by our belief that somebody is fair. Finally, trust is built. Helpfulness is the first factor and the one that is crucial from the economic point of view. Everything in the economy happens between people. It is impossible to cooperate without help, and it is impossible to build a good relationship with somebody if he does not respond to the help given.

According to the general hypothesis, there are increases in the variables that constitute cooperation capital (helpfulness, fairness, trust) in the model. The model is as follows:

$$\overset{o}{GDP}_{i,t} = \alpha_0 + \alpha_1 \overset{o(+)}{L}_{i,t} + \alpha_2 \overset{(+)}{(investment / GDP)}_{i,t} +$$
$$\alpha_3 \overset{(-)}{inflation}_{i,t} + \alpha_4 \Delta \overset{(+)}{helpfulness}_{i,t} + \alpha_5 \Delta \overset{(+)}{fairness}_{i,t} +$$
$$\alpha_6 \Delta \overset{(+)}{trust}_{i,t} + \alpha_7 \overset{(-)}{crisis\_2008} + \alpha_8 \overset{(-)}{crisis\_2009} + \xi_{i,t}$$

where:

$\overset{o}{GDP}_{i,t}$ – GDP growth (for the country *i*, year *t*), constant prices, in %,
$\overset{o}{L}_{i,t}$ – number of employed, growth in %,
$investment/GDP_{i,t}$ – investment/GDP ratio, in %,
$inflation_{it}$ – CPI growth rate, in %,
$\Delta helpfulness_{it}$ – increase in average *helpfulness,*
$\Delta fairness_{it}$ – increase in average *fairness,*
$\Delta trust_{it}$ – increase in average *trust,*
crisis_2008 – dummy variable, 1 in 2008, 0 in other years,
crisis_2009 – dummy variable, 1 in 2009, 0 in other years,
i – subscript denoting country $i = 1, \ldots, 22$.

Expected parameter signs are given in parentheses above the variables.

3.5. The Results of the Model Estimation

A panel EGLS (cross-section weights) method was used to estimate the model.[15] As mentioned earlier, the parameters of variables representing the level of cooperation capital were insignificant, often with a minus sign. The estimation results confirmed the hypothesis about the impact of increases in cooperation capital on economic growth:

Table 2. The basic model of GDP growth and increases in helpfulness, fairness and generalized trust, panel EGLS (Cross-section weights), 2007–2018, 212 observations

Variable	Basic model	
	coefficient	Std. error
constant	**0.40**	0.50
employed, growth$_t$	**0.54*****	0.05
(investment/gdp)$_t$	**0.06*****	0.02
inflation$_{t-1}$	**-0.23*****	0.07
(Δhelpfulness$_t$*+Δhelpfulness*$_{t-1}$ *+Δhelpfulness*$_{t-2}$ *+Δhelpfulness*$_{t-3}$*)/4*	**6.00*****	1.96
Δfairness$_{t-2}$	**2.63****	1.10
(Δ trust$_{t-3}$*+Δ trust*$_{t-4}$*)/2*	**2.51****	1.12
crisis_2008	**-1.78*****	0.29
crisis_2009	**-3.96*****	0.35
IRland_15	**21.3*****	2.58
ESTONIA_2008_2009	**-5.91*****	1.58
R^2 weighted	0.831	
Adjusted R^2 weighted	0.823	
R^2 unweighted	0.771	
S_e weighted	1.55	
JB	0.97	
***DW* weighted**	1.65	
F-statistic	99.0	

R^2 – goodness of fit,-JB- Jarque–Bera test, DW – Durbin–Watson statistic, Se – average residual error.

*The coefficient is statistically different from 0 at the *** .01, ** .05, and * .10 levels.*

Source: authors' own calculations

[15] The basic model presented in Table 2 was also estimated using the fixed effect and random effects methods. Significantly worse results were obtained.

The choices of delays are based on empirical model estimations. „Economic theory rarely provides a basis for specifying the lag lengths in empirical macro-models" (Stigum, 2003, p. 388; see also Nerlove, 1972; Holden, 2005). The delays were chosen taking into account the F-statistic, t-statistic and adjusted R^2 values.

The explanation of delays is relatively intuitive: trust requires time. It is much faster to make sure that someone is helpful to me or to people in general. Usually, the next step is to believe in someone's fair incentives. Trust is built on the recognition of these two. Because of this time sequence, it is possible that an increase in helpfulness will affect economic growth first. The second argument is that the help is relatively directly linked to economic activity, which is not the case with trust. So, the influence of helpfulness is fast, which is not the case for the impact that indirect trust has on economic growth.

Let us explain the construction of the variable:

$\Delta helpfulness_t + \Delta helpfulness_{t-1} + \Delta helpfulness_{t-2} + \Delta helpfulness_{t-3}$, for example. At the beginning, we introduce these variables to the model separately. As the numerical values of the estimated parameters were similar, we assumed that they were equal, and we summed up the Δhelpfulness variables. In addition, it helps to cope with the fact that the ESS survey is only available every other year.

All coefficients have the expected sign and are significant (at a significance level of 5% or lower).

The standard approach is three variables combined into one variable as a simple sum:

$$\Delta helpfulness_t + \Delta fairness_t + \Delta trust_t.$$

"This variable can be taken to denote the general moral basis of a society, a set of unwritten rules and norms that govern everyday life. Thus, we can argue here that … [this variable] indicates individuals' expectations that in general, others, unknown to him/her, will be helpful and fair in their everyday interactions" (Daskalopoulou, 2019, p. 283). Unfortunately, in our model, the simple sum of variables (no lags) has a negative sign.

For comparison, we ran a model with three variables combined into one, with weights taken from the basic model:

$$\Delta Cooperation\ C = 6.00[(\Delta helpfulness_{t} + \Delta helpfulness_{t-1} + \\ + \Delta helpfulness_{t-2} + \Delta helpfulness_{t-3})/4] + 2.63\Delta fairness_{t-2} + \\ + 2.51(\Delta trust_{t-3} + \Delta trust_{t-4})/2. \quad (2)$$

This variable is significant at the 0.0001 level.

The results confirm the hypothesis about the positive impact of increases in the components of cooperation capital on economic growth. For example, the parameter of variable *Δhelpfulness* indicates that the GDP growth rate is influenced by an increase in helpfulness from the current and three previous years – an increase of 0.1 points leads to a cumulative increase in economic growth by approx. 0.60 percentage points (ceteris paribus);

The influence of helpfulness is more than twice as strong as that of trust or fairness.

Among the 15 countries (Table 3), the average GDP growth between 2007 and 2018 was 1.8%. About 1/8 of it can be attributed to cooperation capital.

The most important positive role of cooperation capital growth was seen (CooperationC absolute share GDP growth from 1/4 to 1/3) in Finland, Hungary, the Netherlands, Portugal, and Slovenia.

Table 3. The increase in the cooperation capital effect and the average annual GDP growth for 2007–2018

No.	Country	Average annual %			CooperationC absolute share (2)/(1)
		GDP growth (1)	CooperationC effect equation (2)	GDP growth without CooperationC (3)	
1.	Belgium	1.4	0.3	1.1	1/5
2.	Finland	0.8	0.3	0.5	1/3
3.	France	1.0	0.2	0.8	1/5
4.	Germany	1.4	0.4	1.0	3/10
5.	Hungary	1.4	0.3	1.1	1/4

6.	Ireland	4.4	0.0	4.5	within statistical error
7.	Netherlands	1.3	0.3	1.0	1/4
8.	Norway	1.3	0.1	1.2	1/10
9.	Poland	3.9	0.4	3.4	1/10
10.	Portugal	0.5	0.1	0.3	1/4
11.	Slovenia	1.5	0.4	1.1	1/4
12.	Spain	0.8	0.1	0.7	1/10
13.	Sweden	1.8	0.1	1.7	1/20
14.	Switzerland	1.8	0.2	1.6	1/10
15.	United Kingdom	1.3	0.2	1.1	1/8

Source: authors' own calculations based on the basic model presented in Table 2[16]

Table 4. The increase in the cooperation capital effect and the average annual GDP growth in the sub-periods of 2007–2018

No.	Country	Period	Average annual %			Cooperation C absolute share (2)/(1)
			GDP growth (1)	Cooperation C effect equation (2)	GDP growth without Cooperation C (3)	
1.	Bulgaria	2011–2012	1.4	0.3	1.0	1/4
2.	Cyprus	2011–2012	-1.5	-1.8	0.2	xxx
3.	Czech Republic	2013–2018	2.9	0.4	2.4	3/20
4.	Denmark	2007–2014	0.2	0.0	0.2	within statistical error
5.	Estonia	2009–2018	1.8	0.5	1.4	1/4
6.	Slovak	2009–2012	1.3	-0.1	1.4	within statistical error

Source: as in Table 3

[16] If there is no increase in the cooperation capital in a country, the effect will be "zero".

In general, models with cooperation (social) capital variables have a much better fit than models without this variable.

Because of the relatively high[17] correlation between the components of cooperation capital, we built one combined variable with them. After replacing three increases in cooperation capital with the increase in combined cooperation capital (2) in the basic model, we obtained very similar estimates of the parameters, their significance, and the R^2 coefficients.

A difficult problem with creating combined variables is the arbitrary selection of weights. What weights should we give to the three measurements of social capital in our study, i.e., fairness, helpfulness, and trust? The simplest solution is to give each of them equal weight, with three lags „suggested" by the basic model.[18] This yields significant estimates. However, we obtained much better results when taking weights from the basic model (adjusted R^2 0.830 and 0.784, respectively).

The three components of cooperation capital (involving generalized trust, fairness, and helpfulness) explain economic growth better than the traditional, single generalized trust.

3.6. Conclusions

In the research, we investigated and expanded both the theoretical discussion of generalized trust and empirical analyses of the potential impact of the three components of bridging social capital on economic growth. We developed a commonly recognized thesis on the positive impact of generalized trust on economic growth (see Knack and Keefer, 1997; Zak and Knack, 2001). In addition to trust (most people can be trusted), we used two related components of social capital, helpfulness and fairness.

The model was estimated using a sample from 22 European countries between 2007 and 2018 (212 observations). In general, we confirmed our main hypothesis that economic growth is positively affected by an increase in cooperation capital (trust, willingness to help, and fairness).

[17] Comparing the 0.4 correlation coefficient with 0.15, for example.

[18] In the case of weights determined arbitrarily, the lags are usually not used.

This is a new finding because, so far, the analysis of the role of trust in growth in the economic literature has usually not been connected with the role of helpfulness and fairness. Additionally, the variables of social capital level (mainly the level of trust) were used. The long-term influence of cooperation capital level on economic growth was not confirmed in our analysis. Instead, we found short-term positive relations between economic growth and increases in trust, willingness to help, and fairness. In the surveyed countries, approximately one-eighth of their growth can be attributed to the growth in cooperation capital. This impact varied from 1/20 to 1/3 of the total value of economic growth.

In some countries, this influence is negligible.

We also support the first sub-hypothesis: The three-component cooperation capital explains economic growth much better than the one-component generalized trust. Most likely, this concept better reflects the mutual moral obligation, which is important for economic cooperation and effectiveness.

We also validate the second sub-hypothesis. Based on the econometric model estimation, the weights of the above components of cooperation capital (taking lags into account) can be determined. The lag cooperation capital variables, to the best of our knowledge, were not used, mainly due to the lack of statistical data and the long-term character of most of the investigated relationships.

The cooperation capital variable with the weights estimated in the basic model (Table 2) allows one to specify more precisely the role of cooperation in economic growth compared to the cooperation capital variable with equal weights. The standard model with equal weight without lags is much worse. An increase in cooperation capital affects economic growth in a current year only to a small degree; over 80% of the effect occurs with a lag of 1–4 years.

If we choose a cooperation capital variable with unequal weights, it will be possible to test sub-hypothesis 3. The basic model shows that the most important economic growth factor of cooperation capital is the increase in the willingness to help others, which can be explained by the critical importance of cooperation in economic activities. Approximately twice smaller but significant effects are associated with trust and fairness. Therefore, we confirmed sub-hypothesis 3.

This article discusses three issues: the definition and importance of trust, a review of the models of the impact of generalized trust on the economy, and our model of economic growth with the increase in trust, willingness to help, and fairness variables, while considering lags.

During the global crisis of 2008 and 2009, called a crisis of trust, there was a GDP slowdown in the analysed countries by approx. 1.8% and 4%, respectively. This constitutes an essential prerequisite for the continuation of the initiated analysis.

Our findings point to the conclusion that the most important potential areas of investigation are, firstly, the influence of the global crisis on the relationship between cooperation capital and economic growth. Secondly, when the optimal level of trust, willingness to help, and fairness are exceeded, the phenomenon of cooperation abuse intensifies so much that the cumulative effect on the economy will be negative.[19]

In summary, our analysis claims that helpfulness is a leading and more significant factor in explaining economic growth dynamics than generalized trust and fairness. This means that the intensification of fairness and trust is more likely when based on helpfulness.

The main policy implication of our research is the significance of the positive role of cooperation capital for social and economic development. The important, pragmatic task of government and local authorities should be to support trust, help and fairness, not only because of their moral values but also their impact on the economy.

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[19] Due to the cooperation capital variable, it can be studied by introducing only one variable to the model – the cooperation capital variable squared. The first attempt was not satisfactory (see also Butler, Giuliano, and Guiso, 2016).

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Chapter 4

Marriage, Divorce and Economic Growth in Poland and the European Union[1]

Paweł Baranowski, Jan Jacek Sztaudynger

Abstract

The aim of the study is to estimate the impact of the so-called family social capital (family ties capital) on economic growth. We hypothesise that marital dissolution expresses decrease in the capacity for cooperation, collaboration and sharing responsibility not only within the family but also on a professional level. Thus, an increase in the divorce to marriage rate is accompanied by a slowdown in economic growth.

The divorce rate is regarded here as an indirect cause of the slowdown. The reasons stem from the breakdown of cooperation and collaboration, as well as increased risk, trust reduction, and the shortening of the decision-making time horizon accompanying divorces and resulting from divorces. These phenomena directly affect the working members of the family in which a divorce takes place. According to the main hypothesis, their impact is transferred to professional life and concerns employee teams.

[1] This chapter was published in „Annales. Ethics in Economic Life" 2019, Vol. 22, No. 1, pp. 53–67.

For the study, we employ econometric models, the first one for Poland and the second for 15 European Union countries, for the period 1993–2017.
Keywords: divorce rate, economic growth, the European Union, social capital
JEL Classification: J11, O43, O47, Z13

4.1. Introduction

Since the beginning of the 1990s, social capital—expressing people's capacity for selfless cooperation, the density of the network of interpersonal contacts and the so-called generalised trust—has gained in popularity in economics. Econometric research conducted from the mid-1990s has confirmed the positive impact of measures of this capital on economic growth. Family ties capital—the so-called family social capital—is an important component of social capital

The aim of the study is to estimate the impact of „family social capital" on economic growth. We hypothesise that marital dissolution (measured by the rate of divorces to marriages) expresses decrease in the capacity for cooperation, collaboration and sharing responsibility not only within the family but also on a professional plane (this applies to adult working family members). Thus, an increase in the divorce to marriage rate is accompanied by a slowdown in economic growth.[2]

The divorce rate is not seen here as a direct cause of the slowdown. The reasons stem from the breakdown of cooperation and collaboration, as well as increased risk, trust reduction, and the shortening of the decision-making time horizon accompanying divorces and resulting from divorces. These phenomena directly affect adults, the working members of the family in which a divorce takes place. According to the main hypothesis, their impact is transferred to professional life and concerns employee teams.

For the study, we use econometric models, the first one for Poland and the second for 15 European Union countries, for the period 1993–2017.

[2] It seems that this hypothesis was confirmed for the first time by Sztaudynger (2009).

4.2. Social Capital, Family Social Capital and Economic Growth

Social capital is usually defined as the capacity for altruistic cooperation (Coleman, 1988) or connections among individuals— the social networks and norms of reciprocity and trustworthiness that arise from them (Putnam, 2001). This has a positive effect on economic processes.

The positive impact of social capital in economics can be explained as follows. Firstly, in conditions of incomplete information, the transactions concluded are not Pareto optimal. Due to more frequent social contacts, business entities increase the pool of available information, which allows them to „get closer" to the Pareto solution (Durlauf, Fafchamps, 2005).

Secondly, the positive effects of social capital, especially trust, are postulated by game theories (Durlauf, Fafchamps, 2005, p. 1655; Paldam, 2000). For example, in the prisoner's dilemma, a standard solution is that both players cheat. When both sides trust each other, the optimal solution is possible—cooperation.

Thirdly, based on many models, human capital is an important factor in economic growth. Empirical research indicates a strong positive relationship between social and human capital (Glaeser, Laibson, Sacerdote, 2002).

The assumption about the beneficial influence of social capital on the economy, including economic growth, has been verified empirically. Knack and Keefer first found a strong association between trust and the long-run growth rate.[3] Zak and Knack (2001) claim that an increase in the percentage of people declaring trust in most people (so-called generalised trust) contributes to an increase in economic growth. Beugelsdijk and van Schaik (2005) argue that economic growth positively depends on social capital measured by the percentage of people belonging to voluntary social groups (associations, etc.) or working on a voluntary basis. In our earlier studies, we confirmed the impact of crime and voter turnout on economic growth.[4]

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[3] Knack and Keefer's (1997) research employed data taken from the 1981 and 1991 WVS (World Value Survey) for 29 countries from different continents, operating within market economies.

[4] Cf., e.g., Paszkiewicz, 2011; Sztaudynger, 2005.

Family social capital—family ties capital—is a special type of social capital.[5] The family can develop the capacity for altruistic cooperation, strengthen trust and contribute to increasing the density of social networks—and, thus, to increasing social capital. This view is present in the literature. Slany (2003) claims that:

> the family is the most powerful social capital; its formation is and should be the most important type of investment in social capital.

The family motivates economic, social and cultural activity (Kocik, 2006).

Liberda (2000) shows that the savings rate increases as the number of people in the household increases. Similarly, Anioła-Mikołajczak and Gołaś (2014) estimate the propensity of the household to save (i.e., to declare they have any positive amount of savings). The result shows that the probability of having savings is highest among the households of married people.

The study focuses on the impact of family social capital, measured by the divorce to marriage ratio, on economic growth. We interpret an increase in the number of divorces in relation to marriages as a decline in family social capital. This relationship may express, among others, family, social and economic cooperation as well as uncertainty and the risk present in people's lives (Sztaudynger, 2009, pp. 191–192). Giddens (1991, p. 17) points out that for many people a divorce results in a loss of „confidence in their own judgements and capabilities [...], [they] become discouraged about setting long-range or even short-range goals, much less working towards these goals".

Therefore, we **put forward the hypothesis that increased marital dissolution** (the number of divorces related to marriages) **causes a slowdown in economic growth**. In our study, this rate also acts as an indicator of the breakdown of families. The divorce rate is therefore correlated with an economic slowdown, not as a cause but as a representative of the real cause, which is the breakdown of families.

In the tradition of most societies, marriage is the most public and solemnly concluded cooperation agreement. The importance of this

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[5] Gary S. Becker, a Nobel laureate, made an important contribution to combining family and economic problems in *A Treatise on the Family* (1993).

agreement is that it is concluded for an infinite period (in Christian marriages: „till death do us part"). The contract is recognised by the state, as it is registered by relevant institutions, and its dissolution usually requires a court decision. Divorce, i.e., the failure to honour the special contract which a marriage is, calls into question the adherence to other contracts by a given person after the divorce, undermining the trust in him or her. In particular, it may undermine trust in the performance of the contract of employment and any obligations related to it.[6]

Every economic relationship or activity is a result of an interaction between people. Hence, the great significance of relationships between people and the quality of their lives created together.[7]

The role of financial resources in quality of life is important, and in Poland even more so, due to the fact that income differentiation has increased by about 50%.[8] It is obvious that quality of life depends on many other factors, especially family relationships. These relationships are characterised by emotional closeness, strong feelings, though not always positive, care and help, or lack thereof, love or hatred. The quality of a person's life is created in the circle of closest people, the immediate circle, the family, and family relationships are, among others, also based on material factors, though mainly on mutual feelings of love, acceptance, respect and the accompanying propensity for help, honesty and trust.[9] These values may grow with special intensity or be destroyed in families and in relationships with children.[10]

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6 Keeping agreements was considered the most important element of employee-employer communication (approx. 75%). It was more important that, among others, trust, reliable information and substantive preparation (based on a survey of over 1,200 people) (Fedorczuk, Kliszko, Męcina, 2009, pp. 70–72).

7 In the resolution of the Congress on the 100th anniversary of the Polish Statistical Association (Poznań 2012) the quality of life study was defined as the main task of statistics and economics.

8 As a result of the economic transformation after 1990, income differentiation grew until 2006.

9 One-eighth of economic growth in Europe depends on willingness to help, honesty and trust (Sztaudynger, Ambroziak, Starosta, 2022, as well as Chapter 3).

10 The term "relational capital" is often used in this respect, and it is emphasised that there is no substitute for it, and it cannot be bought with money.

A negative family and marital scenario includes reluctance to help, selfishness, dishonesty and a lack of trust, leading to a loss of sense of security, the dissolution of marriage, a low fertility rate and divorce,[11] to impermanence of life. Therefore, we do not mean just any family but the family with the above-mentioned values. These values are undoubtedly determinants of a eudaemonistic attitude which is accompanied by greater satisfaction with life. This is confirmed by *Social Diagnosis* 2015:

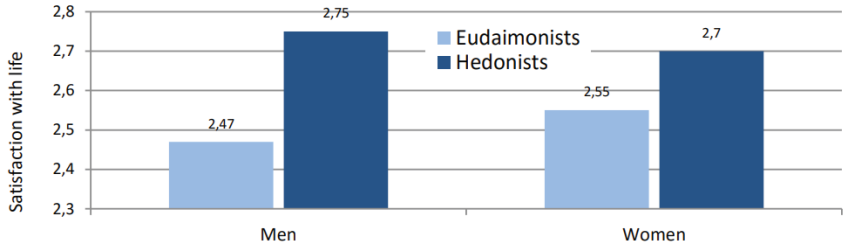

Figure 1. Life satisfaction according to eudaemonists and hedonists

Note. Life satisfaction on a scale from 1 ("my life is wonderful") to 7 ("my life is horrible"). Adopted from (*Social Diagnosis* 2015) and (Czapiński, Panek, 2015, p. 208)

To sum up, we will analyse family social capital and its impact on GDP growth using publicly available information on marriages (positive factor) and divorces (negative factor) to estimate family social capital. In a future investigation, we are going to introduce fertility as a third measure of family social capital.

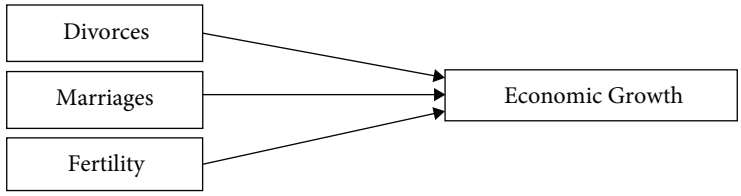

Figure 2. Family-related factors of economic growth

We put forward the hypothesis that these measures have an impact on GDP growth.

[11] Of the factors listed here, only divorce and fertility are observable (statistically recorded).

4.3. Divorce and GDP

This section describes the empirical models verifying the effects of divorce on economic growth. We conduct two empirical studies, both based on a similar specification of an econometric model explaining GDP growth. The first one is based on data for Poland, while the second— is based on data for 15 European Union countries (which formed the EU before 2004). Both models were estimated using annual data from 1993 to 2017.

The number of divorces related to the sum of marriages and divorces (divorce rate—div) is presented below.

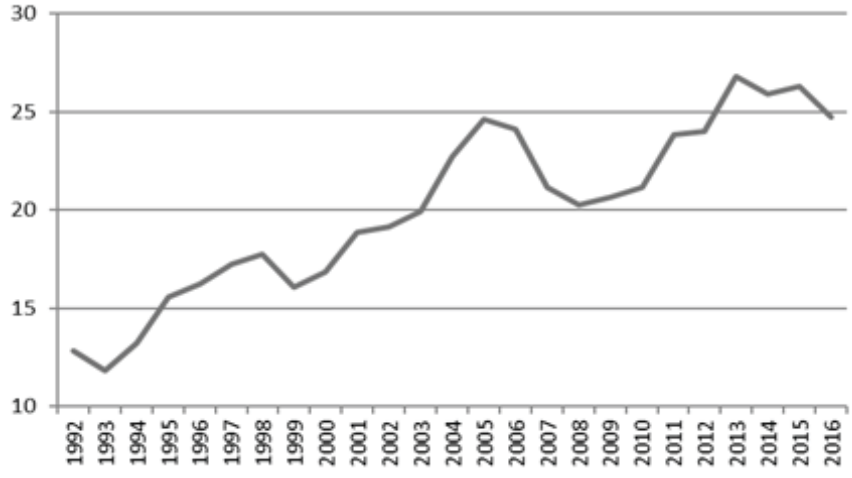

Figure 3. The number of divorces to the sum of marriages and divorces between 1992–2016

Note. Adapted from the Polish Central Statistical Office data

It can be noted that the number of divorces to the sum of divorces and marriages in the analysed period increased.[12]

We assume that economic growth depends first of all on investments in physical capital and—in order to verify the research hypothesis—on the divorce to marriage rate as a measure of the breakdown of family capital.

[12] Similarly, this indicator is seen to have increased in 15 countries of the "old" European Union. Throughout the entire study period, however, it remained at a higher, "worse," level than in Poland.

Due to the possible existence of a reverse relationship (the impact of economic growth on divorce decisions), the divorce to marriage rate is lagged by one year, which means that the study takes into account, according to Granger's concept of causality, only the direction of causality assumed at the beginning (the impact of marital dissolution on economic growth).

As a result, the following formula has been adopted:

$$\Delta GDP_t / GDP_{t-1} = \alpha_0 + \beta_1 \Delta inv_{t-1} + \beta_2 div_t + \varepsilon_t$$

where:

$\Delta GDP_t / GDP_{t-1}$ – *GDP* growth rate at constant prices (%),

div – the rate of the number of divorces to the sum of marriages and divorces (%),

Δinv_{t-1} – the investment rate in physical capital (the share of investments in physical capital in the gross domestic product) (first difference, in %),

ε_t – error term.

The results of estimates for Poland based on a sample of annual data for the years 1993–2017 are presented below:

$$\Delta GDP_t / GDP_{t-1} = \underset{(5.1)}{7.1} + \underset{(2.4)}{0.437} inv_{t-1} - \underset{(2.0)}{0.136} div_{t-1} - \underset{(2.6)}{3.2} u2001$$

$$R^2 = 0.410 \quad S_e = 1.4 \quad JB = 0.49 \quad ADF = -3.2$$

This model also has good statistical properties, all variables are statistically significant, and the distribution of random components is normal. The residuals of this equation are stationary (with probability 0.96, ADF test statistics = –3.26).

A similar model has been estimated for 15 EU countries using annual panel data for 1993–2017. The results, based on the fixed effects[13] approach, are:

[13] Similar results have been obtained by using a random effects model. The results are available from the authors upon request.

$$\Delta GDP_{i,t} \Big/ GDP_{i,t-1} = \underset{(6.0)}{4.3} + \underset{(5.9)}{0.620} inv_{i,t-1} - \underset{(3.2)}{0.078} div_{i,t-1}$$

$$R^2 = 0.124 \qquad F_{fixedeffects} = 4.9 \; (pvalue < 0.001)$$

This model also has good statistical properties, i.e., all parameters (including fixed effects) are statistically significant.

The parameter signs of both the model estimated for Poland as well as the one for 15 EU are consistent with the theory (a positive effect of lagged investment and negative for lagged divorce ratio).

The results both for Poland as well as the panel of 15 EU countries confirm the hypothesis about the long-term negative impact of divorces on economic growth.[14]

An increase in the divorce to marriage rate permanently slows down the GDP growth rate. The results for the European Union are stable—similar results have been achieved in other versions of the model (e.g., using the dataset starting from 1964).

The interpretation of the effects of our main variable, the divorce rate, is as follows: An increase in the divorce rate of 1 percentage point causes a slowdown in economic growth in Poland and 15 EU countries (of approximately 0.14 percentage point and 0.08 percentage points, respectively).

Table 1. Comparison of divorce rate impact on economic growth (1933–2017)

Variable	Poland		EU15		Conclusion
	parameter	t-stud	parameter	t-stud	
Div	-0.14	-2.0	-0.08	3.2	1.7-times stronger effect in Poland

Comparing the estimations presented for Poland and the EU15 countries shows that the divorce-related slowdown in GDP growth in Poland is 1.7-times stronger than in 15 countries of the „old" European Union.[15]

[14] As in the previous studies for Poland (cf. Sztaudynger, 2009).

[15] The approximation of this comparison results from different periods of analysis, different methods of OLS estimation and fixed effects, as well as the

It seems that it can be concluded that in Poland there is a stronger reaction of economic growth to divorce. This can be explained by the great importance traditionally attributed to the permanence of marriage in Poland, strongly rooted in Catholicism and other Christian religions.

4.4. Opponents' Arguments and Our Responses

Several reservations have been made regarding the hypothesis about the impact of marriage and divorce rates on economic growth.

(1) "The relationship between marriages, divorces and economic growth is symptomatic—it is an apparent relationship and not a cause-and-effect one." We believe that the resolution of this dispute may take place through a discussion preceding the estimation of the model. Significant estimates of the parameters at the marriage breakdown coefficient confirm the analysed hypothesis to some extent. They cannot, however, overcome the suspicion that the relationship is only apparent. In our previous research (Sztaudynger, 2009) as well as here, the basic argumentation presented is as follows:
   - family life is very important for most people;
   - marriage is a particularly long-lasting (for many people it is indissoluble) agreement on cooperation and collaboration, and divorce is an extraordinary violation of this agreement; thus, for many family members it is a great failure;[16] and, according to Wallerstein and Blakeslee (1989), time does not fully mitigate the effects of this event;

possibility of only partial standardisation of variables (i.e., the investment rate, the inflation rate, the ratio of the number of divorces to the sum of marriages and divorces).

[16] "For females, odds of completion were reduced 34% and 73% for those who experienced parental divorce or paternal death, respectively" (Sapharas, Estell, Doran, Waldron, 2016, p. 867).

- a large number of marriage decisions in relation to divorce decisions shows a strong social inclination to establish cooperation not only in families but also in the workplace, i.e., it indicates a high tendency to cooperate (Starosta);
- the ability and willingness to cooperate (and have trust in other people) stimulate economic growth.

(2) „The impact of the marriage to divorce rate on economic growth is only apparent." One can use causality tests, although the possibility of resolving this doubt is limited. Due to the fact that a pre-event can be the cause but cannot be the effect of the following event, our results may indicate that the breakdown of the family, as represented by divorce, may cause an increase in an economic slowdown (regardless of whether the opposite direction exists). The Granger causality test allows us to state with a high probability (the order of 0.98) that martial dissolution (represented by the divorce rate) is the cause of the evolution of economic growth rate (in Poland).[17]

(3) „In fact, there is a reverse relationship: the economy and economic growth have an impact on families, marriages and divorces." Agreed. A reverse relationship of the influence of the economy on the family also occurs. The divorce rate was dependent on lagged economic growth (negative impact), wage differentiation (positive impact), and the economic level (positive impact).

(4) As we have already mentioned, due to the fact that in the presented models the family breakdown coefficient is lagged, one can rule out the fact that the analysed models express a relationship opposite to the relationship present (such a danger could occur if there was no lag in the model). However, the possibility of an apparent correlation still exists.

(5) „Modern enterprises base their development on total availability, which means that young workers can hardly start families, have children, etc."—Czyżewski.[18] This is the argument-hypothesis regarding

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[17] The cause in the Granger terms. This test does not exclude the possibility of only apparent correlation.

[18] Czyżewski notes that this phenomenon, marked mainly in the post-1989 period, is often perceived by right-wing oriented people as anti-family

a negative impact of employee availability (and economic growth) on the number of marriages.[19] However, the martial dissolution coefficient we use also expresses the divorce rate. In the light of the obtained results, the impact of economic growth on the non-marriage rate is weaker than its impact on reducing the divorce rate. In further studies, we will attempt to introduce two variables; marriage and divorce variables.

(6) A more general hypothesis of substitutability can be formulated (Work-Family Conflict): the better the employee, the worse he or she is at fulfilling his or her family roles. We have formulated and confirmed the reverse hypothesis – let us call it the hypothesis of complementarity[20] (or Work-Family Balance): **the more successful an employee is in the workplace, the better he or she is at fulfilling his or her family roles** (Sztaudynger, 2009, Appendix 1) **and vice versa**. In fact, substitute and complementary situations overlap. The obtained results allow us to suppose that **the situations of a dynamic economy supporting the family in a complementary manner dominate and vice versa**.

(7) "Changes in legislation regulating marriage, divorce and separation." Agreed. The obtained results allow us to conclude that the changes have been so marginal that a study of the influence of the marriage breakdown coefficient on economic growth is possible. Let us add that the interactive variable expressing the introduction of separation in 2000 has proven to be irrelevant.

(8) Like the arguments presented in point 7, one can observe that the marriage to divorce rate changed due to the demographic situation.

(9) "After a divorce, women are more likely to take up work and work more efficiently, which contributes to GDP growth." One of the reasons for this is economic coercion or the desire to preserve

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capitalism. This issue will be examined in the equation where the divorce rate will depend on economic growth.

[19] The rate of marriage breakdown will then grow (as with the increase in the number of divorces).

[20] According to Czyżewski, from a conservative point of view, one could talk about pro-family capitalism in this respect.

the „pre-divorce" standard of living. Workload and household duties are, in this situation, excessive and devastating (Wallerstein Blakeslee, 1989). It can be assumed that in the short term there will be a positive effect on economic growth (it would be a substitution effect), while in the long term the effects will probably be negative (a complementary effect).

The positive effect is, in this case, a statistical illusion. For example, a woman did not work professionally before the divorce, looking after a pre-school child. After the divorce, the woman takes a job (GDP growth), and the child is sent to kindergarten (also GDP growth). If the child had better care at home than in kindergarten, the second increase in GDP is a statistical illusion because the statistics do not include housework in GDP. However, if housework is transferred to service institutions, then it is included in GDP.

(10) „After a divorce, an extra flat is needed for one of the ex-spouses, sometimes a second car. Therefore, demand grows, especially for durable goods." It is true, but it is possible only with an increase in the income of the ex-spouses. Meanwhile, many studies show that a so-called marital premium exists—higher incomes of spouses, especially husbands, in comparison with divorced people.[21]

It is worth mentioning that a positive influence of the divorce rate on investments was found for Poland, which accelerates economic growth. At the same time, the direct negative impact of the divorce rate on economic growth is ten times greater, and therefore the total impact is negative (Sztaudynger, 2009).

(11) Many arguments (including points 6, 9 and 10) refer to the divorcing spouses and the consequences that impact them directly. It seems that **indirect** effects are more significant, understood as an increase in the sense of marital and family insecurity in people who are in contact with the divorcing couple. The increase in uncertainty, the fear for the permanence of one's marriage and the fear of making a decision about a marriage negatively affect the integration of all families, causing a drop in quality of life. This, in turn, reduces labour productivity and slows economic growth.

[21] An overview of such research is found, among others in Stolarska (2013).

(12) Due to the fact that the relationship of cooperation is a feedback relationship, the above-mentioned unfavourable phenomena **indirectly** affect entire employee teams in which people from families affected by divorce work or which are managed by them.

(13) A large number of divorces are characterised by the instability and deterioration of interpersonal relations in all families, and not only those that were directly affected by the divorce (just as high mortality testifies to the poor state of health of the whole society). We assume that a large number of divorces in relation to the number of marriages is a symptom of deteriorating interpersonal relationships in **all** families and workplaces.

(14) Growiec (e-mail of July 5, 2009) points out that in sociology, family social capital is measured by the frequency of contacts with the family, excluding the spouse. Thus defined family capital is included in the **bonding** capital which is supposed to slow down economic growth (Putnam, 2001; Sabatini, 2006; Growiec, Growiec, 2010).
We, on the other hand, suggest measuring the permanence and quality of family relationships by means of the frequency of marriages in relation to the frequency of divorces. A marriage is the beginning of a new, traditionally understood family. A divorce is not the end of the family, but a manifestation of a very serious crisis within it. That is why **we propose that it should be one of the measures of family social capital**. We assume that an increase in family social capital in the measure we have adopted—the marriage to divorce rate—is characterised by readiness to build lasting ties and cooperation between people (future spouses), as spouses usually do not know each other beforehand, since they often come from different social, national groups, etc., while a divorce is the dissolution of ties and cooperation between the potentially closest people (culturally, emotionally, institutionally, traditionally, religiously), i.e., spouses. The adopted measure thus characterises the **bridging** of family social capital.

(15) The main conclusion of our considerations is as follows: the interdependence of the family and the economy means that sustainable growth **requires** the protection of the family environment. Coworkers **should,** therefore, support each other in fulfilling family

roles. Employers striving to integrate employees **should not** do so at the expense of their families. All of these **obligations** will be justified by the interdependence of the family and the economy.

In relation to this conclusion, the objection is made that it is of an evaluative nature, and therefore it is not a scientific judgement. However, it should be noted that we use the term **should** in the context of economic consequences for economic growth.[22] This is, of course, only one among many of the negative dimensions of the influence of an impermanent family on the lives of each of us.[23] Acceptance of the proposed approach and the obtained results provide arguments for the traditional family model.[24] According to Dzionek-Kozłowska, „[…] it is impossible to formulate independent recommendations on current problems that are utterly detached from values" (2006, p. 76; cf. also Dzionek-Kozłowska, Matera, 2015, p. 21; Dzionek-Kozłowska, 2018, p. 203).

According to Popper's rule, theories are scientific only if they are falsifiable. The condition of falsifiability is the formulation of a prediction based on a given theory that, in certain circumstances, something will or will not occur. If we are not able to formulate such predictions, it means that the theory is unfalsifiable (impossible to refute on the basis of empirical tests).

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[22] This has been verified econometrically. The model can be used for forecasts. These arguments are of importance only to readers who consider the analysed relationships to be cause-and-effect and not only apparent.

[23] The recommendations of sociologist Krystyna Slany (2003, pp. 49–50) are similar, as she states that: "Significance **should** be restored to the marriage and family. Reconstruction **should** be carried out by families themselves, the church, neighbourhood groups, the mass media, and not by state subsidies or government programmes [...]. It **should** be supported, and its universal values **should** be emphasised. After all, it is the basis of our existence, the foundation of our morality and the foundation of social organisation. The family is the most powerful social capital; its formation is and **should** be the most important type of investment in social capital."

[24] If we were to justify the thesis that it is necessary to care for the survival and sustainability of nature, the natural environment, because it serves sustainable growth and quality of life, the objection referring to unscientific contexts of worldviews would surely not be formulated.

4.5. Conclusions

An important component of social capital is family ties capital—the so-called family social capital. In the paper, we hypothesise that the breakdown of family social capital (expressed as an increase in the divorce rate—the number of divorces in relation to the number of marriages) slows down economic growth.

In order to verify this hypothesis, we applied two econometric models, estimated for Polish as well as 15 European Union countries (both for the period 1993–2017). These econometric analyses allow us to confirm the formulated research hypothesis. In the model estimated for 15 European Union countries, an increase in the divorce rate of 10 percentage points reduces the rate of economic growth by approx. 0.8 percentage points. In turn, on the basis of the model estimated for Poland, it can be concluded that the same increase in the divorce rate causes a slowdown in economic growth of approx. 1.4 percentage points. These results are, to a large extent, comparable due to the similar specification of the models and the same time period.[25]

We received stronger effects of marital dissolution for economic growth in Poland than for 15 European Union countries. These differences can be explained by the greater significance of the family's permanence in Poland, which results from its culture, tradition and the special role of religion.

The confirmation of the hypothesis about a negative impact of marital dissolution on economic growth can also be interpreted as a lack of contradictions between ethical values (the attitude to family and relatives) and economic goals (economic growth) at the micro and macro scale.

The study ignores the most important and the most difficult problem—the responsibility of adults towards children. It can be assumed that in addition to the „current" impact of divorces on working adults,

[25] Preliminary results of estimates for Poland indicate that the strength of the negative impact of marriage breakdown on economic growth decreases over time (this thesis was put forward by Czyżewski, on June 22, 2009). If a similar phenomenon occurs for the 15 EU countries, then comparisons should concern the same period.

it also has negative effects on children, i.e., the next generation.[26] In this case, a divorce could again reduce labour productivity when work is undertaken by people who were affected by divorce as children.[27]

And it is necessary that not only those who—as they argue—"have the right to life, to happiness and self-realisation" but also victims of this legalised egoism should talk, write, and express opinion on this threat [to the family—J.J.S.] and on their own fate [...]. Children [...], deprived of true love, hurt at the beginning of their lives, should talk about it., (John Paul II, 1987)

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[26] The first part of this negative impact consists in reducing the learning outcomes (cf. Sapharas, Estell, Doran & Waldron, 2016). This results in a permanent reduction of human capital, followed by a slowdown in economic growth.

[27] The study of such dependence seems possible on the basis of panel data (5–10 years).

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Chapter 5

Family and Economic Growth in Poland New Estimation Results*

Jan Jacek Sztaudynger

Abstract

Economic growth is mostly explained by investments and employment growth. Since the mid-1990s various social categories have been introduced into economic growth analysis, such as trust, crime, and income inequality, among others.

According to sociology and psychology, it is the family that constitutes interpersonal relationships and it is an indicator of happiness and quality of life. It can be said that happy people better fulfil their social roles and work better. We put forward the hypothesis that family ties have an influence on economic growth. More precisely: the more divorces (relative to existing marriages) there are, the slower economic growth is.

This hypothesis was confirmed in an analysis of Poland's economy between 1995 and 2017. Due to the disintegration of family ties measured by the divorce rate, Poland's annual economic growth slowed by

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an average of about 1 percentage point. This estimation is based on the productivity (GDP to labour ratio) growth model, which, along with the divorce rate, also includes the investment and new marriage rates.
Keywords: economic growth, family, Work Family Balance, econometric model, marriage, divorce
JEL Classification: O41, O47, O11, A13, C01

To My Loved Ones – My Family

5.1. Hypothesis: Unstable Families – a Slowdown in the Economy?

An important component of social capital is family social capital, i.e., family ties capital. So far, family capital has been sporadically introduced into econometric models of economic growth. It was as if society was important, and the family – the immediate environment – was less important, or even not at all.[1] I attempt to use the statistics of marriages, divorces and fertility as measures of family social capital, then examine the links between these categories and economic growth.

Parallel considerations of family and economy constitute a formalized, model look at Work–Family relations. My main hypothesis assumes the dominance of balance over conflict. In model terms, it is the hypothesis about the dominance of balance, i.e., that a well-functioning family fosters the economy and vice versa. The parameters that describe these interactions should be positive.

I believe that an analysis of the economy separated from the family is an oversimplification. This is not a new point of view. When referring to the stoic concept of proper conduct and Aristotle's conception, Smith (2006, p. 250) said that:

[1] One can guess that this incorrect gradation of importance is a result of the conviction that the strength of family ties is not suitable for statistical measurement.

[Among] those primary objects which nature had recommended to us as eligible, was the prosperity of our family, of our relations, of our friends, of our country.

The most lasting relationships that connect people are family ties, i.e., between spouses, parents and children, grandparents and grandchildren, and siblings. The permanence and importance of family relationships stem from tradition, culture, religion and the institution of marriage.[2] The permanence and strength of parents' relationships with children additionally depend on organic maternal and paternal ties.[3] We love (or hate) most often and in the most lasting manner, and we are loved (or not) in the family; the quality of our lives, as well as a sense of happiness and security, are dependent on family ties.[4] It seems that relationships with people outside of the family circle are weaker and cannot replace family ties, due to a lack of „irrevocable" kinship and institutional character, as well as the weaker cultural and religious support of their permanence.

The basis of the family is marriage.[5] Sources of family permanence are derived mainly from the unbreakable nature of blood ties and the legal institutionalisation of marriage. The permanence of marriage is strongly

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[2] Kocik (2006, p. 60) points to the fact that "*the institution of marriage and family has often been more important than religion, ethnicity, civic background or nationality, as they have been changed for the sake of sanctioning of the marriage and family.*"

[3] Similarly, one can see the role of such ties in the relationship between grandchildren and grandparents.

[4] Smith (2006, p. 198) states that; "*After himself, the members of his own family, those who usually live in the same house with him, his parents, his children, his brothers and sisters, are naturally the objects of his warmest affections*." Zubrzycka (2006, p. 95) justifies the importance of love in the family by saying that love creates the readiness for mutual understanding and respect, allows one to provide and feel a sense of security, and generates loyalty in sharing work and responsibility. Adamski (2002, pp. 41–42) claims that above all in the family man can satisfy *the need for feelings* and this has a huge impact on people's attitude and life activity.

[5] A traditional family consists of spouses and their children (including adopted children); as well as people related by affinity or consanguinity. Attempts are made to extend the scope of the family concept to include cohabitation.

supported by tradition, culture and, especially in Poland, by religion.[6] Catholicism gives marriage the rank of an indissoluble sacrament. John Paul II in *The Letter to Families* emphasised that man „*cannot 'fully find himself except through a sincere gift of self*. […] *The gift of the person must be lasting and irrevocable*" (p. 11).[7] In a context wider than the one related to the family, John Paul II asked: „*Can an individual find complete fulfilment without taking account of his social nature, that is, his being »with« and »for« others?*"[8] A family breakdown, and in extreme cases, a divorce, is a crisis in the life of each of the spouses and theirs loved ones. It is he crisis of family now and in the future generations, the crisis of humanity.

Kocik (2006) states that the family „*…links the human being in all phases of life with society, culture, nation, and social class. It motivates economic, social and cultural activity, it shapes the personality traits of man*". Similarly, Tyszka (1980, quoted in Kocik, 2006, p. 59) writes that the micro-world of the family is integrated into the system of general social, economic and cultural processes of a given country.[9]

In English, the concept of the family is more akin than in Polish to the concept of household.

6 The role of religion was already emphasised by Smith (2006, p. 15): *"…The administration of the great system of the universe, however, the care of the universal happiness of all rational and sensible beings, is the business of God and not of man. To man is allotted a much humbler department, the care of his own happiness, of that of his family, his friends, his country."*

7 *The Letter to Families* is not of a scientific nature, it is cited as an illustration of the position of the Catholic Church, which significantly affects people's attitudes. The importance of the family is in fact smaller for people who declare a low participation rate in religious practices. Cf. Centre for Public Opinion Research (2008, p. 5).

At the turn of the 20th and 21st centuries, strong attacks on the institution of the family were carried out at the UN forum. In the documents of UN special sessions, attempts were made, among others, to replace the word *family* with the word *partnership*. An important role in blocking these attempts was played by the Polish representatives. Cf. Kropiwnicki (2008).

8 The question was asked by John Paul II during the celebration of the World Day of Peace in 2005 (p. 3).

9 Kocik (2006, p. 59) adds that *"the analysis of family life cannot be limited only to matters within the family but must also concern the external relations of the family – its embedding in society, its structures, processes and culture."*

"…married people are happier than single people, have higher incomes, experience warmth and emotional support, [...] live longer than single people" (Slany, 2003, pp. 41–42).

*"…*A 'good family' creates the best environment for primary, deepest socialisation, providing an irreplaceable source of a sense of security and stability for the individual, as well as an inspiration for development and self-realisation*"* (Kocik, 2006, p. 314).

In the four above-mentioned statements, the motif of the relationship between the family and the economy as well as the development of an individual – the development of human capital in the long run – can be seen.

Already A. Smith claimed that the permanence and importance of the family are diminishing due to the development of civilisation associated with the growing legal protection of man of even the „most humble station".

A modern attempt to describe the decline in the importance of the family is the theory of the second demographic transition (dating back to around 1960). This transition involved an individual's pursuit of self-realisation and autonomy, the rejection of traditional values for the benefit of the liberal ones, and improved of the living conditions because of the development of services and technical progress. Among other things, these improved living conditions make life on one's own easier and reduce the interdependence of family members. As a result of the second demographic transition „…the family and child are less important than a couple or an individual". The increase in the importance of alternative relationships for the family is evident (Slany, 2003, p. 31).

We will measure decreasing family capital by the ratio of divorces to existing marriages.[10] We treat this relationship as an indicator of:

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[10] As the number of couples who live together outside of a formal relationship (cohabitate) grows.

It can also be argued that 40% of such couples become married (in the USA, according to Castells). Of these marriages, up to 50% end in divorce (cf. Slany, 2003, pp. 43–44). Hence, it can be assumed that one of the reasons for the growing phenomenon of divorces is rising popularity of cohabitation which results in less durable marriages. Slany (2003) notes that cohabitation unions are not invested in (emotionally and materially, including children), whereas

(1) an unstable family,
(2) the weakening of family ties (family capital),
(3) the weakening of family and social cooperation skills (including economic and professional ones),[11]
(4) the increasing uncertainty and risk in people's lives,[12] as it is impossible to fully replace family relationships with people outside the family circle.

In Poland, in 2019, there were approximately 180,000 marriages, 120,000 less than at the beginning of the 1980s. On the other hand, the number of divorces increased in this period from approximately 40,000 to 65,000.

Not every divorce reduces family social capital. When there is a long-term conflict between spouses, when the marriage does not sufficiently fulfil important functions, when it does not provide attention, safety, and care, and it does not satisfy emotional needs, a divorce is a lesser evil than staying married at any price.

In practice, determining the line beyond which the spouses should divorce is infinitely difficult. This difficulty results from the need to consider the interest of all family members, including children,[13] not only during the divorce, but also later – until the end of their lives, and even the lives of subsequent generations.

"…in the case of marriage, there is certainty that the investment is legally and socially protected" (pp. 44, 49).

[11] Paweł Starosta drew attention to this aspect during a conversation we had on November 19, 2008.

[12] *"The family has an enormous social value ... as a factor that stabilises individual and social life"* (Kocik, 2006, p. 63). The family's tasks include, among others, "...providing all of its members with a sense of security and respect" as well as appropriate material conditions (cf. Zubrzycka, 1993, p. 97). Both tasks are very important for the effective participation of people in the creation of the product.

[13] The interest of children is particularly difficult to determine, especially when children are not grown up. Then adults try to express the interest of children, as a result this interest is not usually sufficiently represented (cf. Wallerstein and Blakeslee, 1989).

We hypothesize that the weakening of family ties, measured by the frequency of divorces, resulted in a slowdown in economic growth in Poland.[14] We will verify this hypothesis using an econometric growth model in which there are also other variables: investments, inflation and crime.

5.2. Family Social Capital

Social capital can be described as the potential that results from the closeness of interpersonal relations and the strength of social bonds, which serve social interests and not only group or individual interests.[15]

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[14] Several discussants (e.g., Czyżewski) rightly see the need to explain also the divorce rate, i.e., the need to analyse the mutual impact between family breakdown and economic growth. The results of estimating the inverse relationship are included in the Appendix. The divorce rate was positively significantly related to the Gini coefficient (wage inequality) with lags of two, three, and four years, as well as with GDP per capita. It was negatively correlated with GDP growth per capita lagged by two, three, four, five, and six years. (cf. "Divorce and Economic Growth...", 2008).

[15] The line between the group and social interest is very difficult to draw practically. The social interest can be identified with the common good. Following Gryżenia (2007), the common good will be understood as "[...] the integral and full development of [each] human being, realised in shared life, taking into account and using material resources," i.e., the conditions and limitations of social life. Human development, in the framework of the common good, provides man with knowledge, love, and freedom. "Full development, both physical and mental, can only be achieved in the framework of participation in social life. [...] Members of society united by a common goal, renouncing a certain range of rights, gain other goods that they could not achieve without social coexistence." A special common good is the national common good, which, I think, in economic terms, is closely related to economic patriotism (cf. Koźmiński, 2008). According to Koźmiński, this patriotism should be based on building a competitive advantage, not on protectionism. The family is the cradle of patriotism and the common good. Both these values are passed from generation to generation. It seems that economic patriotism, including from the perspective of future generations,

Social capital is only partially measurable using many categories. Putnam (2000) distinguishes 14 such indicators, stating that trust in other people dominates among them. It dominates in the sense that it is the most strongly related to other measures. The impact of trust on economic growth has been confirmed by Zak and Knack (2001).[16]

Many researchers have studied the impact of income inequalities on economic growth. If income inequalities are not consistent with a sense of justice in a major part of society, it has a negative impact on interpersonal bonds and cooperation of people in economic processes. It is very interesting to try to determine the income inequality which is optimal for economic growth (more in Chen, 2003; Cornia and Court, 2001, pp. 23–24; Sztaudynger, 2003, pp. 68–71).[17]

Another measure of negative social and moral capital[18] is crime, whose impact on economic growth in Poland has been confirmed (more in Sztaudynger and Sztaudynger, 2005, pp. 68–71).

The influence of a typical social capital indicator – voter turnout – on economic growth in the territorial system has also been verified (Paszkiewicz, 2009).

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involves striving for the economic development of the country (nation) in the long-term to ensure, among others, the well-being of one's own family.

[16] Zak and Knack's research was based on a sample of 32 countries. Their growth model is described in Sztaudynger (2005, pp. 72–74).

[17] Research for Poland, the USA, and Sweden indicates that the income inequality optimal for growth was almost twice as high in the USA as in Poland and Sweden (Kumor & Sztaudynger, 2007; Sztaudynger, 2018).
In Poland, wage inequality has been increasing since 1991 and at the end of the 1990s exceeded the optimal level for growth Cf. Kumor & Sztaudynger, 2007). Kowalik and Kozłowski (2007, p. 15) stated that "Polish capitalism creates wealth for some, but it destroys society. In this sense, it is deeply immoral."

[18] We will not deal with the moral capital that characterizes individuals. Moral capital consists of features such as justice, beneficence, and temperance (Cf. Ratnapala, 2003, pp. 213–233). It also includes honesty and truthfulness, fulfilling agreements and keeping one's word, reciprocity in relations with others, and remembering about one's duties (Cf. Kochanowski, 2002, pp. A8–A9). If each of the cooperating persons is characterized by a high level of moral capital, it contributes to social capital.

Henderson even introduced the term ***love economy***, based on various forms of altruism, voluntary work, social and family cooperation, the selfless care of children, elderly and sick people, respect for the natural environment and the rights of future generations, as well as protection of resources – human and natural ones (Pietila, 1997). Love is understood in this respect as a willingness to selflessly serve other people.[19] The love economy is realised mainly in households, and its 'products' include, among others, strong family ties as well as physical and mental health of family members.

The love economy is based primarily on social capital and, to a lesser extent, on money and financial capital. Man's goal and success are not primarily wealth and profit, but gaining lasting, good relationships and ties with other people,[20] including family members. Homo economicus does not take on the superior role. Smith (2006, p.11) emphasised this in the initial period of man's activity:

> *How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it.*[21]

In surveys, Poles were asked about the most important values they followed in everyday life. *Family happiness* was indicated more than four

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[19] Combining love with creativity seems interesting: creativity should be "understood not only as artistic or scientific activity, but as man's entire fulfilment in love as a person." The self-realisation of a person is the pursuit of something 'new', 'non-existent yet' (Przesmycki, 2002, p. 176).

[20] I think that is why John Paul II said: "earn a heavenly account, not an earthly bank account" (quoted in Półtawska, 2005, p. 25).

[21] According to J. Twardowski (2007, p. 257): "*all sainthood volves a fight against selfishness. This is a lifelong battle for the rest of your life, as it is extremely difficult not to think about yourself*".
Janina Filek (2009, pp. 179–188) points out that Adam Smith as *"the creator of economics defeated the philosopher of morality, and the victorious attitude for eternity set a certain pattern of thinking about man (as homo economicus) and determined the objective relation of man to man."* Above I have sought to present Smith's moralising views.

times more often than *prosperity and wealth*.[22] This can be treated as confirmation of the dominance of the love economy. *For real happiness, man needs a family* – this statement was confirmed by 92% of Poles, while only 6% think that one can live happily without a family (Centre for Public Opinion Research, 2008, p. 3).[23] It is not surprising then that Poles value the family the highest among all values, and that it is the most important life goal (Kocik, 2006, pp. 73–76).

Family social capital (family capital) is understood as the ties between family members that serve their cooperation and are not at odds with the social interest. These ties are expressed in attitudes of respect, trust, love, interest, help and care for family members.

Becker (1976) created the economic theory of the family. He emphasised that characteristics such as honesty, reliability, solidarity, the capacity for cooperation and sacrifice, diligence, and fondness for order are formed in the family. Similarly, Fukuyama (1995) claimed that an environment that is particularly conducive to the emergence of trustworthy people is a well-functioning family. However, all of these features are also very useful in business.

5.3. Several Reasons for Divorce

The destabilisation of the marriage and family is a result of general changes in values: from the traditional values such as a call for duty to the values of self-fulfilment (Mariański, 1997, p. 78).[24] The role of a woman

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[22] The respondents were able to point out some of the most important values they followed in everyday life. 78% indicated *family happiness*, and 18% *prosperity and wealth* (Centre for Public Opinion Research, 2008, p. 3).

[23] This was clearly expressed by actor Jan Nowicki: "…there was no time for people… I paid the highest price for it – I paid with loneliness. A lack of pleasure derived from contact with family" (Jagas, 2008, p. 82). Kępiński (2015) wrote that "the joy of life is brought solely by giving love" (p. 92). Stuhr (2008) claims that: "[...] the family taught me and still teaches openness [...]" without it "[...] I would be a terribly hollow man" (pp. 258–259). And he writes about the strength the family has given him.

[24] Rosset's monograph *Rozwody* [Divorces] (1986) has made a great contribution to the study of the family crisis.

has been dismantled, and her expectations of an equal position in her professional life and in married-family life have been aroused but not satisfied (Mikołajczyk-Lerman, 2006, p. 29).

> "*In the emerging divorce mentality, marriage is not understood as a life-long choice but as a contract... on the mutual provision of services that can be terminated at any time. To some extent, it is an extension of the consumption mentality to marriage and family… and perceiving them as one of many »things« that one can have or not have, according to one's preferences…*" (Mariański, 1997, p. 75).[25]

Mariański calls this phenomenon the mobility of marriage and family. „A marriage is concluded not so much according to the criterion of „till death do us part", but rather „temporarily", if love and affection continue" (pp. 74–75).[26]

The weakening, disintegration, and deinstitutionalisation of the family allows for relatively free decision making, but they do not protect against doubt and uncertainty (more in Mariański, 1997, p. 68 et seq.).

In the post-modern world, there occurs the deinstitutionalisation of marriage, which „...ceases to be the only authorised »place« of sexual activity (the separation of sex from marriage). The protest sexual taboos is made in the name of freedom, progress, autonomy, self-expression, self-fulfilment, social reform, the abolition of restrictions and control. For some[27], it provides the evidence of the unlimited eroticisation of society, the perpetuation of unlimited freedom, a lack of responsibility, dangerous individualism, the sign of the gradual disintegration of family life, and its decadence, while for others it is the pursuit of normality, and even a yardstick of post modernisation" (Mariański, 1997, pp. 75–76).

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[25] Similarities to buying on a whim consumption can be found here.

[26] Other term would be "the unstable of marriage and family".

[27] The estimate of the proportions of both attitudes is provided by a survey conducted in 2006 among French single men aged 18–65. Over half of these men dream of a lifelong relationship with a woman. Only 11% of the respondents indicated casual affairs (Grabowska, 2008, p. A23).

Becker (1990, p. 411) believes that the tendency to divorce is the greater the smaller the importance of „specific investments", including children,[28] acquired knowledge of the partner's habits and views.

Mariański (1997, p. 78) hypothesized that deinstitutionalisation processes affect the marriage more than relationships between parents and children. However, this thesis raises some doubts. Although couples more often live together without marrying, several institutions replace parents and often weaken their relationships with children (nursery, kindergarten, summer camps, extracurricular education institutions, orphanages, retirement homes, nursing homes, etc.). Parents, devoting time to themselves – their professional career, hobbies, recreation, education – are willing to entrust children to these institutions. Similarly, later, adult children devote time to their own pursuits and not to their elderly parents, placing them in care homes for seniors. Also, the pension system provides income for elderly people, making them independent from their children's material help.[29] It can be said that is substitute to the institution of family, especially with regard to its caring functions.[30] Replacing the family in its functions makes it seem less needed. It is easier then to decide about divorce.

5.4. Several Consequences of Divorce

Giddens (1991, p. 17) stated that after a divorce many people „…lose confidence in their own judgements and capabilities and may come to feel that planning for the future is valueless. They sense that life gives hard knocks and is essentially unpredictable; they conclude that the best-laid

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[28] The specificity of such investments lies in the fact that in the case of separating a child from one of the parents, the pleasure felt by the child is smaller (Becker, 1990, pp. 432–433).

[29] Andrzej Kacprzyk drew my attention to the role of the pension system. Cf. also Kocik (2006, p 358).

[30] The analysis of the choice between supporting the family or developing the institutions taking over its functions was carried out by Kropiwnicki (2002, pp. 330–331).

plans go awry and become discouraged about setting long range or even short-range goals, much less working towards these goals".

According to Wallerstein and Blakeslee, the effects of divorce and their durability are underestimated. Most often a divorce improves the situation of at most one of the ex-spouses (more often a man). One of the most important, unexpected by the authors, conclusions is that the biggest losers are the children. „Children of divorce grow up with the notion that love can be transient and commitment temporary, but all children – even those raised in happy, intact families – worry that their families may come undone as well".[31]

Divorced people usually earn less than working people with similar qualifications and positions. Lower earnings result in lower saving rates. In addition, saving rates decrease with the lower number of people in the household, which is a consequence of the divorce.[32] A decrease in saving rates leads to a fall in investment, which in turn slows down economic growth.

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[31] 52 families – ex-spouses and their 110 children – were surveyed in California in the USA in the years 1971–1983. For over 90%, it was the breakup of their first marriages. The study was conducted during the divorce period and then five and ten years after the divorce.

I would like to quote the final part of the book written by Wallerstein, Blakeslee (1989, p. 308): "When six-years old John came to our centre shortly after his parents' divorce, he would only mumble, "I don't know." He would not answer questions; he played games instead. First John hunted all over the playroom for the baby dolls. When he found a good number of them, he stood the baby dolls firmly on their feet and placed the miniature tables, chairs, beds, and eventually all the playhouse furniture on their heads. John looked at me, satisfied. The babies were supporting a great deal on their heads. Then, wordlessly, he placed all the mother dolls and father dolls in precarious positions on the steep roof of the dollhouse. As a father doll slid off the roof, john caught him and, looking up at me, said, "He might die." Soon all the mother and father dolls began sliding off the roof. John caught them gently, one by one, saving each from falling to the ground.

"Are the babies the strongest?" I asked.

"Yes," John shouted excitedly. „The babies are holding up the world".

[32] Liberda (2000) indicates how the saving rate in Poland grows with the increase in income and the increase in the number of people in the household (pp. 87–91).

The social status of a divorced man is worse than the status of a married one and a bachelor, although better than a divorced woman (cf. Gagik, 1989, in Mikołajczyk-Lerman, 2006, p. 54). The fall in the status of divorcing spouses can be explained by their failure to fulfil a very important, if not the most important, role in life. This limits the trust of other people in them and in whether they will be able to meet other important social, professional and family roles.

A divorce is most often associated with the restriction of parental functions of one or both parents. And yet spouses, or former spouses, never cease to be parents. This limitation of parental functions violates the child's right to live in a full family, which, in my opinion, may be considered as a violation of the child's dignity.[33] Bauman (2007, p.338) stated that:

> "*…the life worthy of a human being and the respect a human being is entitled to due to its humanity constitute the highest value that cannot be overridden or compensated for by any other values, even the richest and the most diverse ones; also, and mainly because* ***all other values are values in as far as they serve human dignity, its defence and cultivation.***"[34]

The above-presented considerations make us hypothesise that a stable family is a necessary condition for stable economic growth since:

- it exerts a medium and long-term impact on adult working family members; we will attempt to capture this impact in the econometric model;
- it exerts an intergenerational impact[35] – on children[36] (more than long-term, multi long-term one); this impact will not be described

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[33] Bauman (2007, p. 336) emphasises that "*…dignity is a human invention. Dignity is man's humanity*".

[34] Półtawska links dignity with honour and faithfulness, adding: "yet without faithfulness there is no trust" which allows a person to live. In her opinion, family abandonment is a disaster for everyone (2005, pp. 11–12).

[35] At the 8th Congress of Polish Economists in November 2007, Sadowski recognised a lack of intergenerational analyses as the main weakness of economic sciences. I think that the lack of such analyses is not accidental. In intergenerational analyses, that passes between cause and effect makes it very difficult to carry out the empirical verification.

[36] This is referred to as "investments in children" (mentioned, among others, by K. Slany). The period of such investment is usually from 15 to 25 years

in our model, as this would require the use of long-term (5–10-year) data from many countries as well as a longitudinal and cross-sectional sample.

We hypothesise that the weakening of family ties, measured by the intensification of the divorce phenomenon, has resulted in a slowdown in Poland's economic growth.[37]

5.5. Divorces in Relation to Marriages

The intensification of the divorce phenomenon will be measured by the ratio:

$$divr = div / mar$$

where:
div – the number of divorces in thou,
mar – the number of existing marriages in mil,
divr – number of divorces on 1000 existing marriages will be called the divorce rate.

Divorce rate depends on the age structure of the population and changes in the divorce law. It takes values from the two to nine range.

(from birth to undertaking employment by the child). These investments determine the level of a young person's education, physical and mental health, as well as material resources and the image of the family and family name (family and social capital). A family breakdown and divorce limit all these investments. This means that a young person starts work from the level of lower social and human capital, and thus generates lower production (the comment made by J.M. Sztaudynger).

[37] Next, we intend to examine the strength of family ties measured by women's fertility. Both of these measures are subject to certain fluctuations, having a source in demography – in the differences in the population number of successive generations.

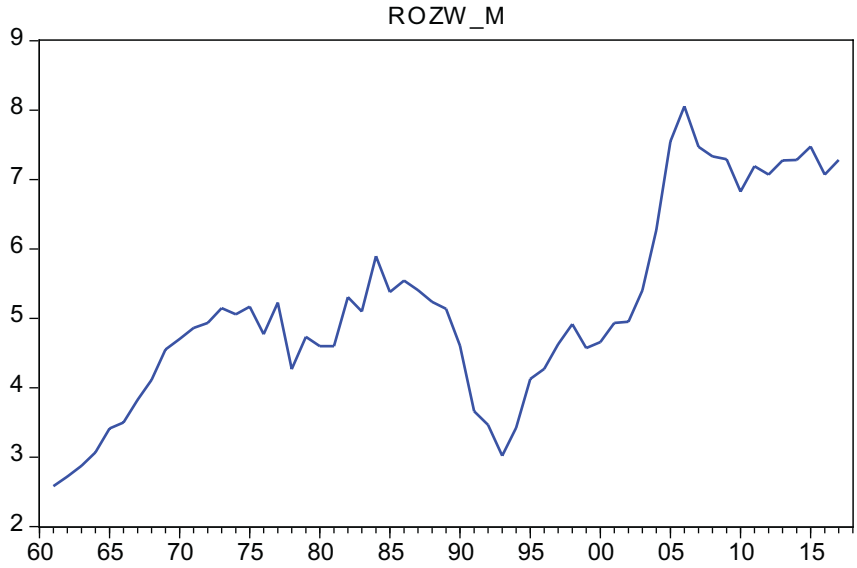

Figure 1. Number of divorces on 1000 existing marriages

Source: own elaboration based on CSO data

The graph shows the family divorce rate between 1960 and 2016. In the considered period, the following can be distinguished:

- the first period of growth until middle of 70-ties,
- the period of stabilisation: 1975 to middle of 80-ties,
- the period of decline: from middle of 80-ties to 1993,
- the only period of rapid growth from 1994 to 2006,
- small decline and stabilization from 2007 to the end of investigated period,
- the third, longest period of growth after 1994.

5.6. Family Social Capital and the Economic Growth Model

The impact of the divorce rate on economic growth is examined based on the labour productivity function:

$$(\dot{GDP/L})_t = \dot{A}_t + \beta(invest/GDP)_t - f(divr)$$

where:
GDP – gross domestic product,
L – labor (number of people employed),
GDP/L – GDP per person employed,
invest – investments,
invest/GDP – investment rate – gross fixed capital formation as a percentage of GDP,
divr – divorce rate,
A – analogue of total factor productivity.

To smooth agriculture fluctuations I use the endogenous variable as two years average. Similarly, all other variables were transformed to two or more years averages.

$$(\dot{GDP/L})_{t,t-1} = 0.13\Delta\left(\frac{invest}{GDP}\right)_{t,t-1} + 0.16(marriar_{t-1} - marriar_{t-7}) + \\ +0.74\sum_{i=1}^{i=4} divr_{t-i} - 0.03(\sum_{i=1}^{i=4} divr_{t-i})^2$$

R^2 = 0.822 S_e = 0,60 *DW* = 2,12 (including constant term) 1995–2017

where:
marriar – marriage rate, i.e., number of new marriages on 1000 existing marriages dots mean growth rates.

The values of the Student's t-statistic are above 2.6, so all structural parameters are significant with a probability of 0.98 or higher.

The divorce rate was introduced parabolically. This allowed me to determine the rate of divorce that is optimal for economic growth. The equation confirms the negative impact of the disintegration of family social capital on labour productivity. The divorce rate occurs with a lag of one, two, three, and four years. On average, the slowdown in the considered period amounted to approximately 0.6 percentage points. The real average labour productivity growth rate in the analysed period was of the order of 3.3%. From the model, it follows that if family disintegration had not been growing, the rate would have amounted to approximately 3.9%.

This model shows the effects of an increase in divorces in Poland between 1995 and 2017. If the number of divorces had not been increasing since 1995 (from 38,000 to 65,000 in 2017), GDP in 2017 would have been approximately 0.25% higher. This means that as a result of the growing number of divorces between 1995 and 2017, six years of dynamic economic growth were lost.

In model our, we are particularly interested in the components that link parabolically an increase in labour productivity rate with the divorce rate:

$$(\dot{GDP/L})_{t,t-1} = \cdots + 0.74 \sum_{i=1}^{i=4} divr_{t-i} - 0.03(\sum_{i=1}^{i=4} divr_{t-i})^2 + \cdots$$

The parabola reaches the maximum for the divorce rate of 4.1. Between 1995 and 2017, the slowdown in economic growth due to a significant increase in the divorce rate seems to be overestimated. This can be explained by the assumption that the optimal divorce rate was constant over time, while it can be assumed that it shows a tendency to increase as the role of marriage decreases.

5.7. Conclusions

The weakening of family ties and divorces belong to the sphere of the private life of every human being. My intention was not to violate this privacy. However, it is worth realizing that apart from the painful, individual dimension, this problem also has a general social and macroeconomic dimension. It results in a slowdown of economic growth, whose effects impact each of us, even if we belong to the most ideal family.[38]

[38] As it seems, this statement cannot be included in the so-called "ideology of growth," which is one of the causes of the crisis of values. In this ideology, it is emphasised that the most important is economic growth, and broadly understood values, including family values, are ignored or treated as secondary. We, on the other hand, say that the crisis of family values causes a slowdown in economic growth.

The research confirms the impact of the divorce rate on a slowdown in economic growth. We confirmed that the intensification of the divorce rate causes a periodic (temporary) decrease in the economic growth rate. Based on this assumption – based on model of labour productivity – we can conclude that between 1975 and 2017, the average annual slowdown of economic growth caused by divorce was of the order of 0.6 percentage points. If not for this slowdown, the average annual GDP growth would have amounted to 4.3%. This meant a slowdown of economic growth of **more than one-fifth.**

Based on the model, reducing the divorce rate from its current level would permanently accelerate economic growth. A further reduction in the divorce rate would slow down the „current" economic growth. The model has been constructed in such a way that it leads to a specific recommendation of a certain number of divorces. As has already been mentioned, the negative inter-generational effects of divorce are not considered here.

The hypothesis has been confirmed that there is an optimal divorce rate for growth – that some marriages are so ill-conceived that they should end in divorce,[39] which seems more likely.

In further research, we will also consider the reverse relationship – the impact of economic growth on divorces. Then it will be possible to capture the interdependencies: the intensification of the phenomenon of divorce slows down economic growth, which results in an increase in the number of divorces,[40] etc. There is, therefore, a negative spiral that intensifies the mutual impact of economic growth and divorce (family disintegration).

At the „Ethics in Economic Life" conference in May 2005, Sójka posed the question: „Does homo oeconomicus – an individual's aspiration to maximize one's benefits[41] – stand in contradiction to ethics as a reflection on human obligations, the way to strive for good, justice and human

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[39] Janina Godłów-Legiędź calls a divorce in such marriages "a lesser evil".

[40] These interdependences are characterised by significant lags of up to nine years.

[41] Twardowski (2007, p. 257) calls the struggle with one's own selfishness the pursuit of sainthood.

rights [...]?" The article assumes that fulfilling family responsibilities and striving for the happiness of the whole family are important goals for people. We formulated the hypothesis that the rate of achieving these goals is decreasing, which we indicate by pointing to an increase in the phenomenon of divorce. This slows down economic growth and hence interferes with homo oeconomicus. We have shown this on the scale of the economy as a whole. The question remains whether it can be seen at a single person or family scale. Can a person see that the breakdown of his or her family hinders and slows down the pursuit of maximizing his or her own economic benefits?

The conclusion I seek to draw from this text is as follows: A **permanent marriage and family, as an important factor that ensures the stable and dynamic development of the economy, is important for using the potential of the entire economy. Family values[42] support homo oeconomicus and do not compete with it. Family values are a necessary condition for an efficient economy and economic success.**

In the article, we have sought to show that the weakening and breakdown of the family have slowed down economic growth in Poland. This is only one of the many negative dimensions of the influence of the weak family on each of our lives. Therefore, one should agree with the sociologist Slany (2003, p. 4950), who stated:

Significance should be restored to the marriage and family. Reconstruction should be conducted by families themselves, the church, neighbourhood groups, and the mass media, and not by state subsidies or government programs [...]. The family has existed for thousands of years, but it has proved to be extremely fragile in modern times. It should be supported, and its universal values should be emphasized. After all, it is the basis of our existence, the foundation of our morality, and the

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[42] Jacek Filek (2005, p. 39) says that: "the values are not only recognised by 'understanding' their content [...] but values are also felt", and man is willing to follow these values in life. The act of opening to the values is a total act of the entire person.

The purpose of my analysis is to better understand the importance of the family and stimulate the will oriented towards family values. The sphere of feeling the values should be beyond the scope of considerations as one that cannot be treated objectively.

foundation of the social organisation. The family is the most powerful social capital; its formation is and should be the most important type of investment in social capital.

The estimation of the divorce equation is included in Appendix.

In the presented models, we do not consider the diverse intergenerational effects of divorce. They include, among others, the weakening of trust in loved ones and parents, and, consequently, the weakening of trust in other people, which is destructive to social capital and rebounds on many people.

A divorce is usually a statement that one cannot live with one's spouse and that it is not worth living together. A husband or wife abandoning the family is tantamount to one of the parents abandoning the children, even if the divorce is accompanied by an assurance that this is not true. It is difficult for a child not to think that father abandoned not only my mother but me too. This weakens the child's self-confidence, making it difficult to acquire knowledge and improve human capital. I think that this aspect is not sufficiently strongly emphasized in the considerations of sustainable growth. This kind of growth is growth that does not damage the natural environment, but it also does not destroy interpersonal relationships or the social environment, in particular, the family environment.

In conclusion, I will quote two thoughts. Erich Maria Remarque: „No one can become stranger than the person you once loved." And this happens to divorced spouses. Georges Sand: „There is only one happiness in this life, to love and be loved". This happens more easily in stable and good families.

Appendix

Divorce Rate Equation

Divorce ratio equation, 1970–2017 sample:

$$divr_t = 1{,}63 - 2.0\ GDPpc_{t-2} - 2.9\ GDPpc_{t-4,5} + 0.04 \sum_{i=1}^{i=4} GINI_{t-i} + \\ +0.05 marriar_t + 0.67 divr_{t-1}$$

where:
GDPpc – GDP per capita, index 1990=100;
divr – divorce rate – the share of the number of divorces in the existing marriages (%);
GINI – coefficient of in %.

The values of Student's t-statistic are above 3.4, so all structural parameters are significant with probability 0.98 or higher. The only exception is the GDPpc parameter, significant with a probability of 0.93.

Based on the Granger causality test, the hypothesis can be verified with the probability of 0.97 that GDPpc dynamics are the cause of the divorce rate.

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Chapter 6

The Impact of Supply Bottlenecks on Investment Efficiency[1]

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Abstract

The impact of physical capital investments on macroeconomic growth is examined. The authors try to show to what extent it depends on the supply bottleneck (disequilibrium), which existed before the investment and which is eliminated by this investment. The narrower the bottleneck and the more it slows down macroeconomic growth, the more output growth will result from this investment in physical capital. In order to verify this hypothesis, the growth model was modified. Because bottlenecks occur irregularly, GDP fluctuations generated by the model are also irregular (noncyclical).

We propose to estimate the macroeconomic bottleneck by the average lagged GDP growth (lags 2 to 6 years). The results of calculations made for Poland's economy between 1997–2019 confirm that economic slowdown preceding investments strengthens their growth effect.

Keywords: economic growth, physical capital investment, supply bottleneck, Solow model, endogenous growth model
JEL: O40, E13, E20, E22, C20, F43

[1] This chapter is close to the article that was published in „Ekonomista" 2022, No. 1, pp. 23–40.

6.1. Introduction

There are thousands of production processes in the economy, and in many of these we can probably identify as supply bottlenecks. It can be assumed that the majority are caused by changing demand structure or increased demand, neither of which can always be adjusted by substitution, export, or import. When such adjustments prove to be insufficient, investments in fixed assets are necessary. In this article, we will examine the impact of physical capital investments on economic growth. Investments are designed to mitigate or eliminate imbalances. An economic imbalance consists of many bottlenecks, which is why this article could very well be titled „The impact of supply imbalance on investment efficiency."

We will examine the impact of investments in physical capital on production growth and will try to describe to what extent this growth depends on the bottleneck (imbalance) that preceded the investment. The investment has overcome this production bottleneck. The investment decision to deal with economic disequilibria is enhanced by education (Schultz, 1975, p. 843). Therefore, we will treat our model as an endogenous growth model.

We theorize that the more a bottleneck slows down production, the more production will increase as a result of the investment.[2] Taking the construction of a road as an example, the larger the traffic jams there were before its construction, the greater the effect will be of putting it into service. Such regularity occurs on a single investment scale, but will it be observed on a macro scale by examining the growth of gross domestic product (GDP)?

The concept of the study was developed while analysing the effects of infrastructure projects. In this article, we try to relate the problems that

[2] This approach is slightly similar to the „plucking model", which was proposed by Friedman in 1964. Friedman (1993, p. 171) wrote, that the magnitude of an expansion is „…related systematically to the magnitude of the succeeding contraction". He „…suggested a model of business fluctuations that stresses occasional events producing contractions and subsequent revivals rather than a self-generating cyclical process".

are typical of infrastructure investments to the total investment in fixed assets in Poland (using annual data from the 1990s to 2019).

The discussion about the factors of economic growth has a long tradition, and it will most certainly continue. Despite the ambiguity of the concept, economic growth is widely regarded as an important criterion for a good, effective, and efficient economy and its institutions, which is why economists pay so much attention to it (see also Acemoglu 2012;[3] Akcigit 2017, pp. 1736–1737).

Because the only creator of new value in the economy—man—is evolving, the economy and the factors determining its growth are also changing. Moreover, due to the infinite complexity of man and the motives behind his behaviour, including behaviours at work, creating a simplified model that reflects his role in the economy is an enormously difficult task. This is why it is important to consider the relationships between individuals and the social skills necessary for interaction and cooperation in groups.

Why is the economy growing? Why do employees increase their productivity? Our answer is that it is because they increase their knowledge and skills. In recent decades, greater importance has been attached to the ability to cooperate and improve social relations, and human capital and social capital appear with greater regularity in research on growth factors.

The increase in working efficiency occurs not only through education, patents, *learning by doing,* and the spread of knowledge but also through employees adapting to harmonized, economic structures and thus turning investments into fixed capital. The increase in work efficiency also occurs as a result of technical progress, which is supported by the new, increasingly more modern, and efficient generation of fixed assets created through investments. Man's role is also to allocate investments as accurately as possible and then to use them creatively—creative in the sense that investments most often change, improving both

[3] "Economic growth continues to be one of the most relevant and exciting sub-areas of economics. …The problem of economic development remains a major one for humanity at large and for economics as a science" (Acemoglu, 2012, p. 545).

the production process and the working environment of employees. We bring up these rather obvious matters because investments are often thought of as an independent growth factor, and it tends to be forgotten that without man there would be no influence at all.[4]

In this article, we will focus on investments in fixed capital—on improving the skills and efficiency of employees thanks to modernized machines and devices and on extensive economic infrastructure. We will analyze the effects of the unbalanced structure of fixed assets in the so-called bottlenecks.

In growth models, the effects of investments in fixed capital depend on their value. These effects occur in the current year or with an annual delay, and they usually do not depend on what was happening in the economy prior to the investment.[5] In particular, the effects of investments in these models do not depend on whether the purpose of the investment was to eliminate the bottleneck in the production process or how much the bottleneck slowed down production.

If we look at it from this point of view, it appears that an increase in employee performance depends not only on employees being equipped with machines and devices but also on the accuracy of locating investments to eliminate bottlenecks. These decisions are not related to a single employee and his workplace being provided with machinery and equipment. They are not related to factors affecting the performance of a single employee. Decisions regarding the elimination of bottlenecks are made from the level of the enterprise to the level of the entire national economy. We can state that the work efficiency of each employee depends on how the head of the company uses his potential in the company and

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[4] Romer emphasizes that the source of technological progress is people's actions (Romer, 1994, p. 12) "Technological advance comes from things that people do." Abraham Lincoln (1861) spoke in a similar way: "Labor is prior to, and independent of, capital. Capital is only the fruit of labor, and could never have existed if labor had not first existed."

[5] In GDP statistics, investments are defined as investment outlays and not as completed investments. Supply-side investments are more closely related to the increase in GDP from the supply side; many investments are spread over several years. This makes economic growth dependent on investment outlays from previous years.

how accurately his superiors allocate investments intended to eliminate bottlenecks. We hypothesize that the **effects of investments depend not only on their size but also on the extent to which the investments eliminate the bottleneck.**

In the article „Economic growth and investments: The role of bottlenecks" (2019), we verified another hypothesis—that the effects occur gradually in the first few years after the investment (e.g., structure matching, learning by doing). However, the verification was poor and was confirmed only for the period of the 1980s, with dummy variables describing the transformation from central planning to a market economy.[6]

6.2. Bottlenecks in the Economy

"Bottlenecks are generally recognized as some resources or utilities, which heavily limit the performances of a production system." (Wang, Zhao and Zheng, 2005, p. 349). A bottleneck is a point of congestion in a production system.

There are two ways to identify bottlenecks—direct identification (Jershov, Sadykov and Sztaudynger, 1987; Sztaudynger, 1990) and indirect identification. Direct identification is about finding the one factor that is the bottleneck. From the point of view of managing a company and eliminating a bottleneck, precise identification is crucial. Indirect identification is when we are not trying to indicate the factor that limits the optimal production but simply observe the dynamics of lag production as a proxy for supply disequilibrium.

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[6] In many previous estimates dating back to the 1980s, the results largely depended on the path through the transformation hole. The estimates can be made in several ways, but as a consequence, the results are ambiguous. To avoid this, we decided to skip the transformation period of the early 1990s and start estimating the model in the mid-1990s.

6.2.1. A Fixed Assets Bottleneck at the Company Level

We shall try to define a bottleneck in the production process at the enterprise level. A bottleneck is one of the production factors that limit the volume of production. This definition is not completely accurate, however, because it does not specify that it refers to optimal production based on the criterion of the company's activity (e.g., gross value added). Therefore, it is necessary to specify what the optimal production depends on. Optimal production is dictated by the cost structure, the price structure, and the demand structure.

If the production structure (a derivative of the structure of fixed assets and employment) is adjusted to the structure of demand in such a way that the factors of production are highly utilized, then the production is optimal.[7] If one or more factors of production are not fully used, then the production is not optimal. It is not optimal because this factor of production is not highly used and because of the costs associated with it. The existence of a bottleneck always slows down the growth of the enterprise's gross value added.

We described the supply bottleneck above, determined by the least common production factor. This bottleneck is usually eliminated by investing in fixed assets.

Demand reductions occur most often when the structure of demand changes. For example, the demand for internal combustion engines is decreasing, while the demand for electric motors is increasing. It is then necessary to invest in fixed assets to increase the production capacity of electric motors. Thanks to investments in fixed assets, the production structure may adapt to the exogenous structure of demand, increasing the production of electric motors. The effectiveness of investments

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[7] Lawrence and Buss' definition is similar: "A shortage of one factor, which limits the possibility of achieving optimal production, is called the bottleneck of the production process… bottlenecks naturally arise when firms organize capacity design and demand volumes to… maximize profits." An economic bottleneck is "…that workstation which most severely… limits profits" (Lawrence and Buss, 1995, p. 355). However, if one factor is the bottleneck, then there is a wide range of other factors.

depends on how big the economic slowdowns (bottlenecks) were before making these investments and how accurate the structure of investment allocation was.

6.2.2. Bottlenecks at the macroeconomic level

We will consider the supply, physical capital bottlenecks at the macroeconomic level. For our purposes, we understand supply bottlenecks as one physical capital element which heavily limits the performances of GDP (see also Macro structural bottlenecks…., 2010).

We will only deal with the indirect identification of bottlenecks. We claim that when added production is characterized by low dynamics, it is because somewhere there is a bottleneck. When this dynamic is high, bottlenecks do not occur. High dynamics can also be caused by the elimination or widening of the bottleneck.

A bottleneck in the production process is always structural in nature; its occurrence is the result of a mismatch between the demand structure and the structure of the company's production capacity (and the factors of production that determine it). We assume that the demand structure is exogenous. Therefore, we have to ask the question „How can supply and its structure be adapted to exogenous demand and its structure?"

Zatoń states (mail 3.08.2019): What will happen if the demand decreases in the next period? Employment will adapt, but fixed assets will remain unused, and after this period, the next increase in demand should not encounter bottlenecks (eventually, bottlenecks will not be so narrow). So, from the point of view of bottlenecks, not every GDP growth will have the same meaning. In this case, the accelerating growth would not be the result of investment.[8] This model does not take this into account.

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[8] For example, Russia suspends the import of Polish apples. Apple sales fall. Apples are sent to Japan and Canada. Eliminating the bottleneck in this way is not associated with investments and is not associated with the increased efficiency of typical investments. At most, investments that adapt sales to long-distance transport can occur here.
The greater the reduction in demand, the greater the effect of unblocking the bottleneck. This is the full analogy.

We are trying to add something more. Without questioning the human and social capital sources of economic fluctuations, we state:

1. The important causes of economic fluctuations are the emerging bottlenecks.
2. Bottlenecks slow down economic growth: slow economic growth is an indicator of the severity of the bottlenecks. We propose estimating the macroeconomic bottleneck by the average, lagged GDP growth (or that deviation from the trend).
3. The narrower the bottleneck, the greater the GDP growth effect that is achieved thanks to the investments that are intended to eliminate it.

In other words, we will examine economic growth that results from a specific imbalance indicator, which is the average dynamics of the economy in the last few years.[9]

Do these points give a new possible economic explanation for economic fluctuations?

6.3. The Problem of Investment Impact on Growth and the Role of Bottlenecks

We will focus on the varying effect of investing in fixed capital during economic growth. We suppose that the **production effects of investments depend not only on their size but also on the extent to which the investment eliminates the bottleneck in the process of GDP creation.** We present our hypothesis in the two charts below. The first illustrates the level of GDP that is periodically slowed down by bottlenecks. The second depicts one bottleneck that slows down GDP growth before the investment and that accelerates as a result of the investment.

[9] Because the analysis is conducted at the macro level, we will only analyse the approximate identification of bottlenecks.

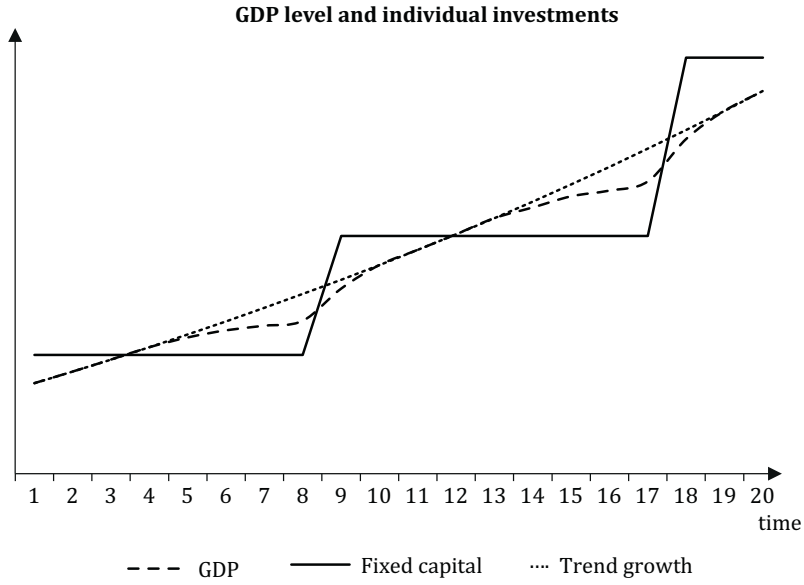

Figure 1. Levels of GDP (dotted line) and fixed capital (solid line)

Source: own elaboration

In Figure 1, we can see that when the level of fixed capital **K** is below the respective **GDP** level line, it is a bottleneck for the development of the economy.

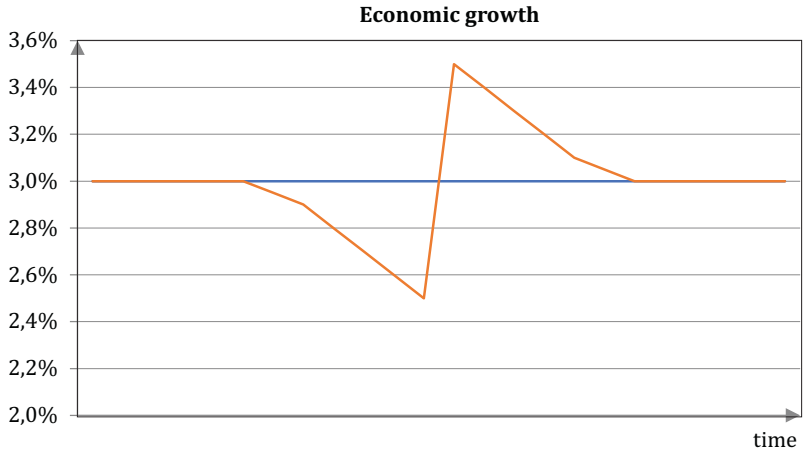

Figure 2. Regular GDP growth (blue line) and GDP growth changed by a bottleneck and a single investment (brown line)

Source: own elaboration

In Figure 2, the blue line shows the dynamics of a steady 3% GDP growth rate, while the brown line shows a decrease in the GDP growth rate as a result of a bottleneck and acceleration at the end of the investment, which eliminates the bottleneck. The bottleneck build-up process and its elimination through investment can be divided into two phases (see Figure 2), as follows:

1. In the first phase, GDP growth occurs with initial fixed capital **K** and a gradually increasing shortage of this capital or increasing bottlenecks. When losses due to a deficiency of **K** grow to large proportions, under the pressure of diminishing efficiency,[10] that is, a bottleneck, an investment is made.[11]
2. Depending on the limitations of the funds for investments, varying amounts of supply excess are generated by investments; they are in excess for shorter or longer periods.

After the completion of a given investment, the phase of gradually decreasing the excess of **K** and the transition to the new phase 1 begins. Excess **K** does not accelerate growth; there is no relationship between excess factor **K** and production dynamics; excess **K** means that there are other restrictions on production growth.

It should be added that because the bottlenecks are varied, the effects of the investments that level them are also varied. These differences occur at the micro scale, that is, at the scale of a single investment. At the macro scale, that is, the aggregate of all investments, differences in time may not be visible if the „average bottleneck" of all investments does not change significantly over time.

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[10] The pressure is of a technical and economic nature, but it is also often social and political (e.g., by influencing election results).

[11] It seems that this problem occurs especially in infrastructure investments.

6.4. The Modification of the Solow Model with Bottleneck Identification

We will look at the production process and economic growth in the context of a crucial analysis tool, the Cobb–Douglas (CD) production function (Cobb and Douglas, 1928; Douglas, 1976).[12] This function forms the basis of the neoclassical, long-term Solow growth model. We will use the dynamic version of the CD production function:[13]

$$G\dot{D}P_t = \dot{B}_t + \beta_1 \dot{L}_t + \beta_2 \dot{K}_t, \tag{1}$$

where $G\dot{D}P_t$ is the GDP growth rate; $\dot{L}_t$ is the employment growth rate; $\dot{K}_t$ is the fixed capital growth rate, and $\dot{B}_t$ is the total factor productivity (TFP) growth rate,[14] expressing man's development and improvement when creating new value in the production process.

Due to the significant, empirical difficulties in calculating the value of physical capital at constant prices, we will modify production function (1) and replace the fixed capital growth with the investment to GDP ratio:[15]

$$G\dot{D}P_t = \dot{A}_t + \alpha_1 \dot{L}_t + \alpha_2 \left(\frac{invest}{GDP}\right)_t \tag{2}$$

where: *invest* is the investment in gross fixed capital; *invest/GDP* is the investment/GDP ratio, and $\dot{A}_t$ is the modified total factor productivity (TFP) growth rate.

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[12] For simplicity of recording, the random term is omitted.

[13] Also called the Solow–Swan model.

[14] Because the only factor that creates new value is a person, instead of calling total factor productivity TFP, it would be better to rename it "total labor productivity" or "indirect labor productivity" as opposed to labor productivity. TFP measurement problems are described i.a. by Tokarski (2009, pp. 27–37), J.J. Sztaudynger (2005, pp. 17–18).

[15] Replacing the rate of fixed capital growth with the rate of investment is a common practice.

Let us repeat, we hypothesize that the **effects of investments depend not only on their size but also on the extent to which the investments eliminate the bottleneck (disequilibrium).** In order to model this, we relate the parameter with a measure of GDP disequilibrium - the supply gap – ***sug*** defined as follows:

$$\boldsymbol{sug_t = GDPpo_t / GDP_t}$$

where:
$GDPpo_t$ supply, a potential GDP approximated by a simple deterministic, exponential function of time:

$$GDPpo_t = \rho\, e^{\delta\, t}$$

The dynamic supply gap can be expressed in the following form:

$$s\dot{u}g_t = G\dot{D}Ppo_t - G\dot{D}P_t = \delta - G\dot{D}P_t \tag{3}$$

where δ represents the trend supply component of growth, while $\delta - G\dot{D}P_t$ – is fluctuation, a supply gap component of growth.

Let us assume that in model (2) the effect of investment α_2 depends on the disequilibrium (bottleneck) – α_2 is a linear function of the supply gap:

$$\alpha_2 = \alpha_3\, s\dot{u}g_t \tag{4}$$

It leads to model:

$$G\dot{D}P_t = \dot{A}_t + \alpha_1\dot{L}_t + \alpha_3 s\dot{u}g_t \left(\frac{invest}{GDP}\right)_t \tag{5}$$

Because the $s\dot{u}g_t$ definition include $\boldsymbol{G\dot{D}P_t}$ and explains $\boldsymbol{G\dot{D}P_t}$ we lag GDP growth in order to avoid the vicious circle (*idem per idem)***.** To properly describe the supply gap role, it is essential to consider the supply gap with a several-year lag. The bottleneck effect occurs gradually, the investment decision and the investment process take time[16]

[16] At the beginning, disequilibrium occurs. Next, the investment decision is made, followed by the investment process. Finally, the fixed assets investment

and they have a long-term character.[17] So, we lag the supply gap two or more years:
$s\dot{u}g_{t-i} = \delta - G\dot{D}P_{t-i}$ i = 2,3,… and use average lagged supply gap:

$$\text{av } s\dot{u}g_{t-i} = \delta - \text{av } G\dot{D}P_{t-i} = \delta - [1/(\text{k} - 2) \sum_{i=2}^{k} G\dot{D}P_{t-i}] \quad (6)$$

where: $\text{av } G\dot{D}P_{t-i} = \frac{1}{\text{k}-2} \sum_{i=2}^{k} G\dot{D}P_{t-i}$

So, the lag av $s\dot{u}g_{t-i}$ is the difference between the exponential trend supply growth and the average lagged GDP growth. It is a kind of rule about decreasing investments returns.

In models (1) and (5), employment dynamics describe the role of the employed person only in quantitative terms. The increase in the quality and complexity of work—the effectiveness of the employee—is expressed in models (1) and (5) by an exponential function of time and, indirectly, by investing in fixed capital. We will try to modify the production function by introducing the lagged GDP growth deviation from the trend that expresses a structural imbalance (bottleneck) in the economy. We will measure this imbalance globally and relate them to the bottleneck of the production process. As a result of these considerations, parameter α_2 is not a constant but a linear function of the lagged GDP deviation from the trend:

$$\alpha_2 = \alpha_3 (\delta - \text{av } G\dot{D}P_{t-i}) \quad (7)$$

Substituting in the formula (6) as in (7) we obtain:

$$G\dot{D}P_t = \dot{A}_t + \alpha_1 \dot{L}_t + \alpha_3 (\delta - \text{av } G\dot{D}P_{t-i}) \left(\frac{invest}{GDP}\right)_t \quad (8)$$

---

is introduced to production. This time is different for each investment. Thus, we must consider not a single lagged supply gap but the average, from years *t*–2 to *t*–3, and so on. The length of lag in the average av $s\dot{u}g_{t-i}$ was empirically estimated.

[17] On the other hand, the one year lagged GDP growth is usually positively correlated with coincident GDP growth due to inertia.

This model shows the relationship between the investment/GDP ratio and the rate of economic growth. In the empirical part of the article, we will try to use the model (8).

We have made the following hypothesis: **Investment efficiency depends on the scale of imbalances (bottlenecks) that are eliminated by this investment. The slower the economic growth preceding the investment, the greater its effect, i.e., the greater the acceleration of economic growth. At the macro scale, the range of imbalances can be measured by the lag deviation of GDP growth from the trend.**[18] If there has been an economic slowdown in previous years, we interpret this as being a result of increased imbalances (bottlenecks) in production, supply, and sales processes. If this is the case, the effectiveness of the investment that eliminates these bottlenecks will be substantial. We can also point out that the economic slowdown causes, among other things, a shortage of funds for investments, and this leads to only the most necessary and effective investments being made.

If there is a lack of fixed assets, they can be substituted in some situations, but this involves additional costs and reduces added production. Returning to the analogy of a road, if a road that is most convenient for us is heavily used (e.g., traffic jams after a slight increase in the number of users), we can take a different route. But other roads, the substitute ones, take longer to get there and are more time-consuming and less effective. In other words, there is an excess of fixed assets that create a safety margin precisely because they are inferior, and their use is less efficient economically.

What is the essence of the investment process? Does it simply widen the bottleneck, or does it increase the margin of safety? If investments in fixed assets increased the safety margin, the relationship between investments and GDP could be observed only when the level of utilization of these investments is relatively constant. We hope that the estimation of the model parameters will help resolve this dispute. The phenomenon of a decrease in investment efficiency with decreasing imbalances (bottlenecks) can be described by a linear decreasing function (Figure 3).[19]

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[18] The deviation of GDP growth from the trend in (8) is a bit like the concept of the error correction model (commentary from Majsterek).

[19] Thanks to M. Majsterek and P. Baranowski for comments on the role of investments.

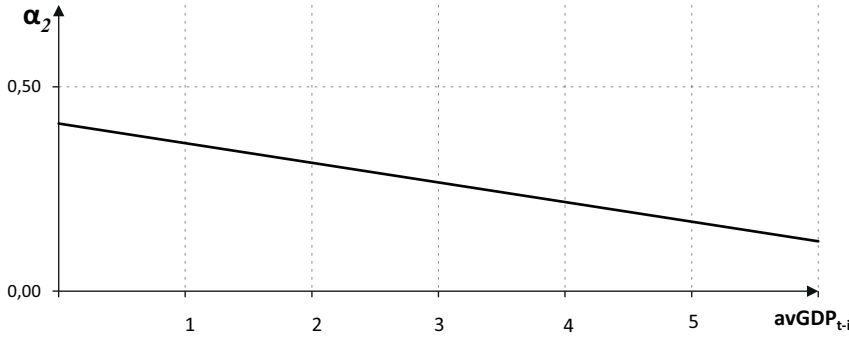

Figure 3. Parameter α_2 in (7) depending on the average GDP growth in previous years

Source: own elaboration

Therefore, we assume that high investment efficiency is preceded by growth slowdowns (bottlenecks) and, vice versa, relatively lower investment efficiency is preceded by dynamic GDP growth. Formally, our hypothesis involves treating the α_2 parameter in model (2) as a variable parameter presented in Figure 3.

We suppose that the fluctuation component – supply gap – should be included in parameter $\boldsymbol{\alpha_2}$ in model (2); $\boldsymbol{\alpha_2}$ varies over time. We use the GDP dynamics in previous years[20] $G\dot{D}P_{t-i}$ to change parameter $\boldsymbol{\alpha_2}$. The lags were chosen by a trial and error method of empirical model estimation. „Economic theory rarely provides a basis for specifying the lag lengths in empirical macro-models" (Stigum 2003, p. 388; see also Holden 2005, p. 467, Nerlove 1972). The delays were chosen, taking into account the F-statistic, t-statistic and adjusted R^2 values.

[20] We omit $G\dot{D}P_{t-1}$ due to the inertia of economic growth and a positive correlation with current GDP growth. Moreover, between the occurrence of the bottleneck and the commissioning of the investment, which contributes to bottleneck being eliminated, there is time to make sure that the bottleneck is of a lasting nature, to gather funds to finance the investment, and in the case of construction and assembly works to carry out design works, taking into consideration the period from the start of the investment to its commissioning. This last argument does not apply to the investment on machinery and equipment.

Model (8) can be treated as a modification of the endogenous growth model with a smoothing of economic fluctuations.[21] Economic fluctuations are the result of bottlenecks (imbalances) and are offset by effective investment allocations. This is achieved by the precise choice of technology and the innovation level as well as the territorial location.

6.5. Results

The economic situation preceding the investment in year t is characterized by a moving average of GDP dynamics in the previous five years from t–2 to t–6. The investment efficiency parameter is a linear, decreasing function of such a defined economic situation (Table 1).

Table 1. GDP growth model (8) with variable parameter $\alpha_2 = \alpha_3\ (\delta - \text{av}\ G\dot{D}P_{t-i})$ – investment efficiency

Variables	Parameters	t-statistic absolute values	ADF
GDP growth	-	-	–4.2***
Employment growth rate t, t-1, t-2,[22]	-	-	-
Investment/GDP ratio	0.41	11.2	–3.5**
$\frac{1}{5}\sum_{i=2}^{i=6} G\dot{D}P_{t-i}$ *Investment/GDP ratio	-0.046	5.6	–4.5***
Dummy 2012-2016	-2.0	4.4	-

Adjusted $R^2 = 0.679$ $S_e = 0.9$ JB = 0.46 DW = 1.97 ADF (residuals) = –5.40 estimation period 1997–-2019, equal lagged GDP weights

Source: own calculations

The parameter of the average GDP dynamics (from the previous five years) is significant at the level of 0.99. So, if in the previous five years

[21] "…Education and experience influence the efficiency of human beings (…) to undertake action that appropriately reallocate their resources" (Schultz, 1975, p. 827).

[22] With this variable, no significant parameter estimations have been obtained so far.

the GDP growth was slow (2%), then the investment efficiency was more than twice as high than if the GDP growth had been rapid (6%) (α_2 being 0.32 and 0.13, respectively; see Figure 3).

The model presented in Table 1 can be considered a specific mapping of economic fluctuations. GDP lags by 2–6 years (on average, 4 years) are opposite to the stage of fluctuation to year t. Therefore, it can be interpreted as a specific 8-year „cyclical" regularity because GDP_t is negatively correlated with the „average" lagged - GDP_{t-4}. This result confirms, to some extent, the presence of a fixed investment fluctuation similar to the Juglar cycle.[23] But the bottlenecks occur irregularly. The presented model shows a special kind of regularity in eliminating bottlenecks and reducing the disequilibrium.[24]

Fixed capital investments are unsystematic and irregular, happening every once in a while. **They are far from having a regular character or cycle. However, according to the result of our estimation, as a reaction to investments, economic growth follows a specific pattern related to the preceding imbalance. For example, in the basic equation, as a result of the slowdown of GDP growth in year t-2 by 1 pp, we get:**

- an increase of the α_2 parameter in the years from t to t+4 equal to 0.01 and
- an increase of GDP growth in the years from t to t+4 in the range 0.2 pp each, jointly 1 pp.

In the article, we tried to confirm the validity of the hypothesis that **the effects of investment depend not only on the investment/GDP**

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[23] This fixed investment cycle was identified in 1862 by C. Juglar (Morgan, 1990, pp. 40–44). The length of the Juglar cycle is 7–11 years. In Juglar, by contrast, we only find the assumption that by simple elimination of the excesses the crisis will bring the system back to a state of stable (momentarily, at least) equilibrium (Besomi, 2005, p. 32).

[24] This result seems to support the view that in the economy we do not observe regular cycle fluctuations: "Since no two cycles are alike in their details, some economists dispute the existence of cycles and use the word 'fluctuations' . . . " (Nagakawa, 2008, p. 1). In reality, there is no regularity in the timing of cycles. „In many ways the term *business cycle* is misleading. (…) Most economists, however, believe (…) booms and recessions occur at irregular intervals and last for varying lengths of time" (C.D. Romer, 2008).

ratio but also on the extent to which the investment was preceded by a bottleneck characterized by the average GDP dynamics of the previous five years (from t-6 to t-2). The result is described by the formula:

$$\hat{\alpha}_2 = \hat{\alpha}_3\hat{\delta} - \hat{\alpha}_3 \text{av}\, G\dot{D}P_{t-i}) = 0.41 - 0.046 * (0.2 \sum_{i=2}^{i=6} G\dot{D}P_{t-i})$$

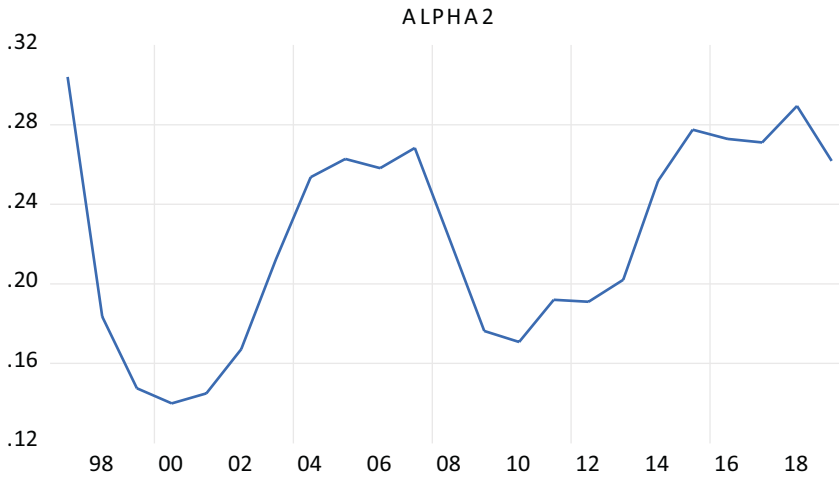

Figure 4. Investment effectiveness: $\hat{\alpha}_2$ parameter, 1997–2019

Source: own calculations, based on the equation presented in Table 1

The α_2 parameter took values from the range of 0.15 between 1999 and 2001, when there was a relative lack of bottlenecks, to around 0.26–0.28 between 2004–2007 and 2015–2019, when bottlenecks appeared to a substantial degree.

Table 2. The average supply gap as percent of GDP

1997	6.6	2009	3.8
1998	4.0	2010	3.7
1999	3.2	2011	4.2
2000	3.0	2012	4.1
2001	3.1	2013	4.4
2002	3.6	2014	5.5

2003	4.6	2015	6.0
2004	5.5	2016	5.9
2005	5.7	2017	5.9
2006	5.6	2018	6.3
2007	5.8	2019	5.7
2008	4.8		

Source: own calculations, based on the equation presented in Table 1

As a by-product of our analysis, we can pinpoint bottlenecks in the Polish economy.

The bottlenecks took place in the periods 2004–2007 and 2015–2019. In these years, investment efficiency, as expressed by the α_2 parameter, was the highest as well as the supply gap.

We also estimated an alternative equation with polynomial distributed lag weights (Table 3) (R^2 is similar size).

Table 3. GDP weights - equal weights and polynomial (parabolic) distributed lag weights

	Equal – Table 1 model		polynomial distributed lag	
$G\dot{D}P_{t-i}$	**weights**	**t-statistic**	**weights**	**t-Statistic**
$G\dot{D}P_{t-2}$	**-0.20**	**5.6**	**-0.17**	**3.4**
$G\dot{D}P_{t-3}$	**-0.20**	**“**	**-0.27**	**3.7**
$G\dot{D}P_{t-4}$	**-0.20**	**“**	**-0.30**	**4.3**
$G\dot{D}P_{t-5}$	**-0.20**	**“**	**-0.25**	**5.5**
$G\dot{D}P_{t-6}$	**-0.20**	**“**	**-0.12**	**2.1**

Source: own elaboration

Based on the equation with polynomial weights, we got very similar curves to those presented in Figure 4.

This model (4) can be interpreted as a modification of the endogenous growth model with a smoothing of economic fluctuations.[25] Growth slowdowns are the result of bottlenecks and are offset by effective investment allocations.

[25] “…the ability to deal successfully with economic disequilibria is enhanced by education and that this ability is one of the major benefits of education…” (Schultz, 1975, p. 843).

We think that it has been initially confirmed for the Polish economy after 1997 that an economic slowdown reinforces the growth effects of an investment. The slower the growth is before the investment, the greater the effect of the investment. This is expressed by the decreasing linear function that describes the impact of the average GDP dynamics of the five preceding years on the α_2 parameter.

6.6. Conclusions

The impact of physical capital investments on macroeconomic growth was examined. We try to show to what extent it depends on the supply bottleneck (disequilibrium), which existed before the investment, and which is eliminated by this investment. We confirmed the hypothesis that supply bottlenecks have impact on the investment efficiency. The narrower the bottleneck and the more it slows down macroeconomic growth, the more output growth will result from this investment in physical capital. In order to verify this hypothesis, to the growth model was added the bottleneck variable – the average lagged GDP growth (lags 2 to 6 years).

The results of calculations made for Poland's economy between 1997–2019 confirm that economic slowdown preceding investments strengthens their growth effect.

Because bottlenecks occur irregularly, GDP fluctuations generated by the model are also irregular (not cyclical). So, we agree with the view of Burns and Mitchell (1946, p. 466) „…that irregular changes in cyclical behaviour are far larger in scope than secular or cyclical changes" and each of economic episode depends on „…the peculiar combination of conditions prevailing at the time, and that these combinations differ endlessly from one another" as bottlenecks differ. The sequence of change is repeated but not periodic, recurrent but not periodic. According to our research regular is economic reaction on bottlenecks.

In the dispute about the essence of the investment process—whether it widens the bottlenecks or increases the safety margin—it seems that the result is an argument in favour of the first view.

We consider the confirmation of our hypothesis important but also preliminary. It is important because it seems to show a possible new modification of the growth model. We use the simplest potential production—and a deviation from it—to determine the imbalance.[26] It is preliminary because the model should include variables that characterize human and social capital.

In future research, we intend to consider the endogenous nature of the investment-to-GDP ratio and use the instrumental variable method instead of the least squares' method. All considerations contained in this text can be related to infrastructure investments..

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Appendix

The Dynamics of Physical Capital Substitution for Investment Output Ratio in the Solow Model

Jan Marek Sztaudynger

The basis for all chapters in this book is the classic, dynamic Cobb-Douglas model of production (Cobb and Douglas, 1928, Douglas, 1976):

$$G\dot{D}P_t = \propto_0 + \propto_1 \dot{L}_t + \propto_2 \dot{K}_t \qquad (1)$$

where:
GDP – the volume of production (GDP) at constant prices,
$G\dot{D}P_t$ – GDP growth at constant prices,
$\dot{L}_t$ – dynamics of the employment,
$\propto_0$ – rate of technical and organizational progress,
$\propto_1$ $\propto_2$ – the elasticities of GDP with respect to L and K,
$\propto_1 + \propto_2 = 1$ is, therefore, a homogeneous function of degree one,
$\dot{K}_t$ – dynamics of physical capital (fixed assets) **net** value at constant prices.

Unfortunaly the Central Statistical Office in Poland provides only the initial **gross** value of physical capital at constant prices.[1] What's more, it

[1] The Central Statistical Office does not count and provide dynamics of net fixed assets in constant prices (mail from Ewa Śliwka of Wydział Nakładów Inwestycyjnych i Środków Trwałych – Department of Fixed Assets and

is a very difficult statistical problem to separate the increase in the price of a fixed asset into a part related to its improvement/modernization and a purely inflationary part, and to express fixed assets of very different ages in constant prices. Therefore, the dynamics of physical capital net value at constant prices $\dot{K}_t$ are replaced by the investment output (production) ratio $\boldsymbol{I_t/GDP_t}$ (numerator and denominator expressed at current prices).

In Solow's neoclassical model, this substitution can be derived from the equation of capital growth:[2]

$$\boldsymbol{\Delta K_t = s_t GDP_t - \delta K_t} \tag{2}$$

where:
s_t – the savings rate (is equal to the investment rate $\boldsymbol{I_t/GDP_t}$ in the Solow model (both numerator and denominator expressed in current prices),
δ – the rate of capital depreciation.

If we divide both sides of equation (2) by K_t, we get:

$$\boldsymbol{\dot{K}_t = \Delta K_t/K_t = s_t GDP_t/K_t - \delta}$$

where:
$\boldsymbol{GDP_t/K_t}$ – capital productivity.

Assuming that, in the long run, the productivity of capital is constant, $\boldsymbol{GDP_t/K_t = A}$, we get:

$$\dot{K}_t = \frac{\boldsymbol{\Delta K_t}}{\boldsymbol{K_t}} = \boldsymbol{A}(I/GDP)_t - \boldsymbol{\delta}$$

and after substitution to (1):

$$G\dot{D}P_t = \propto_0 + \propto_1 \dot{L}_t + \propto_2 [\boldsymbol{A}(I/GDP)_t - \boldsymbol{\delta}] \tag{3}$$

Investments of the Central Statistical Office, 1.12.2022). This is probably due to the need for the contractual calculation of depreciation rates.

[2] A justification for replacing physical capital dynamics net investment rate was proposed by Baranowski (18.11.2022).

and arrangement:

$$G\dot{D}P_t = \propto_0 - \propto_2 \boldsymbol{\delta} + \propto_1 \dot{L}_t + \propto_2 A(I/GDP)_t \qquad (3')$$

If, in addition, we assume that the "constant term" can change over time:

$$G\dot{D}P_t = \dot{A}_t + \beta_1 \dot{L}_t + \beta_2 (I/GDP)_t$$

where:

$\dot{A}_t$ – the analog of Total Factor Productivity (TFP) in the Solow model.

As we can see in (3'), this TFP analog is reduced by the depreciation rate of capital multiplied by $\propto_2$ – the elasticity of GDP with respect to capital.

The AK model of endogenous growth (also called the Arrow model) is similar to (3).[3] In this model, the sustainable growth rate (steady state) (Jones, 1995, p. 504; Baranowski, 2008, p. 36–37) is equal:

$$G\dot{D}P_t = \boldsymbol{A}(I/GDP)_t - \boldsymbol{\delta}.$$

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[3] In the AK model production is a Cobb-Douglas type function of two capitals, physical and human, with a sum of elasticity equal to one.

This book deals mainly with economic growth, its interdependence with social capital, and the consequences of the "happy productive worker" hypothesis. A happy employee works better, earns more money, and as a result, his quality of life goes up. This feedback loop of productivity and happiness means that on the road to effective economic growth and development, man and his quality of life must be taken into consideration as a very important causative factor.

The authors guess that the social capital (trust, helpfulness, fairness), family social capital (marriage, divorce, fertility), as well as income inequality are social determinants of the quality of life, sustainable growth and development. They all are characteristics of society's harmonization. Most of these hypotheses have been verified using econometric models. We hope that such an approach will help to reduce the danger of the fetishization of economic growth.

Likewise, the hypothesis on non-cyclical GDP fluctuations was considered, where efficiency of fixed capital investment depends on past bottlenecks.

The book summarizes Jan Jacek Sztaudynger's scientific work on economic growth over the last twenty years. It contains six published articles (co-authors: Ewa Ambroziak, Paweł Baranowski, Paweł Starosta, and Jan Marek Sztaudynger).

Jan Jacek Sztaudynger (1946–), Full Professor at the Institute of Econometrics at the University of Lodz. He published three books and hundred research papers. The eight of his doctoral students have completed dissertations. Head of nine central projects on econometric models of economic growth, income inequality, social capital, and European integration.

He received a Ministerial awards for his PhD and habilitation dissertations, and Professor Edward Lipiński Prize for his book *The Modifications of Production and Productivity Functions*.

Recently he has been working on social capital: trust in others, readiness to help, and fairness, as well as on family social capital (marriage, divorce, fertility) and their influence on economic growth and quality of live.

He spent one year at the University of Pennsylvania where he worked with Nobel Prize winner Lawrence Robert Klein; and nine months at the University of Bonn.

Head Chair of Econometrics in 2012–2016, Council of Statistics member 2000–2001, council member of National Science Centre in 2016–2018, council member of Jan Karski Institute of War Losses from 2022.

He has two sons and six grandchildren.

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