Socio-Econo-Engineering:

What is the right dose of capitalism regarding fertility?

Recommendations how to use capitalism for population control and how to avert the falling rate of fertility in capitalist territories

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Abstract

In a realm of literature on influence factors on fertility rates; this paper innovatively introduces capitalism being associated with lowered fertility rates. Based on a 180 country strong worldwide data set and cross sectional correlation studies, this paper outlines that hallmark pillars of capitalism are all negatively associated with fertility rates. The 2017 *Economic Freedom Index* – comprising of input variables such as property rights protection, judicial effectiveness, government integrity, fiscal health, freedom of business, labor, monetary policy, trade, investment, finance, taxation, GDP freedoms as well as FDI inflows – is significantly negatively correlated with fertility rates around the globe. Based on a 139 country strong worldwide dataset on industrialization as measured by the UNIDO in the *Industrialization Intensity Index* of 2014 and fertility rates, a highly significant negative relation is found between industrialization and fertility rates around the world. Urban areas around the world tend to have higher fertility rates and access to markets within rural communities lowers fertility rates measured by the World Bank *Rural Access Index* for 64 countries around the world. The inverse relation of economic freedom and fertility was also found for 50 U.S. states based on the 2017 *Economic Freedom Index* and fertility rates in the United States. The historic examples of communism imploding giving way to free market mechanisms but also an Islamic regime changing towards a Western free market approach captures capitalism to crowd out fertility in a meta-analysis, which also finds higher education levels not being stringently related to fertility rates. Industrialization, globalization and capitalism lead to vanishing populations. Being occupied by production and consumption but also the entertainment of capitalist markets, economic mobility and international trade may distract societies to prosper regarding fertility. Focus on competing in markets may hinder from procreation. Equilibria und markets may have an undocumented negative effect on fertility. Unruled capitalism may lead to a falling rate of fertility, decimating the populace and eventually also the reserve pool of economic agents. The paper concludes with proposals how to use these novel insights as (1) birth control mechanism in those parts of the world, where overpopulation is currently demanding governments to find ways how to lower the fertility rate and (2) means to avert the falling rate of fertility in capitalist societies with a shrinking, aging population. Infusing capitalistic market freedoms in birth control needed territories but also taxing capitalist activities to fund parenthood through direct investment in social benefits and/or via subsidized parenthood to alleviate the tendency of the falling rate of fertility in the eye of capitalism is recommended concurrently, depending on the starting level on the overpopulation-low capitalism versus under-reproduction-high-capitalism spectrum. Revealing the found mechanism has also implications for advocacy to strengthen fertility and the intergenerational glue in light of vanishing populations in the Western world. In addition, the findings have innovative and futuristic prospects in the age of artificial intelligence. Robotics and artificial intelligence slowly taking over human capital labor activities but not being able to reproduce a human DNA is argued to increase the future value of humanness – and with that human fertility – in the artificial age.

Keywords: Artificial intelligence, Business freedom, Capitalism, Capitalism-Fertility Index, Economic Freedom Index, Ethics, Fiscal health, Foreign Direct Investment (FDI), Falling Rate of Fertility, Fertility, Gross Domestic Product (GDP), Government integrity, Index of Economic Freedom, Industrialization, Industrialization Intensity Index, Investment, Judicial effectiveness, Labor freedom, Monetary policy, Overpopulation, Property rights protection, Rural Access Index, Tariffs, Taxation, Trade, Under-reproduction, Urbanization

1. Introduction

What Athens, the cradle of democracy, is for society, Delos stands for in economics. Birthplace of Apollo, god of the sun, logic and reason; the Greek island of Delos accounts for the first and foremost ancient Wall Street studded with an ample range of festivals and entertainment games. Since ancient times, it was prohibited to anyone to give birth or be born on Delos.

This paper sheds novel light on the complex interactive relationship between capitalism and society. What if the equilibrium has an impact on our social relations? Pricing goods and services guiding our decisions? More concretely, the article argues that deepening economic activities challenge human procreation. The paper thereby takes a heterodox stance to unprecedentedly investigate the relation of access to economic markets and fertility rates.

The effect of education on fertility rates is well-documented in the economics, international development and governance literature (Cochrane, 2010).[1] Once female obtain higher education in a society, they are less likely to have children and tend to have less children. The more educated a population, the more the fertility rate declines. This paper revises this idea by reporting a crowding out effect of capitalism on fertility. Education may only be a part of the picture and the actual driving effect stems from the wish to compete in economic markets better through being more educated. Market economies thereby bleed into market societies, in which individuals forget to procreate in the eye of anticipating future market point equilibrating situations, in which their labor power becomes competitively commodified and their resumes need to feature distinct credentials, which to acquire blocks them from reproduction. Individual's attention being occupied by consumption and production

[1] http://documents.worldbank.org/curated/en/550621468765918708/Fertility-and-education-what-do-we-really-know

in the wake of industrialization, may also imply unexpected socio-economic developments. Markets may leave a mark on society. Pricing of human labor may erode human procreation.

Since the post-World War period, the world globalized. International economic activities now involve a larger number of countries and sectors than at any time in history. Capitalism reaches deeper into every human life than ever before (Held & McGrew, 2007). Globalization led to unknown systemic economic risks on a global scale (Centeno, Cinlar, Cloud, Creager, DiMaggio, Dixit, Elga, Felten, James, Katz, Keohane, Leonard, Massey, Mian, Mian, Oppenheimer, Shafir & Shapiro, 2013; Okamoto, 2009; Urry, 2012). In the light of growing anti-globalization tendencies, the demand for an in-depth understanding of how markets influence society gained unprecedented momentum. New economic thinking widens the interdisciplinary lens to study emergent risks of how the spread of economic markets around the world may influence the societal compound. The shadow of economic freedom may echo in society. Applying emergent risk theory onto economic outcomes on society is an innovative way to foresee the potentials of capitalism but also prevent the negative outcomes of an industrialized world (Centeno et al., 2013; Held & McGrew, 2007).

In exceeding orthodox economics' insights and traditional public policy attempts to curb societal risks, a heterodox economics approach may capture the impact of economic markets on fertility as real-world emergent risk prevention strategy. Economic indicators of product wages, international trade, economic competition, output-capital ratio, and post-tax profits have been studied extensively to derive conclusions about societal prosperity. In the economics, international development and public policy literature, the negative impact of education on fertility is widely discussed. The relation of economic correlates on fertility, however, is hardly addressed. The following article therefore sets out to relate access to economic markets to the fertility rates around the world, in the U.S. as well as in historic economic transition cases of socialist-communism and Islamic countries in order to derive

recommendations on what the right dose of capitalism is around an overcrowded planet featuring also under-reproduced societies.

Based on a 180 country strong worldwide data set and cross sectional correlation studies as well as U.S. data and a historic case study meta-analysis, this paper outlines that hallmark pillars of capitalism and industrialization are negatively correlated with fertility rates. Taxation and tariffs, on the other contrary, are associated with higher fertility rates. A worldwide dataset on industrialization as measured by the UNIDO in the *Industrialization Intensity Index* and fertility rates, consolidate a highly significant negative relation between industrialization and fertility rates around the world. Urban areas around the world tend to have higher fertility rates than metropolitan centers, while access to markets within rural communities lowers fertility rates. Education may therefore just be a vehicle to engage in the economic game of producing and consuming. Selling us the idea that education drives out fertility in a society may thus just sugarcoat the fact that industrialization, globalization and capitalism lead to vanishing populations. Being occupied by production and consumption but also entertainment, mobility and internationally-traded products and services alongside online access to markets may distract societies to prosper regarding fertility. In the Marxian tradition (1867/1995), unruled capitalism may therefore lead to a falling rate of fertility, decimating the populace and eventually also the reserve pool of economic agents.

In the discussion, this paper pays tribute to the positive and negative externalities of capitalism on fertility rates depending on where populations start from regarding their fertility rates on an overpopulation and under-reproduction spectrum. Outlining the found mechanism has implications for advocacy to either use economic markets to control overpopulation in less economically enclosed market areas or strengthen fertility and the intergenerational glue in Western world vanishing populations living in highly developed market economies. Having found a way how to naturally curb

overpopulation, negative coercion or biased birth phenomena of overpopulated world territories may be evaded. For Western world market economies that report a decline of the population, the paper provides recommendations how to alleviate the falling rate of fertility tendency in the eye of capitalism. Capitalism's declining need for labor may either be used to curb an overpopulated planet in those territories with exploding populations; or can lead to a hardly described societal downfall in well-established market economies, where capitalism is eroding itself given a shrinking pool of economic agents in advanced economies.

The paper concludes with proposals how to use market freedom to curb overpopulation in over-fertile countries but also how to avert the falling rate of fertility in vanishing societies of Western world market economic territories through taxing capitalist activities to fund parenthood by tax revenues, direct investment and/or subsidies and social benefits. In its entirety, the following paper also holds valuable contributions to sustainability pledges in the eye of an overpopulated planet with scarce resources as it offers concrete advice how to curb implicit industrialization failures' socio-economic consequences down the road and potentially-disastrous outcomes of globalization over time.

The findings also have innovative and futuristic implications in the age of artificial intelligence. Shedding light on these insufficiently-described shadows of free markets of the world economy in the age of globalization is of highest importance regarding the future rise of digital innovations. With the prospect of automated control and artificial intelligence taking over manual, repetitive tasks, humanness – hence activities that are innate and unique for human beings – is likely to become more precious. Robotics and artificial intelligence slowly taking over human capital labor activities but not being able to reproduce a DNA is argued to increase the value of humanness – and with that human fertility – in the future artificial intelligence age to come. Outlining the positive potential and negative impacts of industrialization, globalization and capitalism on fertility rates holds the key to argue for

human reproduction to be considered as a means of production that is unique to human beings and should become directly remunerated in the digital age.

The paper is structured as follows: The theoretical part starts with an outline of alternative capitalism theories and view of fertility as cause of overpopulation and under-reproduction. The paper then covers the existing literature on a vast array of crowding out factors influencing fertility around the world, featuring hardly any reference to economic variables. It is then innovatively argued that capitalism and access to markets as well as attention to participate in production and consumption curbs people's humane-imbued wish for parenthood. A worldwide data sample on capitalism measured by the *Index of Economic Freedom* is portrayed to be negatively correlated with fertility rates around the world. Tariffs and taxation are associated with higher fertility rates. Based on a 139 country strong worldwide dataset on industrialization as measured by the UNIDO in the *Industrialization Intensity Index* of 2014[2] and fertility rates as reported by the CIA *World Factbook*,[3] a highly significantly negative correlation is found between industrialization and fertility rates around the world. Urban areas have lower fertility rates than metropolitan centers and access to markets as measured by the World Bank *Rural Access Index* is associated with lower fertility rates. This effect also holds for a 50 U.S. states dataset of the 2017 *Economic Freedom Index*, which reveals economic freedom to be negatively associated with fertility rates in the United States of America. The historical cases of the transition of communist USSR to the more capitalist contemporary Russia as well as the East and West Germany reunification as introduction of East Germany to capital markets; but also the Czech Republic's gaining access to economic markets and the Islamic state Westernization of Iran in the 1990ies are meta-

[2] https://tcdata360.worldbank.org/indicators/mva.ind.int?country=USA&indicator=3793&viz=line_chart&years=1990,2014

[3] https://www.cia.gov/library/publications/the-world-factbook/

analyzed in order to reveal that access to markets crowds out fertility over time in different parts of the world. In the historic cases, education, on the contrary, is not related to fertility in a stringent way and therefore argued to just be a vehicle to engage in the economic game of producing and consuming; but the actual driving effect being access to capitalist markets. Practical recommendations are targeted at limiting the downsides of international aid creating overpopulation by shifting to opening markets for overpopulated areas and enabling fertility alongside strengthening the intergenerational glue in under-reproduced areas of the world. The paper concludes with policy recommendations how to implement capitalism in overpopulated-low capitalistic territories and enhance fertility in under-reproduced-high capitalistic countries by curbing capitalism and funding parenthood, which is prospected to become more precious in the digital age.

2. Theoretical background

2.1 Capitalism and alternative theories

Market economies have existed under many forms of government and in many different times, places and cultures. Since industrialization, capitalism emerged as an economic system based upon private ownership of the means of production and their operation for profit (Rosser, Rosser & Barkley, 2003). Central characteristics of capitalism include private property, capital accumulation, wage labor, voluntary exchange, a price system and competitive markets (Heilbroner, 2008). In a capitalist market economy, decision-making and investment are determined by every owner of wealth, property or production ability in financial and capital markets; whereas prices and the distribution of goods and services are mainly set by competition in goods and services markets (Gregory & Stuart, 2013). After the first introduction and description of the advantages of market systems by Adam Smith (1776/2005)

and international trade in David Ricardo (1821/1996); Karl Marx (1867/1995) drew attention to the shadows of the invisible hand in the division of society into producers and consumers.

Modern capitalism developed in Western Europe during the Industrial Revolution. Since then capitalist economies have become dominant in the Western world and continue to spread. Modern capitalist societies feature a universalization of money-based social relations materializing in a consistently large and system-wide class of workers who must work for wages and a capitalist class who owns the means of production. Over time, capitalist countries are – in the predominately neoclassical tradition – reported to have experienced consistent economic growth and an increase in the standard of living. However, economists, political economists, sociologists and historians have adopted different perspectives in their analyses of capitalism and have recognized various forms of capitalism in practice. Within economics, different schools capture capitalism from different angles.

Neoclassical perfect and imperfect competition: The neoclassical perfect competition model builds on hyper-rational, fully informed representative agents operating in a structured world. The following imperfect competition paradigm starts bringing economics closer to capturing reality. Behavioral economics in the North American tradition acknowledges an interdisciplinary economic view but remains being organized around the failures of standard economics. Demonstrating failures of neoclassical assumptions proceeds to psychological explanation for human fallibility and predictions about human decision making in economic systems. All these schools assume rising standards of living in capitalist economies.

Real competition: The most novel heterodox stance on capitalism is real competition introduced in Professor Anwar Shaikh's opus *Capitalism: Competition, Conflict, Crises* (2016). Real competition is antagonistic by nature, turbulent and different from perfect competition. Real competition generates specific patterns. In real competition, each-against-each competition captures that everyone engaged

in markets uses tactics and strategies to evaluate prospects for gaining. The intensity of the competitive struggle depends on price-setting, cost-cutting and technology variations intrinsic to competition. Every corporation wants to operate at lowest costs to compete. Firms constantly need to cut costs as a firm with lower unit costs can always drive out competitors by cutting price to the point where their profit rates are lower than the own. Prices thereby become weapons for survival in the competitive struggle for profits and market shares. Prices set by different sellers in the same industry are roughly equalized through the mobility of customers toward lower prices. Profit rates on new investments in different industries are roughly equalized through the mobility of capital toward higher profit rates. Both produce distributions around a corresponding common center. The price level, which depends on the cost of capital, also determines the interest rate. In the turbulent real competition economies, the profit motive is inherently expansionary: Investors try to recoup more money than they put in, and if successful, can do it again and again on a larger scale, colliding with others doing the same. Over time, higher capital intensity leads to lower costs, which will eventually contribute to a falling rate of profit given the competitive nature of capitalism. The incremental rate of profit driving capitalism derives from new investments and the adoption of new technologies. Firms are incentivized to try new technologies, in order to reclaim new market segments and high profits. New technology adoption and capital mobility also enable lowering costs (Schumpeter, 1949).

The turbulent equilibration is very different from the conventional description of equilibrium as a state-of-rest. Supply and demand play a role in the process but not in the final outcome, since both are affected by price-cutting entry and exit of competitors. An important point is that price and profit rate equalization are quintessential emergent properties, unintended outcomes of constant jockeying for greater profits (Shaikh, 2016). The equilibrium may have an impact on social relations.

Anticipation of facing equilibrating scenes may shadow fertility. A socio-economic extension of standard equilibrium theory is therefore called for.

But how exactly do markets shape reality? What distraction to engage in markets and compete in production and consumption means for socio-psychological decision making in the social compound, is hardly described in the economics literature. If considering all markets to run on price wars and competition, decisions made in the eye of equilibrating processes may change the social relations and quality of life. Capitalism may distract humans from humanness – or what it means to be human regarding fertility.

Conventional supporters argue that capitalism provides better products through competition, creates strong economic growth, yields productivity and prosperity that greatly benefits society. Capitalism is praised as the most efficient system for the allocation of resources offering an ample variety of consumption options and entertainment choices. Critics of capitalism comes from various disciplines that point at the inherently exploitative, unsustainable nature that creates economic inequality, erosion of human rights and incentivized imperialist and destructive expansion (Marx, 1867/1995; Shaikh, 2016). While there is a wealth of literature on the positive and negative effects of economic growth on society, the investigation of the impact of economic markets on society lacks a description of the relation of capitalism to societal fertility rates.

In the realm of writings about the marginal propensity to consume and invest to quantify induced consumption and derive business cycle patterns, the concept's potential externalities in regards to procreation is completely neglected (Keynes, 1936/2003). The social influence and societal correlates of markets and the distracting effect of equilibrating processes is rather undescribed in the contemporary economic literature. Equilibrating processes are assumed to be inherently turbulent and having a vastly undescribed effect on bounded agents' choices (Shaikh, 2016). This paper therefore

aims at sketching the impact of access to economic markets on procreation choices and hence fertility rates.

Amidst the literature on the impact of economic growth on society, there is no stringent information on the relation of economic markets on society in regards to fertility rates. Markets, however, echo in society. Economic conditions determine people's day-to-day decisions. Individual market actors make choices under economic constraints, which have personal and social consequences. Access to markets matters – it affects individuals' daily decisions. Economic opportunities play a decisive role in patterns of economic agents. Focus on fitness in the equilibrating process may cause individuals to forget to procreate; so may ample opportunities to entertain and satisfy oneself in capitalistic societies. Trainings in maximizing utility may create a trend to maximize the welfare of offsprings, thereby foster the wish to limit one's own children to bundle resources for fewer offspring, which naturally drives down the fertility rate. In addition, individuals' perceptions of the economy around them may influence individuals' spending and investment choices – may these be monetary or temporal in allocating their time, attention and resources towards self-created offspring. Being tied into a system of division of laborers and capitalists but also being consumed by ample varieties of entertainment and access to international markets online, individuals may fall for capitalism while being detached from humane reproduction. Capitalism may therefore lead to a falling rate of fertility, which will eventually deplete capitalism in highly industrialized countries since value can only be derived from human workers, whose pool will be shrunk. A falling rate of fertility in the wake of capitalism thereby builds on Marx's (1867/1995) argumentation that capitalism will eventually implode if extended to the labor forces needed for accumulation of capitalists. Capitalism may therefore kill itself if not being curbed at an advanced stage. Markets may have to fail, in order to be reproduced via their agents.

The following paper describes a study on the relationship between capitalism and fertility rates. Data will be presented to outline general patterns how individuals may react to markets around them in their decision to conceive a child or not. Capturing a suppressed fertility in the eye of capitalism has implication for social structures but also on capitalism itself. For one, capitalism crowding out fertility hold enormous potentials to naturally curb overpopulation problems in too fertile countries of the world, in which children face starvation due to lacking resources and hardly any access to market powers. But on the other hand, capitalism naturally lowering populations implies less diversity and a decimated pool of laborers, consumers and producers in the industrialized world, where fertility rates need to be boosted in the eye of an aging Western world shrinking population.

In its entirety, the article will unravel how economic patterns influence society. Drawing inference on economic agents' life decisions within economic markets, the paper will thereby also introduce psychological and sociological elements of intergenerational relations into economic calculus and societal debates of capitalism. Children have been an historical means of ensuring security of the aged. But eldercare has been taken over by the welfare state in advanced capitalism, which could account for some of the decline in fertility. The inherent focus on the self, which capitalism inculcates also works against taking care of others, such as one's own children. Markets offer ample ways how to outsource child- and eldercare, thereby also potentially eroding fertility rates and the intergenerational glue (Puaschunder, 2017).

2.2 Fertility

The fertility rate is the absolute natality of a population representing the average number of children that are born to a women in a nation state over her entire lifetime. The total fertility rate therefore equals the average number of children a woman would potentially have through all her fertile

years. According to the Central Intelligence Agency (CIA)'s World Factbook, the average global birth rate was 18.5 births per 1,000 total population in 2016.

Birth rates vary by geographic location. The country with the highest birth rate is Nigeria at 51.26 births per 1,000 people. The country with the lowest birth rate is Monaco at 6.72 births per 1,000 inhabitants. In today's US society, there are 59.8 births per 1,000 women aged 15-44 years reported, which accounts for the lowest fertility rate since records have been kept from 1909. The average total fertility rate in the European Union is at 1.58 children per woman in 2015.[4] Africa is the world region with highest fertility, in particular Niger, Burundi, Mali, Somalia and Uganda. The highly successful, developed high-tech economies of East Asia – such as Singapore, Macau, Taiwan, Hong Kong, Japan and South Korea – are the lowest contemporary fertility regions in the world.

The fertility-income paradox or demographic-economic paradox outlines that the high fertility countries are poor given an inverse relationship between income and fertility (The Economist, 2009). The demographic transition theory postulates that when a country undergoes economic development and social change, its population growth declines. As societies advance, birth mortality rates decline. However, the relation of economic variables, development and fertility is complex. Developed countries have a significantly lower fertility rate stemming from a variety of attributed factors, such as the wish to have greater wealth per child. In underdeveloped regions, high fertility rates are often referred to as for crowding out focused support of offspring. Higher living expenses and costs for sophisticated education, clothing, feeding and social amenities in the developed world are associated with lower fertility rates (Mira & Ahn, 2002). But also higher education, urbanization and housing opportunity factors play a role. Longer periods of time spent obtaining higher education pushes conception to later life stages. In contrast, underdeveloped regions of the world are attributed to

[4] http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsdde220&plugin=0

sometimes feature children as labor and caregiver aid. Lack of access to contraceptives and stricter adherence to traditional religious beliefs as well as devotion to family values but also lower levels of female education are linked to higher fertility rates in developing parts of the world. Access to birth control crowds out fertility.

Fertility is an issue of concern and policy of national governments. Fertility engineering depends on the starting level and situational context. Around the world, pro-natalist policies, hence policies to increase the crude birth rate; and anti-natalist policies to reduce the crude birth rate, are enacted concurrently. In the developing world, governments have often set population targets that can also be tainted with discriminatory agendas or biased outcomes, such as China's one child policy leading to an overrepresentation of male offspring (Marshall, 1997).

Why care about fertility rates? Fertility remains the eternal flame of societies but also determines living conditions and the sustainability of humankind on earth. Population control therefore is an ideal of scientific theory and public policy practice. Overpopulation and under-reproduction areas are concurrently reported around the world, leading to explicit and implicit population size engineering endeavors to raise fertility rates in some vanishing societies and curb fertility rates in other overpopulated world regions.

Overpopulation

By the beginning of the 19th century, the world population had grown to a billion individuals. Already Thomas Malthus (1798/2015) had predicted that humankind would outgrow its available resources, because a finite amount of land would be incapable of supporting a population with a limitless potential for increase. At the same time, mercantilists argued that a large population was a form of wealth, which made it possible to create bigger markets and armies.

Overall, while the rate of population growth has been declining since the 1980s, the absolute total numbers keep increasing. As of April 2018, the world's human population is estimated to be 7.614 billion.[5] Every 8 seconds, one person is born; every 11 seconds one dies. There is a net gain of one person on earth every 14 seconds.[6] In July 2018, the most populous countries in the world were China, India, the US, Indonesia, Brazil, Pakistan, Nigeria, Bangladesh, Russia and Japan. Most contemporary estimates for the carrying capacity of the earth under existing conditions are between 4 billion and 16 billion; 7 billion as estimated by the United Nations.[7] The population is expected to reach between 8 and 10.5 billion between the years 2040 and 2050 and 11.2 billion for 2100.[8]

The recent rapid increase in human population over the past three centuries has raised concerns that the planet may not be able to sustain present or future numbers of inhabitants. In 2017, more than a third of 50 Nobel prize-winning scientists surveyed by the *Times Higher Education* at the Lindau Nobel Laureate Meetings said that human overpopulation and environmental degradation are the two greatest threats faced by humankind (Moody, 2017). In November 2017, a statement by 15,364 scientists from 184 countries indicated that rapid human population growth is the "primary driver behind many ecological and even societal threats" (Ripple, Wolf, Newsome, Galetti, Alamgir, Crist, Mahmoud & Laurance, 2017). Almost all growth will take place in the less developed regions, where today's 5.3 billion population of underdeveloped countries is expected to increase to 7.8 billion in 2050. By contrast, the population of the more developed regions will remain mostly unchanged, at 1.2 billion. An exception is the United States population, which is expected to increase by 44% from 2008 to 2050.[9]

[5] https://www.census.gov/popclock/
[6] https://www.census.gov/popclock/
[7] https://www.upi.com/Top_News/US/2011/10/31/7-billion-people-is-a-serious-challenge/UPI-73301320046200
[8] https://www.un.org/development/desa/en/news/population/world-population-prospects-2017.html
[9] https://www.census.gov/

In 2000-2005, the average world fertility was 2.65 children per woman, about half the level in comparison to 1950-1955, when it was 5 children per woman. Global fertility is projected to decline further to 2.05 children per woman. During 2005-2050, the following countries are expected to account for half of the world's projected population increase: India, Pakistan, Nigeria, Democratic Republic of the Congo, Bangladesh, Uganda, United States, Ethiopia, and China, listed according to the size of their contribution to population growth. The population of 51 countries or areas is estimated to be lower in 2050 than in 2005.

At the same time, global life expectancy at birth is expected to continue rising from 65 years in 2000-2005 to 75 years in 2045-2050. In the more developed regions, the projection is to 82 years by 2050. Among the least developed countries, where life expectancy today is just under 50 years, longevity is projected to rise to 66 years by 2045-2050. During 2005-2050, the net number of international migrants to more developed regions is believed to be 98 million. Because deaths are expected to exceed births in the more developed regions by 73 million during 2005-2050, population growth in those regions will largely be due to international migration. From 2000-2005, net migration in 28 countries either prevented population decline or doubled at least the contribution of natural increase to population growth.

Birth rates are now falling in a small percentage of developing countries, while the actual populations in many developed countries would fall without immigration.[10] The number of children born per woman of the world population decreased from 5.02 to 2.65 between 1950 and 2005. In Europe from 2.66 to 1.41, North America from 3.47 to 1.99, Oceania from 3.87 to 2.30, Central America from 6.38 to 2.66, South America from 5.75 to 2.49, Asia from 5.85 to 2.43, Middle East and Africa from 6.99 to 3.37 and Sub-Saharan Africa from 6.7 to 5.53. The projected world number of

[10] http://www.un.org/en/development/desa/population/

children born per woman for 2050 would be around 2.05. Only the Middle East & North Africa (2.09) and Sub-Saharan Africa (2.61) would then have numbers greater than 2.05 children per woman.[11]

The InterAcademy Panel Statement on Population Growth stated that many environmental problems, such as rising levels of atmospheric carbon dioxide, global warming, and pollution, are aggravated by the population expansion.[12] Human overpopulation exceeds the ecological capacities. In the long run, overpopulation cannot maintain the rapid depletion of too little non-renewable resources, partially as the result of increased birth rates. Problems associated with overpopulation include the increased demand for resources such as fresh water and food, starvation and malnutrition, consumption and depletion of natural resources – such as fossil fuels – faster than the rate of regeneration, air, water, soil and noise pollution, global warming, loss of arable land and increased desertification, salinization, nuclear powered desalination, mass species extinctions and contracted biodiversity, higher infant and child mortality, lower life expectancy and a deterioration in living conditions. Overpopulation is also associated with the urban sprawl, growth of shanty towns, unemployment, homelessness, lacking medical care and education, sewage treatment, waste disposal and energy supply, factory farming, epidemics, pandemics, infectious diseases, poverty, unhygienic living conditions, conflict over scarce resources and crowding, crime, warfare, drug addiction, alcoholism, less open space and personal freedoms and more restrictive laws, totalitarian governments, overconsumption, overfishing, deforestation, soil erosion, pollution from pesticides and fertilizers, food price bubbles, food insecurity and food riots, less social warmth and more competitive stress, and

11 https://web.archive.org/web/20120117215622/http://earthtrends.wri.org/searchable_db/results.php?years=1950-1955%2C1955-1960%2C1960-1965%2C1965-1970%2C1970-1975%2C1975-1980%2C1980-1985%2C1985-1990%2C1990-1995%2C1995-2000%2C2000-2005%2C2045-2050&variable_ID=369&theme=4&cID=&ccID=0%2C1%2C6%2C2%2C3%2C5%2C8%2C7%2C4

12 https://web.archive.org/web/20100210203604/http://www.interacademies.net/?id=3547

other social miseries diminishing the quality of life (Bashford, 2008; Nielsen, 2006).[13] In many poor countries, population crowded areas exhibit high rates of disease due to unsanitary conditions, malnutrition, and lack of basic health care. The usage of the term *Lebensraum* of the Youth Bulge Theory supports the idea that overpopulation may drive warfare through fear of resource scarcity and increasing numbers of youth lacking the opportunity to engage in peaceful employment.

Overpopulation does not only depend on the size or density of the population, but also on the ratio of population to available sustainable resources and how resources are managed and distributed throughout the population. As developing countries with high populations become more industrialized, pollution and consumption will invariably increase. The world's ecological capacity is simply insufficient to satisfy the ambitions of China, India, Japan, Europe and the United States as well as the aspirations of the rest of the world in a sustainable way.[14] According to Worldwatch Institute, if China and India were to consume as much resources as the United States per capita, in 2030 they would each require a full planet Earth to meet their needs.[15] Curbing the population growth is proposed to resolve contemporary environmental problems.[16]

Advocates of population moderation cite issues like quality of life, carrying capacity, and risk of starvation as the basis to argue for population decline. The United Nations has expressed concerns over continued population growth in sub-Saharan Africa. Most countries have no direct policy of limiting their birth rates. Naturally falling human fertility is mainly attributed to education, family planning and increasing access to birth control and contraception, as worldwide nearly 40% of pregnancies are unintended. In the developing world, some 514,000 women die annually of

[13] http://donellameadows.org/archives/poverty-causes-population-growth-causes-poverty/
[14] http://news.bbc.co.uk/2/hi/science/nature/4604556.stm
[15] http://www.worldwatch.org/node/3893
[16] https://www.un.org/esa/population/publications/wpm/wpm2001.pdf

complications from pregnancy and abortion, with 86% of these deaths occurring in the sub-Saharan Africa region and South Asia.[17] Additionally, 8 million infants die, many because of malnutrition or preventable diseases, especially from lack of access to clean drinking water. The population explosion in the developing world is associated with missing education and information about conception as well as affordable means and services to determine the size and spacing of their families. The status of a female in a society, but also women's and reproductive rights play a key role in procreation self-determination. One- or two-child policies and small family role models and immigration restrictions curb overpopulation.

Natalist-coercion is often used in non-Western cultures comprising of taxing individuals without offspring and criminalizing birth control. Sterilizations in India, the United States and one-child policies in China account for controversial involuntary bio-engineering attempts in history. Urban designer plans to have birth credits, which would require to buy licenses for any child born beyond an agreed upon average, or benefits for sterilizations (as, for instance, offered in India in the past), are additional contested proposals to curb overpopulation. The goal remains to bring the developed countries to low population growth while also raising the standard of living in developing countries. Urbanization appears as a way to overcome the density problem as cities hold the potential to concentrate human activities, yet leaves the missing resources question open. Futuristic innovative proposals also argue for extraterrestrial settlement or space colonization with particular plans for Venus, Saturn, Uranus and Neptune, which hold potentially livable conditions for future humankind (Atkinson, 2008; Hawking, 2010).

Under-reproduction

[17] https://wayback.archive-it.org/all/20070816231834/http://www.unfpa.org/news/news.cfm?ID=85&Language=1 http://www.who.int/mediacentre/news/releases/2007/pr56/en/

A vital population is essential for society's sustainability, efficient operation, diversity and democracy to stimulate intellectual, artistic, and technological creativity to facilitate social infrastructure and economic functioning alongside productive output (Daily, Ehrlich & Ehrlich, 1994). Fertility is beneficial for government budgets and standard of living perceptions (Lee & Mason, 2014). Thomas Malthus (1798/2015) postulated that greater economic means enable to have more offspring. In economic endogenous growth theories, fertility is positively associated with rising economies of scale and diversity (Romer, 1994).

Sub-replacement fertility is a condition in which a new generation is less populous than the previous generation in a given area. In developed countries, sub-replacement fertility is any rate below approximately 2.1 children born per women, but as high as 3.4 in some developing countries due to higher child mortality rates. Better sanitation and access to a more sophisticated health care system are contributors to birth success rates. As of 2010, about 48% (3.3 billion people) of the world population lives in nations with sub-replacement fertility, foremost in Europe, Canada, Australia, Brazil, Russia, Iran, Tunisia, China and the United States. In 2015, all European Union countries had a sub-replacement fertility rate, ranging from a low of 1.31 in Portugal to a high of 1.96 in France.[18] As of 2016, the total fertility rate varied from 0.82 in Singapore to 6.62 in Niger.[19]

A lack of young poses economic challenges to governments and society to care for aging citizens. Tipping Western world age pyramids draw attention to rising public pension needs in relation to a shrinking pool of a productive workforce (Puaschunder, 2015). This problem has been raised as a political issue in many European countries, foremost France, Germany and the United States, where policy changes to encourage higher birth and immigration rates have been advocated for (Puaschunder,

[18] http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsdde220&plugin=0
[19] https://www.cia.gov/library/publications/the-world-factbook/rankorder/2127rank.html

2015). The United States population growth is at historical low levels as the United States current birth rates are the lowest ever recorded (CNN, 2014). The current US birth rates are not high enough to maintain the size of the U.S. population (The Washington Post, 2014; The Huffington Post, 2014).

The reasons for a general decline in fertility rates are explained by higher education and rising educational expenses that lead to postponing marriage and home-ownership. Factors associated with decreasing fertility rates include wealth and education (Rai, Pareek & Hemlata, 2013), female labor participation (Bloom, Canning, Fink & Finlay, 2009), urban residence (Sato, 2007), intelligence, widespread birth control usage, and increased age of conception. Factors generally associated with increased fertility include religiosity (Hayford & Morgan, 2008), intention to have children *(*Dommermuth, Hohmann-Marriott & Lappegård, 2017) and maternal support (Schaffnit & Sear, 2014). Declining living conditions in the wake of economic fluctuations, such as depressions, were reported to lower fertility rates.[20] Urbanization and agricultural improvement practices also tend to lower fertility rates (Khan, & Raeside, 1997). While the reasons for fertility are manifold – as mentioned in the literature – ranging from political unrest and war, economic fluctuations, income and wealth, youth unemployment, socio-economic position, social, technological and environmental conditions, female labor force participation, emancipation, growing desire of women to seek careers outside child rearing and domestic work, decreased need for children in industrialized settings, black markets, urbanization, cohabitation, average marriage age, familyism, household and nuclear family formation, later marriage ages, first conception age, family environment, education, intelligence, literacy, human international social and economic development, religious denomination and the influence of religious Islamic clerics and the Vatican, cultural and social norms, racial and ethnic factors, gender equity and acceptance of non-traditional families, pro-family government programs,

[20] https://www.prb.org/datasheets/

population control, material child support and paternal child support as well as respective enforcement policies, child custody laws, agriculture and farming, housekeeping traditions, parenting practices, personality type family planning, personality traits, freedom from patriarchy, independent means of income, egalitarian views about the division of labor, immigration, governmental policies and taxation, legal coercion and discrimination, home-ownership, investment per child, longevity, meeting frequency, relationship intensity and stability, public pension generosity, pollution, viruses, epidemics and pandemics, malnutrition, infections, poverty, unhygienic living conditions, social and psychological distress, drug intake, sleeping behavior, access to healthcare, one's own health and the health status of relatives and social circles, birth defect risks, contraception and reproductive technology as well as development and GDP, crime rates, conflict over scarce resources, food prices, crowding and population density, water quality access, sanitation, hygiene, proper sewage treatment, waste disposal and energy supplies, environmental exploitation, climate change, freedom to choose, fertility preference, happiness, children from previous unions, inter-pregnancy interval, spousal height difference; none of these theories or studies clearly addresses the direct relation of fertility rates and access to economic markets. The literature also features the discussion of limitations such as the time-sensitivity of the results[21] as well as problems to generalize.[22] The unclear directionality or interrelation of these variables and the stark cultural differences of influence factors demand for further research.

Demographic changes open an intergenerational gap (Puaschunder, 2017). For instance, Western world shrinking populations and diminishing economic power in the aftermath of the 2008/09 World Financial Crisis steer intergenerational pressures. Demographically declining populations lower the work force to support a growing body of retired. While old and young have their expectations for

[21] http://www.oecd.org/els/family/SF_2_5_Childlessness_June2014.pdf
[22] http://demografia.hu/hu/letoltes/publikaciok/EPCposter2016.pdf

a decent standard of living degraded in the aftermath of the 2008/09 World Financial Crisis, the economic situation leaves the young with having to afford their and the elderly's living. Life expectancy rising and stable pension ages coupled with ceasing populations will decline access to social welfare pensions and public health care.

Current major European, national pension systems appear unfeasible as the older are much better off. In some European countries, old fashioned taxation and pension plans have neither been reformed nor adjusted to aging populations for decades – for instance, while the Austrian living expectancy has risen over 7 years since the 1950ies, the average retirement age has decreased. Czech pensioners can receive 95-97% of their income after retirement while being allowed to work continuously. Retired being able to double dip the market and governmental aid leads to an economically unfavorably bunkering of workplace vacancies for the upcoming young.

In the Western world, politicians tend to have promised too much regarding pensions for the future in the industrialized world, the young's ability and willingness to pay for the elder to maintain their lifestyles and standard of living is likely to vanish. Politicians in the Western world therefore currently face a massive redistribution conflict from the shrinking body of young and current budgetary liquidity constraints narrowing resources to pay for current needs. As Western world pensions have been calculated with an at least constant population in the past, reforms need to pay attention to demographic changes through legislations and regulations that lift future generations' welfare expenditures burden. The current Western world young population will likely be the first generation that will experience drastic pension cuts and left not having as good pensions as expected. However, the pension system needs to be made feasible in a precautionary way so that social welfare and public wealth remains.

The current financial crisis and governmental overindebtedness add additional tension within the 2008/09 World Financial Crisis-shackled Eurozone. Subsequent credit rating downgrades put pressure on governmental social welfare provision flexibility. Structural problems from demographic shifts and non-adjusted pension systems lead to budget constraints. In Eurozone multi-lateral negotiations, national interests still prevail and frictions arise within the Euro compound. Civilians from one country with higher pension age should not be obliged to bailout a country with younger pensioner ages. It appears unfair if in one European country pensions get cut for 60-year olds in order to pay 50-year old pensioners in another European territory.

If in Eurozone countries the European Union determines a responsibility to help – like Germany leading the bailout of Greece – the European circle must also put reasonable, transnational policies or a fiscal union in place. While young voters should try to change the societal wealth distribution, older – as the largest and most politically active voting group – are overrepresented to express democratic will. With more elder in the voting booth, who are on the receiving ends of pension benefits, the democratic outcomes tend towards their favor. The prevailing hegemony of the old not only features power and status being attributed to older people in parliamentary and policy circles but also the corporate and finance sectors being dominated by the elder. Most European populations have reached a tipping point with a ceasing chance of social welfare pension reforms. In the Western world, and especially in Europe, the chances are getting scarce or have even passed for democratic social welfare and pension system reforms. With the age pyramid already having tipped in most European countries, by now there is resistance to address pension reforms by politicians who struggle getting a political majority vote on pension readjustments. Taking given pension promises away from 'grayers' – the strongest political lobby – in a loss-avert world, by now equals political suicide. This occupation of the

old is also problematic if the older generation blocks innovation and hinders constructive progress of the young.

Individual pensions will require citizen to pay for themselves, which will drive down intergenerational solidarity in the social compound. Solidarity will also break apart when shrinking families lower the young generation's potential to take care of the old within the family compound. The generational pact must be maintained and the new generations' willing to contribute to a system that disproportionally pays for the old strengthened. The United Kingdom is the first EU country tackling the pension reform heralding difficult debates on burden sharing predicaments. Intergenerational all-party parliamentary groups must examine social contracts between age groups to curb infeasible social welfare transfers.

In the light of shrinking Western world populations, prominent natalist policies encourage women to have children by tax allowances for working parents, improving child-care provision, reducing working hours/weekend working in female-dominated professions such as healthcare and stricter enforcement of anti-discrimination in regards to maternity leaves. Additional counterbalancing tendencies to boost population growth are immigration and increasing life expectancy. Controlled immigration is attributed as a way to demographically rejuvenate an aging population (Guillemette & Robson, 2006). In general, areas with low fertility rates are prone to foster immigration in order to rejuvenate the populace, as immigrants tend to have more offspring. However, in this regard, the negative externality of an eroded intergenerational familial glue has not been addressed in the academic literature. There is only so much an immigrant will do for an aging person without concrete familial compound relation. Fertility has only vaguely related to intergenerational transmission of societal values. The transmission of values from parents to offspring, however, is argued to be a vital prerequisite for the social glue and societal strength. The assumption is that parents transmit family

values, preferences, attitudes and religiosity to their children, all of which have long-term effects for societal well-being. Argumentations in this line would draw a case of immigration being used for the rejuvenation of a population missing out on intergenerational inter-familial social components.

3. Research question

In the diverse writings about the influence factors on fertility, the relation of access to economic markets on fertility has not be covered. The well-documented crowding effect of education on fertility will be challenged by investigating the relationship of capitalism and fertility rates (Azarnert, 2010; Binstock, 2010; Janssens, 2007; Kaufmann & Wilcox, 2013). Education may only be chosen to compete better in markets, while the underlying effect is economic distraction of agents anticipating equilibrating situations but also being mentally constraint by focusing on production and consumption. If the study finds that capitalism is crowding out fertility, this result has implications for population engineering and eroded intergenerational glue as an implicit social welfare support up that cannot be filled with immigrant workers' rejuvenating an aging Western world population.

4. Hypothesis

Capitalism is negatively related to fertility insofar as there is a negative relation between access to markets and the fertility rate of a population.

5. Operationalization

5.1 Study 1: World data cross-sectional analysis

5.1.1 Data

Based on a 175 country data set of the *2017 Index of Economic Freedom*[23] and fertility rates around the world as reported by the Central Intelligence Agency's (CIA) *World Factbook*,[24] the economic

[23] https://www.heritage.org/index/download
[24] https://www.cia.gov/library/publications/the-world-factbook/

freedom index of n=175 countries is highly significantly negatively correlated ($r_{Pearson(175)}$=-.434, p<.000) with fertility rates in these countries. The *Index of Economic Freedom* components of property rights protection ($r_{Pearson(175)}$=-.558, p<.000), judicial effectiveness ($r_{Pearson(175)}$=-.45, p<.000), government integrity ($r_{Pearson(175)}$=-.475, p<.000), fiscal health ($r_{Pearson(175)}$=-.151, p<.022), freedom of business ($r_{Pearson(175)}$=-.518, p<.000), labor ($r_{Pearson(175)}$=-.210, p<.003), monetary policy ($r_{Pearson(175)}$=-.125, p<.048), trade ($r_{Pearson(175)}$=-.452, p<.000), investment ($r_{Pearson(175)}$=-.272, p<.000), finance ($r_{Pearson(175)}$=-.423, p<.000), GDP per capita ($r_{Pearson(175)}$=-.498, p<.000) as well as FDI inflows ($r_{Pearson(175)}$=-.179, p<.009) are all negatively correlated with fertility rates around the world.

The tax burden percent of GDP ($r_{Pearson(175)}$=-.345, p<.000) and corporate taxation ($r_{Pearson(175)}$=.377, p<.000), government spending ($r_{Pearson(175)}$=.328, p<.000), and tariffs ($r_{Pearson(175)}$=.476, p<.000) are all highly significantly positively associated with higher fertility.

The relation of industrialization and fertility was investigated. Based on a 139 country strong worldwide dataset on industrialization as measured by the UNIDO in the *Industrialization Intensity Index* of 2014[25] and fertility rates as reported by the CIA *World Factbook*,[26] a highly significantly negative correlation is found ($r_{Pearson(139)}$=-.421, p<.000) between industrialization and fertility rates around the world.

Access to the internet, measured by the OECD *Internet Access* data[27] for the year 2017, which indicates the percentage of households that reported that they had access to the internet, is tendentially negatively correlated with fertility rates around the world ($r_{Pearson(39)}$=-.227, p<.083).

25 https://tcdata360.worldbank.org/indicators/mva.ind.int?country=USA&indicator=3793&viz=line_chart&years=1990,2014

26 https://www.cia.gov/library/publications/the-world-factbook/

27 https://data.oecd.org/ict/internet-access.htm

In order to consolidate the point that access to economic markets influences fertility rates, the degree of agricultural sector contributions to the GDP was associated with fertility rates under the assumption that the more agricultural component of the GDP, the less access to industry and service sector markets a country has. For 189 world countries, the Gross Domestic Product (GDP) agriculture, industry and service sector composition was retrieved from the CIA *World Factbook*.[28] Agricultural output is the component of the GDP of a nation that describes the process of producing food, feed, fiber and other goods by the systematic raising of plants and animals. Industry is the GDP segment of the economy concerned with production of goods including fuels and fertilizers, mining and extraction sectors. The service sector is the non-material equivalent of a good. Service provision is defined as an economic activity that does not result in ownership of physical goods. It is a process that creates benefits by facilitating either a change in customers, a change in their physical possessions, or a change in their intangible assets. Service output is a component of the GDP of a nation that also includes – but is not limited to – farm and factory related activities. Over a dataset of 180 around the world, agricultural societies are highly significantly positively correlated with fertility ($r_{Pearson(180)}$=.648, p<.000). The more agricultural a society, the higher the fertility rate. In order to consolidate that this is the effect of access to economic markets in urban areas and not social norms on the countryside, the access to markets within rural communities served as further investigation support. The World Bank *Rural Access Index* was used as an indicator how much access rural communities have to markets around the world.[29] Over a dataset of 64 countries around the world, there was a highly significantly negatively correlation found for access to urban areas of rural communities and fertility rates. The

[28] https://www.cia.gov/library/publications/the-world-factbook/

[29] https://openknowledge.worldbank.org/bitstream/handle/10986/17414/360060TP100Rural0access0index01PUBLIC1.pdf?sequence=1&isAllowed=y

more access to urbanization and metropolitan markets a rural community enjoys, the lower the fertility rate ($r_{Pearson(64)}$=-.611, p<.000).

Overall, access to economic freedom and markets in the wake of industrialization is associated with lower fertility rates around the globe. Economies strong in agricultural production are associated with higher fertility rates; yet access to urban markets in rural communities lowers fertility rates around the world. Taxation, government spending and tariffs, are associated with higher fertility rates in a worldwide sample capturing 175 world countries.

5.2 Study 2: U.S. data cross-sectional analysis

5.2.1 Data

Based on a 175 country data set of the *2017 Index of Economic Freedom*[30] and fertility as reported by the CIA *World Factbook*,[31] economic freedom ($r_{Pearson(50)}$=-.373, p<.004) is significantly negatively correlated with fertility rates in 50 U.S. states. Access to economic freedom is associated with lower fertility rates in the United States.

5.3 Study 3: Historical free market shock therapy

Historical cases of regime changes serve as evidence for countries' opening to markets being associated with declining fertility rates.

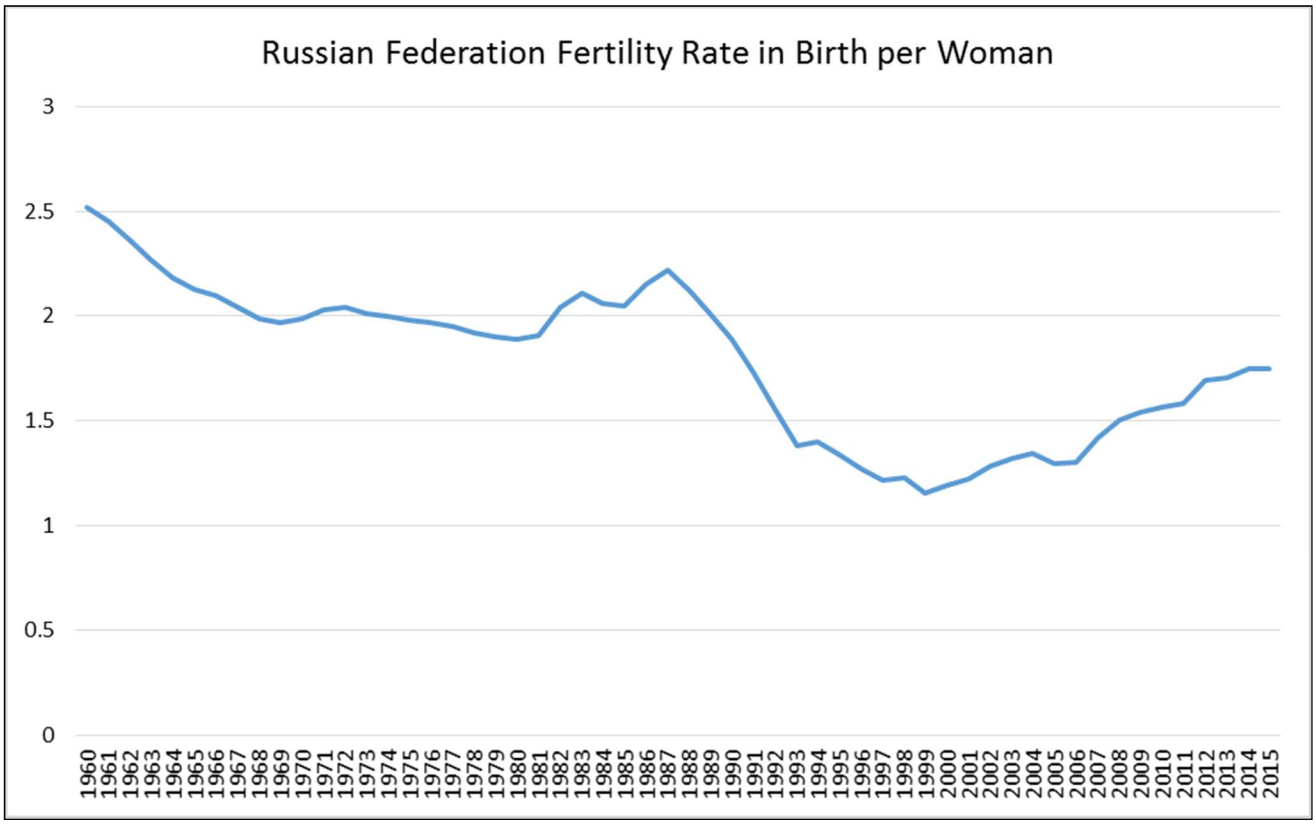
5.3.1 Case study 1: Russia

Based on historical data captured by the United Nations Population Division Fertility Rate data,[32] Russian fertility declined from *Glasnost* (starting in 1986) on and plummeted after communism imploded in the early 1990s, potentially as free market shock (Graph 1). The Russian Federation

[30] https://www.heritage.org/index/download
[31] https://www.cia.gov/library/publications/the-world-factbook/
[32] https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=IR

fertility rate is exhibited for the years 1960 to 2015 in Graph 1, whereby the x-axis captures the year and the y-axis the average total number of children per woman.

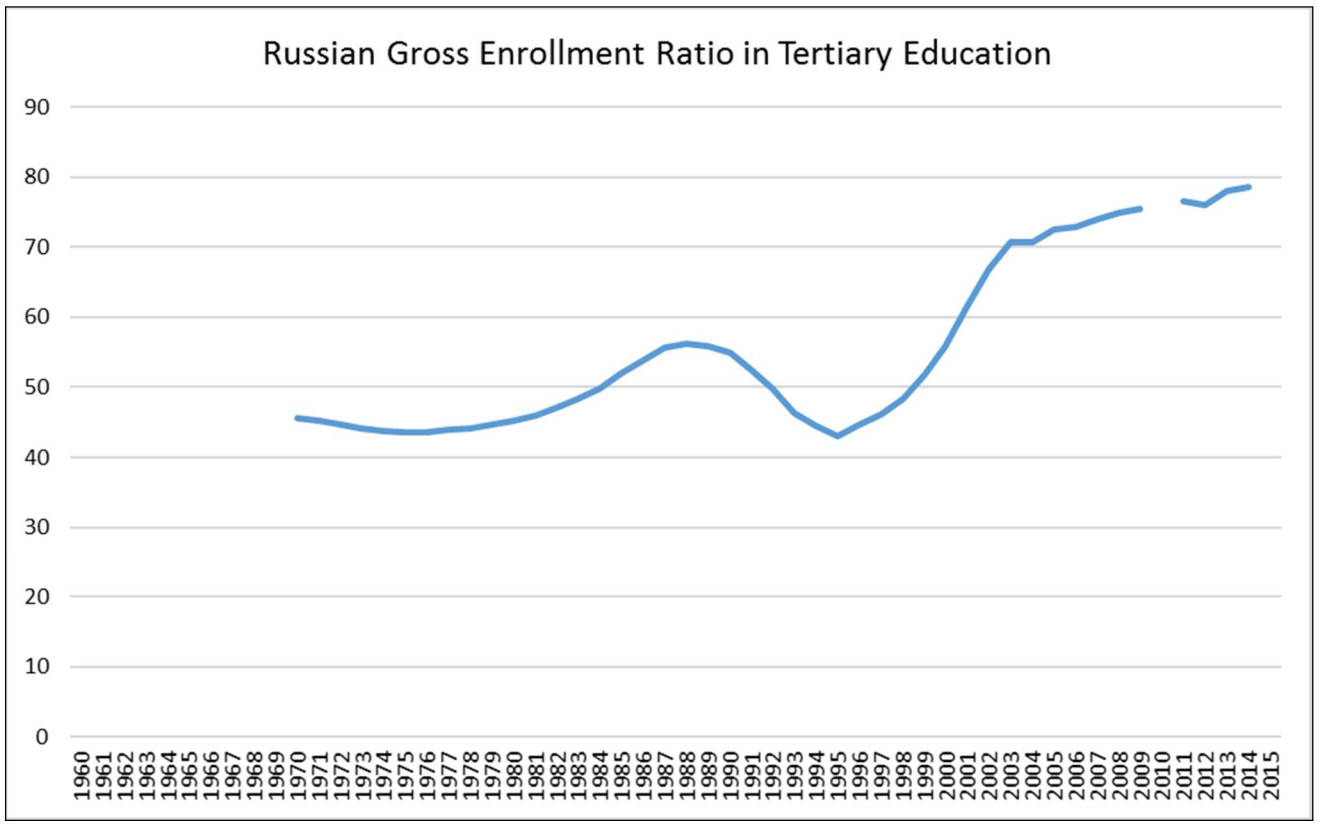
Graph 1: Fertility in former Soviet Union and Russia from 1960-2015



As outlined in Graph 2, the Gross Enrollment Ratio in Tertiary Education as retrieved from Our World in Data[33] declined in the early 1990ies, when fertility plummets, which is counterintuitive from the overall assumption that education lowers fertility rates. The Russian Federation Gross Enrollment Ratio in Tertiary Education is exhibited for the years 1970 to 2014 in Graph 2, whereby the x-axis captures the year and the y-axis the Gross Enrollment Ratio in Tertiary Education, which reflects the total enrollment in tertiary education, regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving.

[33] https://ourworldindata.org/tertiary-education

Graph 2: Gross Enrollment Ratio in Tertiary Education in Russia between 1970-2014

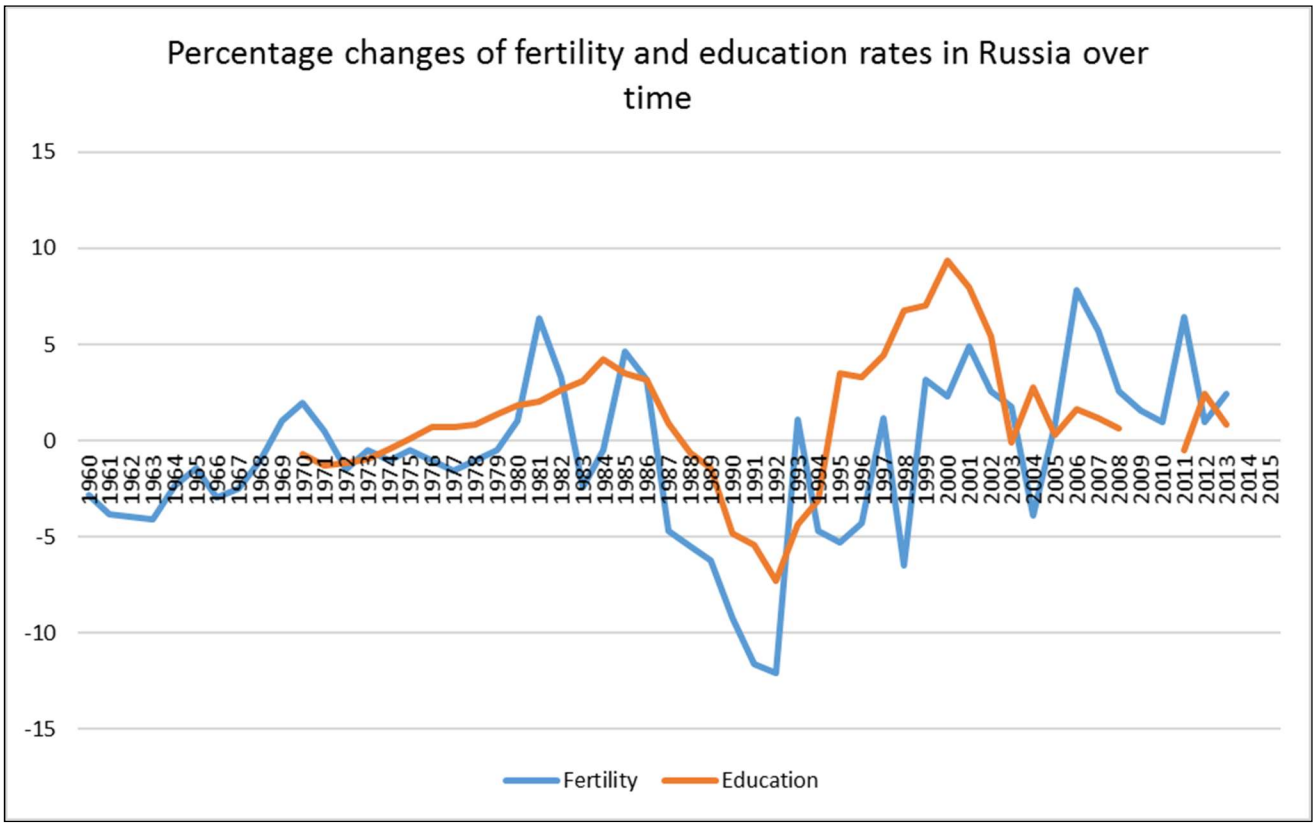


Graph 3 displays the percentage changes in fertility rates and education rates in Russia from 1960-2015, whereby we see a concurrent drop in fertility rates (in blue color) and education rates (in orange color) in the early 1990ies. In Graph 3 the x-axis captures the year and the y-axis the percentage changes of the variables fertility rate and gross enrollment ratio in tertiary education. Percentage changes are calculated by the formula expressed in equation 1:

$$P_c = \left(\frac{x_2 - x_1}{x_1}\right) * 100, \qquad \text{(Equation 1)}$$

Whereby P_c represents the percentage change, x_1 is the rate in a given year and x_2 is the rate in the subsequent year.

Graph 3: Percentage changes of fertility and education rates in Russia from 1960-2015



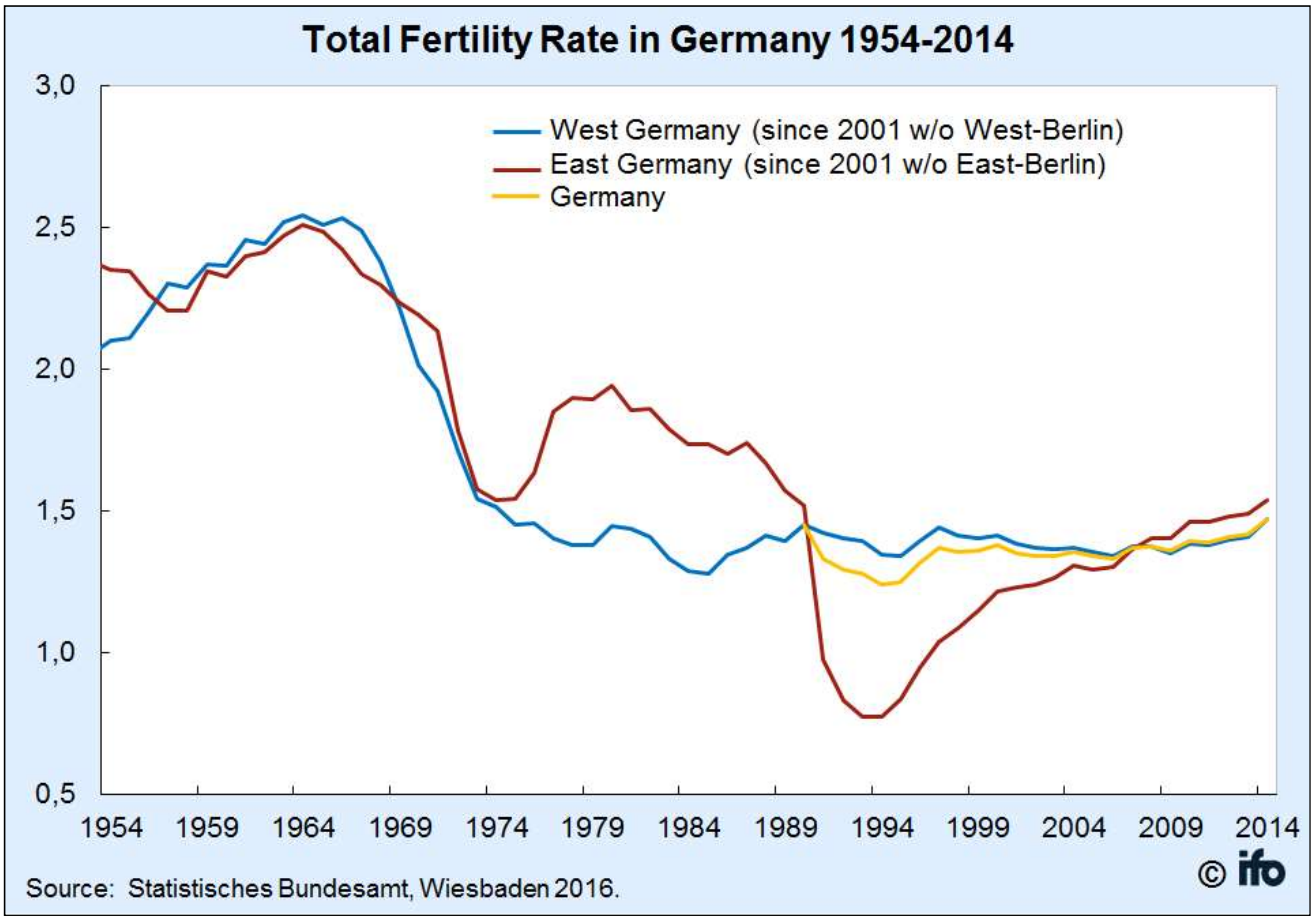
The concurrent drop in higher education attainment and fertility rates is contrary to what the standard literature would predict. The historical example therefore serves as an indicator of not education being the driver of fertility decline but access to markets crowding out steady fertility rates.

5.3.2 Case study 2: Historical capitalism shock therapy data with control group

East and West Germany after WWII fertility data is outlined in Graph 4, which reveals in blue color that the West German fertility rates declined after the economic miracle period in the 1960ies but stayed relatively high in former socialist East Germany. The x-axis of Graph 4 captures the year and the y-axis the average total number of children per woman. The gap between East in red color and West in blue remains until the reunification in 1989 opened economic markets to former East Germany, when

fertility drops drastically in the East. East Germany reported the lowest fertility rate ever recorded with 0.8 in 1994 right after the collapse of the former USSR and gaining access to economic markets.

Graph 4: Fertility in former East and West Germany from 1954-2014

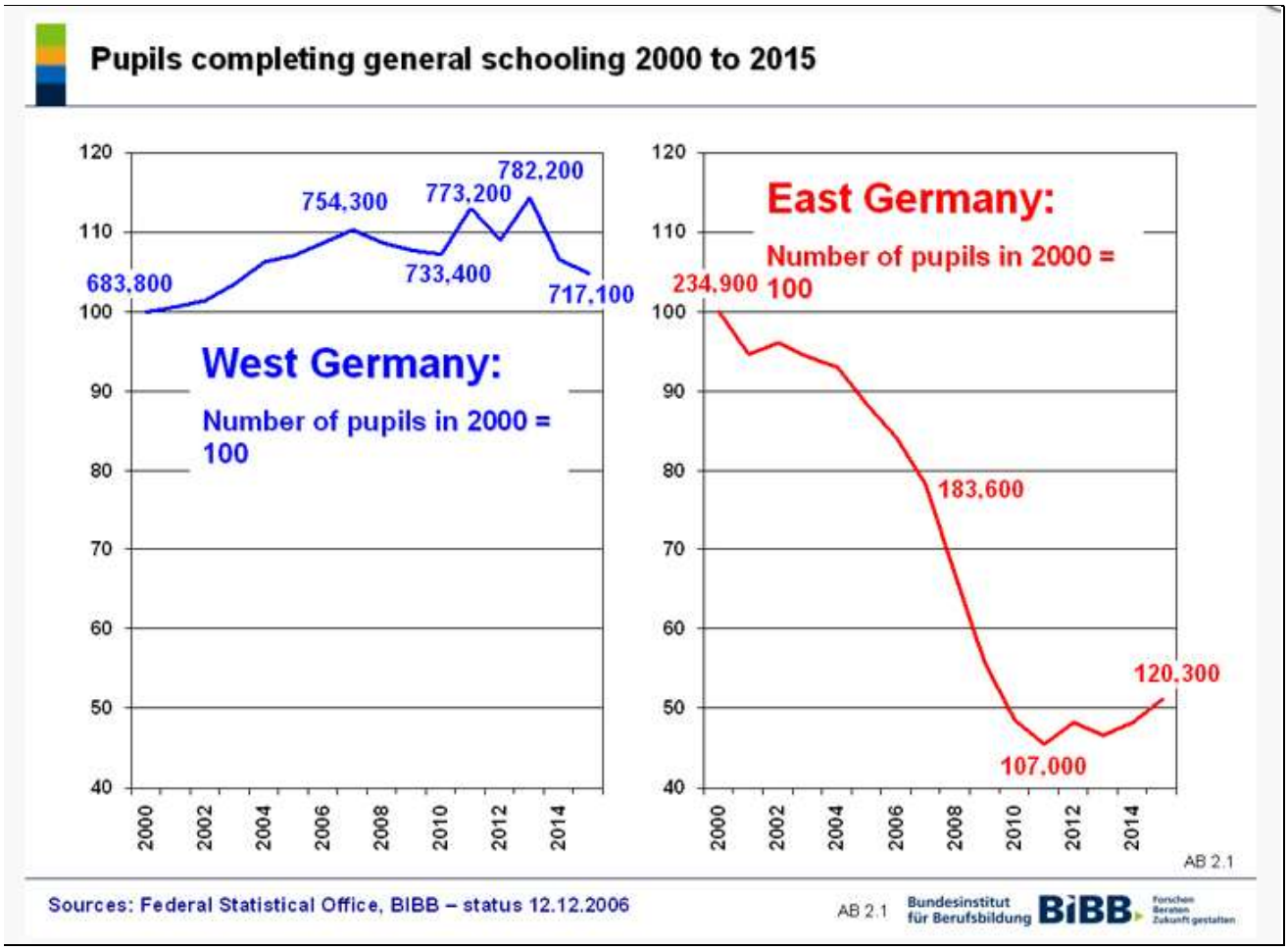


Source: Center for Economic Studies (CES) ifo group Munich, Germany[34]

When comparing East and West Germany after the reunification, we find a drop in general schooling, which is the entrance ticket qualification for higher tertiary education in the German speaking world in East Germany for the years 2000-2015 as exhibited in Graph 5.

[34] https://www.cesifo-group.de/ifoHome/facts/Time-series-and-Diagrams/Diagram-Service/Arbeitsmarkt-und-Sozialpolitik/chart-Total-Fertility-Rate-in-Germany-1954-2014.html

Graph 5: Pupils completing general schooling 2000 to 2015 in East and West Germany



Source: Federal Statistical Office, retrieved meta-analysis[35]

Children born after the reunification are considered in the literature as "lower achievers" (Science 20, 2014).[36] Here again, the stark drop in education in the newly adopted areas for establishing market

[35] https://www.bibb.de/en/16627.php

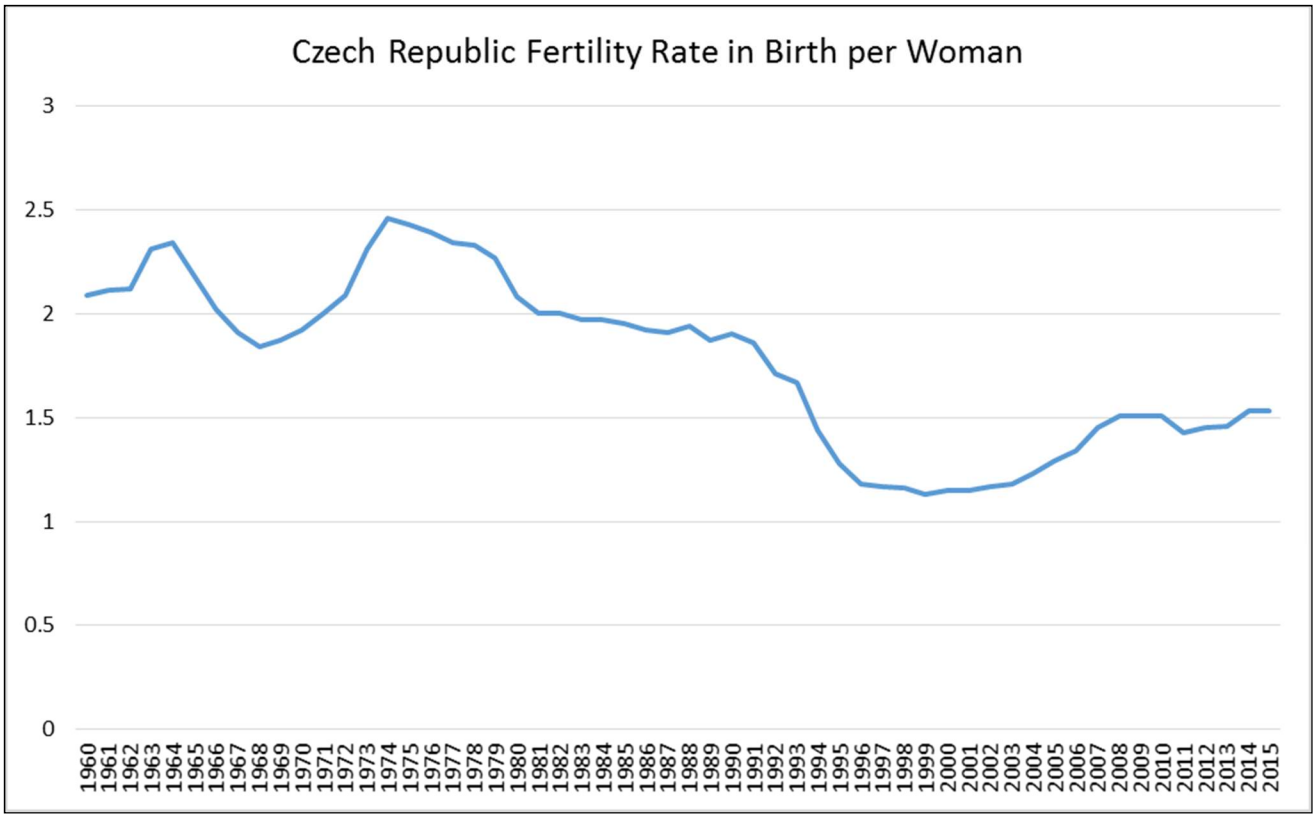
[36] http://www.science20.com/the_conversation/children_born_just_after_the_berlin_wall_fell_were_lower_achievers_heres_why-148455

economies is counterintuitive from the overall assumption that education may lower fertility rates, also underlined in contrast to the relative stable fertility rates from 2000 on in West Germany.

5.3.3 Case study 3: Czech Republic

A particularly strong example is the *Czech Republic* in the period 1992-2002, during which there was a sharp drop in the fertility rate in the wake of the opening of this former Soviet-regulated territory to economics markets. Based on United Nations Population Division Fertility Rate data,[37] the Czech Republic fertility rate is exhibited for the years 1960 to 2015 in Graph 6, whereby the x-axis captures the year and the y-axis the average total number of children per woman.

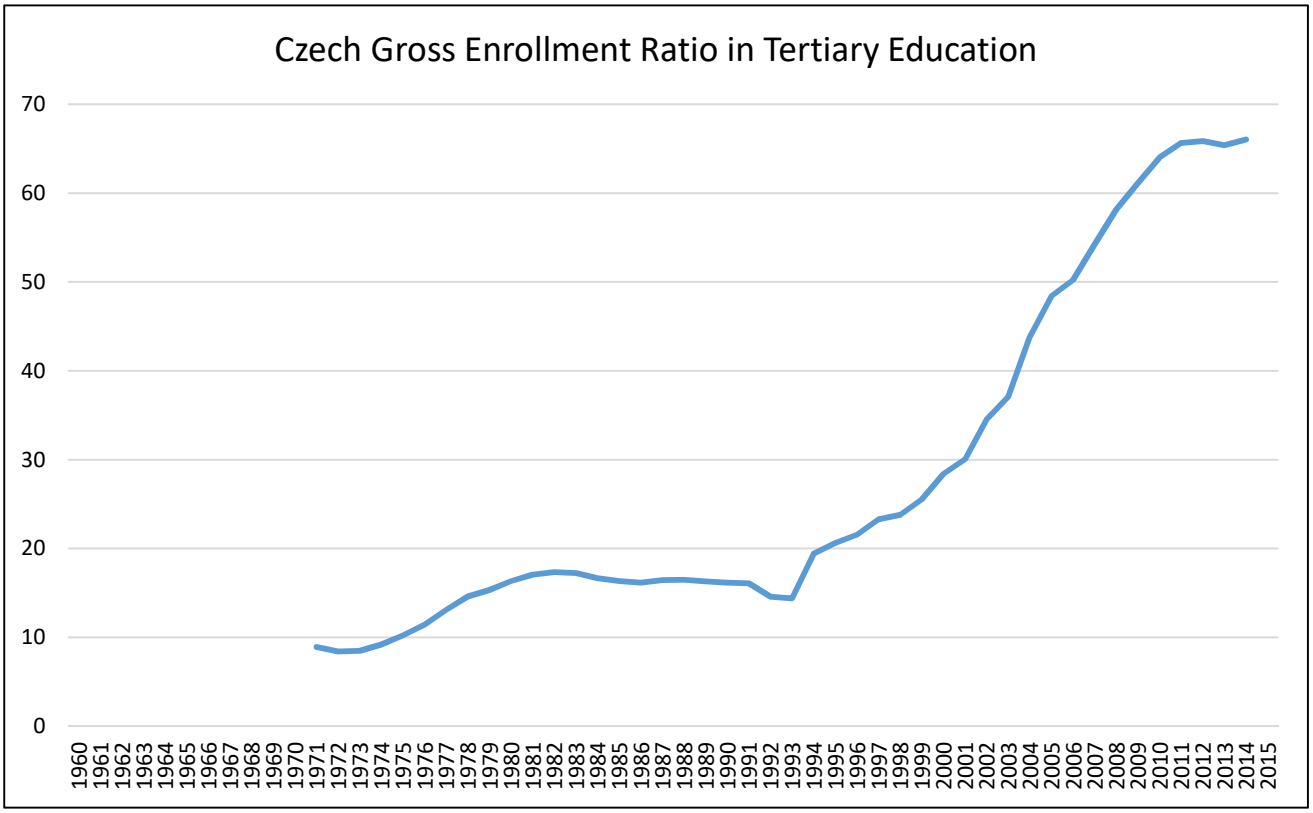
Graph 6: Fertility rate in the current Czech Republic 1960-2015



[37] https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=IR

As outlined in Graph 7, the Gross Enrollment Ratio in Tertiary Education as retrieved from Our World in Data[38] increased from 1994, which goes in line with the plummeted fertility rates. The Czech Gross Enrollment Ratio in Tertiary Education is exhibited for the years 1971 to 2014 in Graph 7, whereby the x-axis captures the year and the y-axis the Gross Enrollment Ratio in Tertiary Education, which reflects the total enrollment in tertiary education, regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving.

Graph 7: Gross Enrollment Ratio in Tertiary Education in Russia between 1971-2014

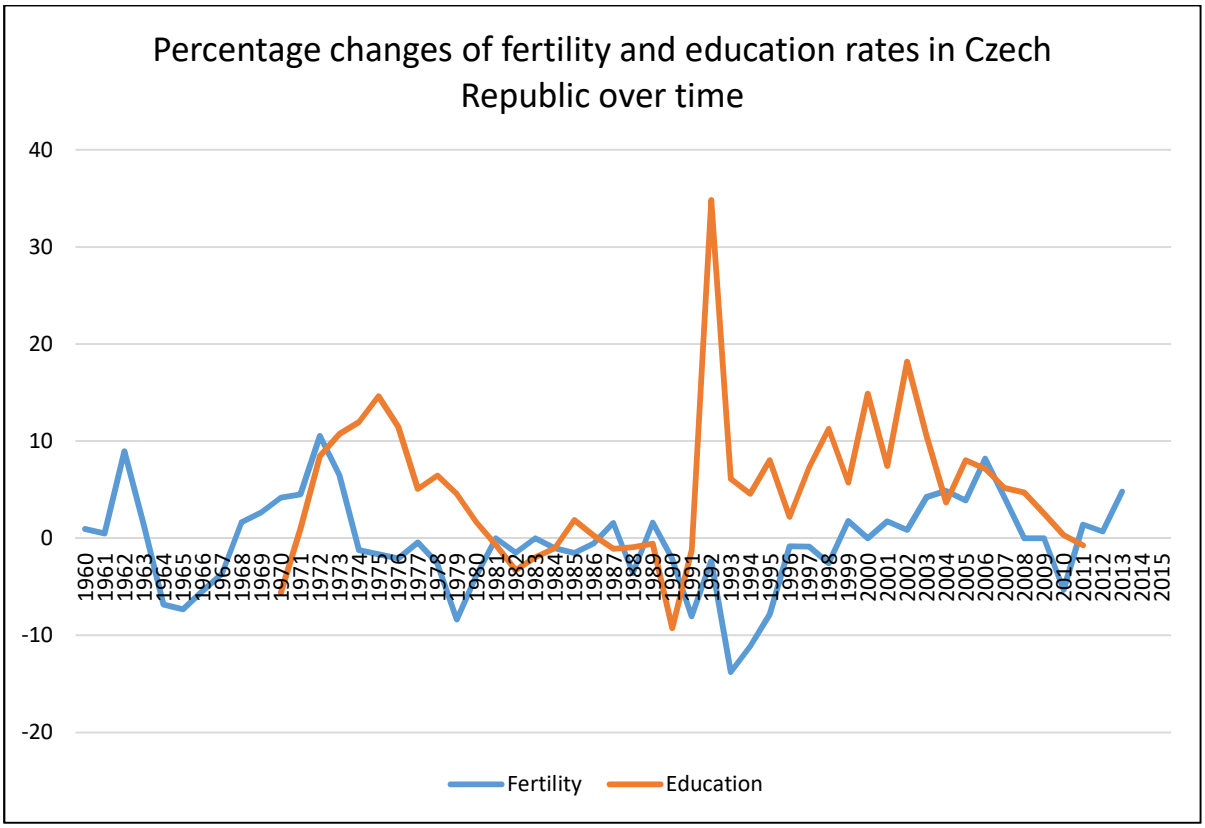


Graph 8 displays the percentage changes in fertility rates and education rates in the Czech Republic from 1960-2015, whereby we see a shortly lagging behind fertility rate drop (in blue color) after a tertiary education spike (in orange color) in the early 1990ies. In Graph 8 the x-axis captures the year

[38] https://ourworldindata.org/tertiary-education

and the y-axis the percentage changes of the variables fertility rate and gross enrollment ratio in tertiary education. Percentage changes are calculated by the formula expressed in equation 1.

Graph 8: Percentage changes of fertility and education rates in the Czech Republic from 1960-2013



In the case of the Czech Republic we have the education-fertility pattern as predicted by the literature – a rise in education is associated with a decline in fertility rates.

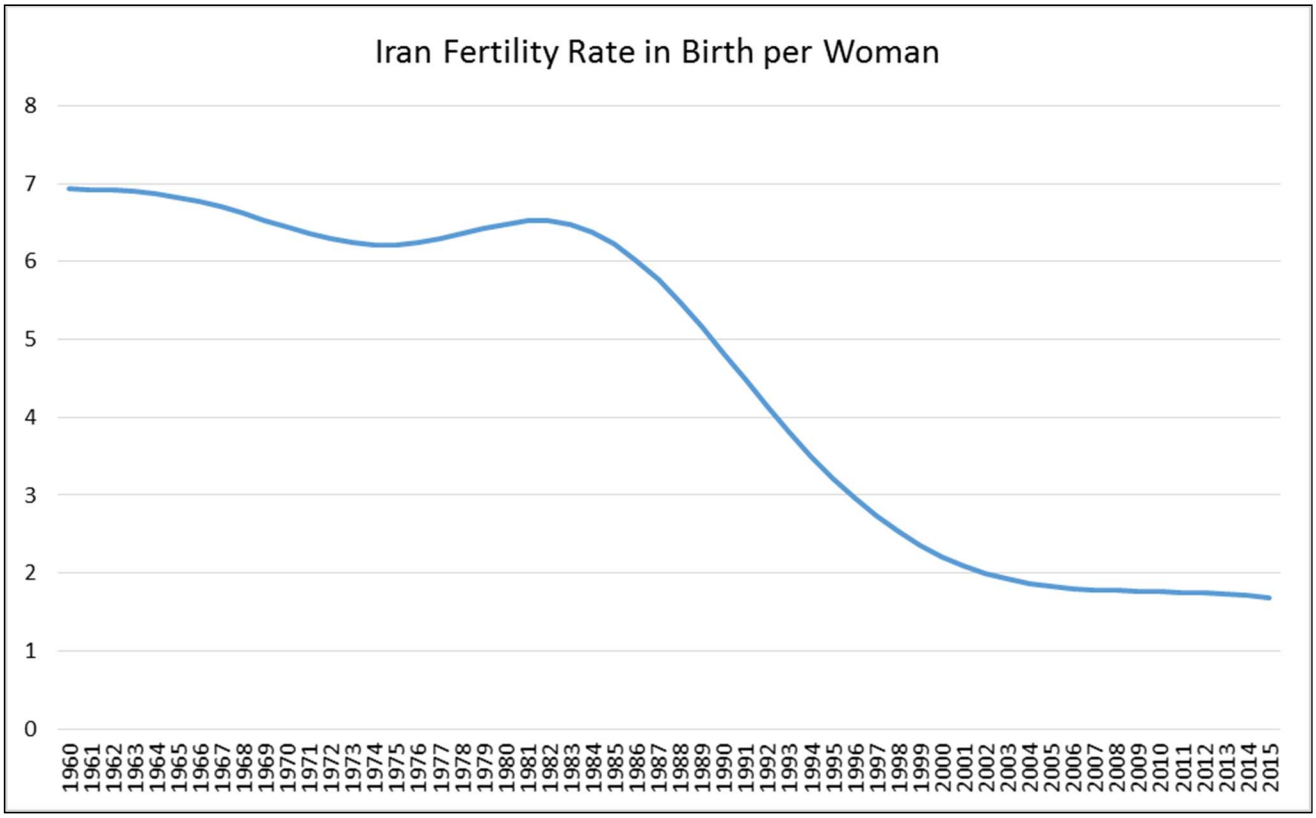
5.3.4 Case study 4: Westernization in the Middle East

The Iranian history serves as additional example for access to markets crowding out fertility. Based on United Nations Population Division Fertility Rate data,[39] the Iran fertility rate is exhibited for the

[39] https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=IR

years 1960 to 2015 in Graph 9, whereby the x-axis captures the year and the y-axis the average total number of children per woman. In 1990, five years after the war ended, Iran saw one of the fastest recorded drops in fertility in world history as the revolution gave way to consumerism and Westernization (Pearse, 2010).

Graph 9: Fertility rate in Iran 1960-2015

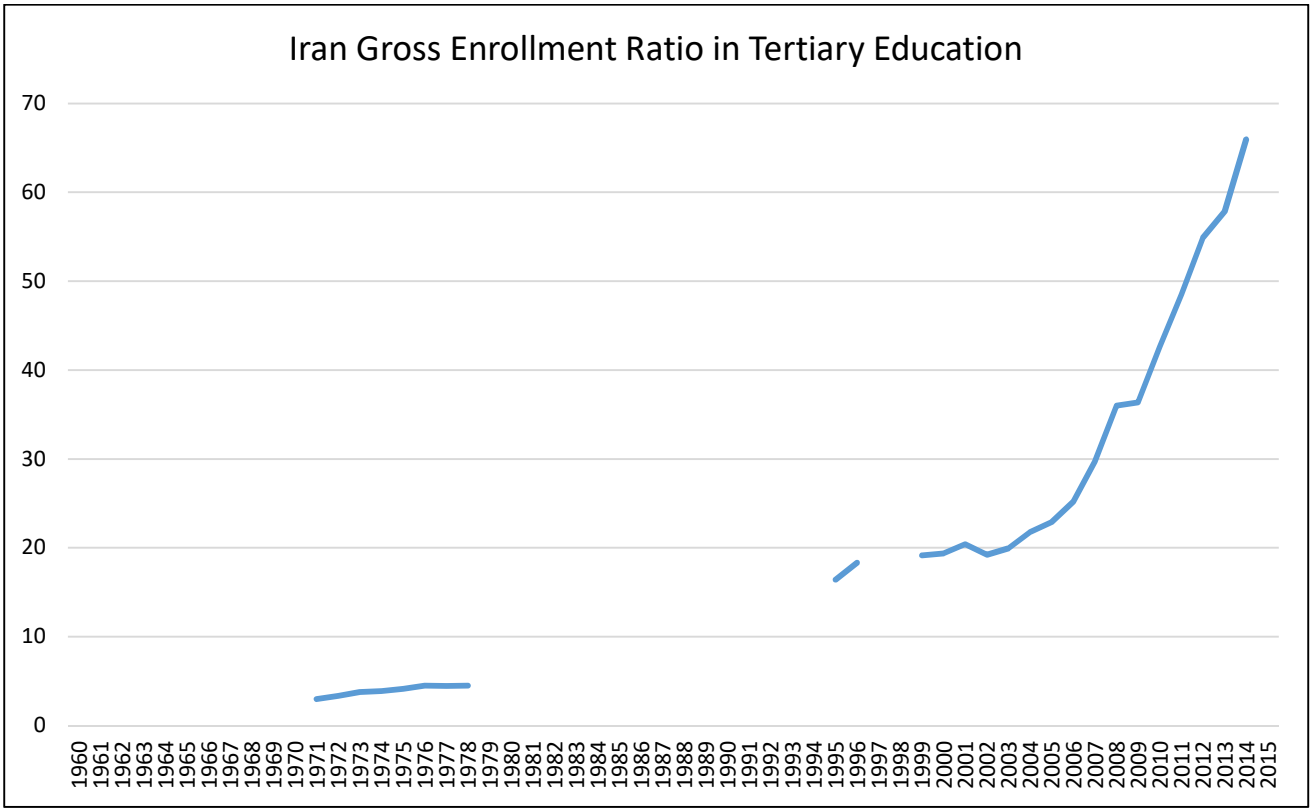


As outlined in Graph 10, the Gross Enrollment Ratio in Tertiary Education as retrieved from Our World in Data[40] increased from around 2005, which does not correspond with the plummeted fertility rates starting in the late 1980s and slowing to a steady fertility rate from around 2005 on. The Iran Gross Enrollment Ratio in Tertiary Education is exhibited for the years 1971-1978 and 1995 to 1996 and

[40] https://ourworldindata.org/tertiary-education

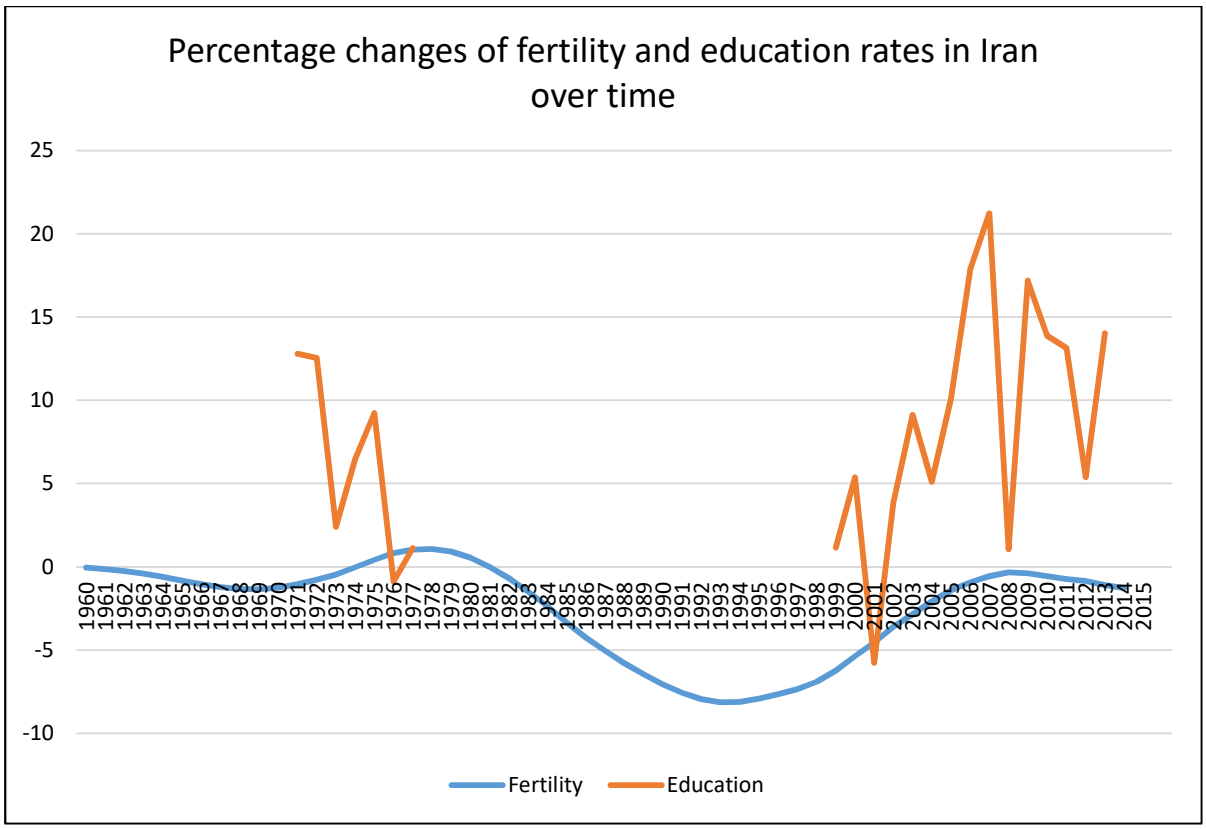
from 1999 on until 2014 in Graph 10, whereby the x-axis captures the year and the y-axis the Gross Enrollment Ratio in Tertiary Education.

Graph 10: Gross Enrollment Ratio in Tertiary Education in Iran between 1971-2014



Graph 11 displays the percentage changes in fertility rates and education rates in Iran from 1960-2015, whereby we see a shortly lagging behind fertility rate drop (in blue color) after a tertiary education spike (in orange color) in the early 1990ies. In Graph 11 the x-axis captures the year and the y-axis the percentage changes of the variables fertility rate and gross enrollment ratio in tertiary education. Percentage changes are calculated by the formula expressed in equation 1.

Graph 11: Percentage changes of fertility and education rates in Iran from 1960-2013



While the data for the 1980s period with declining in fertility rates is missing, we can see a rise in education in the 2000s not being associated with fertility drops. Fertility from the mid 2000s appears as stable, whereas there are huge educational spikes and drops. In Graph 11 the x-axis captures the year and the y-axis the percentage changes of the variables fertility rate and gross enrollment ratio in tertiary education. Percentage changes are calculated by the formula expressed in equation 1.

Overall, the conducted meta-analysis proved by the historical cases of the transition of communist USSR to the more capitalist contemporary Russia as well as the East and West Germany reunification as introduction of East Germany to capitalism; but also former socialist territory Czech

Republic's gaining access to economic markets and the Islamic state Westernization of Iran in the 1990ies that access to economic markets crowds out fertility rates over time. From eyeballing the graphs outlining education and fertility rates, it is concluded that education does not have a direct and causal impact on fertility rates, since only in the case of Czech Republic for the 1990s the inverse relation of education and fertility rates appears to hold. In all other cases – such as the opening of Russia and East Germany to economic markets but also Islamic Iran to Western market values – does a declining fertility rate not necessarily correspond with a rise in education but rather indicate to be related to a changing market climate.

6. Discussion

Overall, this paper introduces the idea of capitalism and low fertility rates occurring concurrently. Access to economic markets is related to lower fertility rates around the globe. Based on a 180 country strong worldwide data set and cross sectional correlation studies, hallmark pillars of capitalism were shown to be related to lowered fertility rates. The 2017 *Economic Freedom Index* comprising of input variables of property rights protection, judicial effectiveness, government integrity, fiscal health, freedom of business, labor, monetary policy, trade, investment, finance, taxation, GDP freedoms as well as FDI inflows is significantly negatively correlated with fertility rates around the globe. Industrialization as measured by the *Industrialization Intensity Index* is also associated with lowered fertility rates. Economies strong in agricultural production tend to have higher fertility rates; yet access to urban markets in rural communities is related to lower fertility rates around the world. Tariffs and taxation, on the contrary, are attributed to higher fertility rates. The inverse relation of economic freedom and fertility was also found to hold for 50 U.S. states based on the 2017 Economic Freedom Index and fertility rates in the United States. Over the course of time and outlined by the historic examples of communism imploding giving way to free market mechanisms but also an Islamic regime

opening up to Western markets, fertility rates dropped when societies gained access to free markets, which is not necessarily related to education. Economic growth may imply a falling rate of fertility in the wake of capitalism.

The results of access to economic markets being associated with lower fertility rates has widespread implications: First, on the theoretical level, the first introduction of a crowding out effect of capitalism on fertility rates demands for a re-writing of economic theory for attention to capitalism's potential as remedy against overpopulation but also shed light on economic market's implicitly collateral damages in the industrialized world, which suffers from under-reproduction. The introduced falling rate of fertility demands for further empirical validation and generalization over time and around the world. Second, the impact of market economies on fertility rates may become the basis for arguments to curb harmful overpopulation in light of natural resource constraints but also for pro-immigration and pro-natalist policy implementation recommendations in the eye of an aging and shrinking Western world populace. The falling rate of fertility in the wake of economic access can be used as remedy against an overcrowded planet with scarce resources, yet also points towards pro-natalist policies and programs as well as allowing immigration. Revealing the found mechanism has also implications for advocacy to strengthen fertility and the intergenerational glue in light of vanishing populations in the Western world capitalist territories. Third, as a future outlook, the value of human reproduction is expected to rise in the age of artificial intelligence and with that the introduction of market elements in human fertility protection appears as an interesting and necessary sophistication of future society.

Theoretically, the article serves as first step towards acknowledging the externalities of capitalism on fertility rates. Industrialization, globalization and capitalism lead to vanishing populations. Being occupied by production and consumption but also the entertainment of capitalist

markets, economic mobility and international trade may distract societies to prosper regarding fertility. Focus on competing in markets may crowd out procreation. Equilibria und markets may have an undocumented negative effect on fertility. Unruled capitalism may therefore lead to a falling rate of fertility, decimating the populace and eventually also the reserve pool of economic agents. Capitalism may distract people from procreation and create an implicit opportunity or wish to compete in markets the fittest as possible thereby leaving aside reproduction. Less children in economically sophisticated markets may stem from the elder's wish to get educated in order to compete better in markets. Ample consumption opportunities may also drive the rationale to enable less children a better standard of living than more would have to share given limited resources of time and money. Thereby market actors overlook the value of fertility. Capitalism triggering a falling rate of fertility, however, macro-economically and over time causes a less diversified labor pool and retirement equity imbalances. The falling rate of fertility leads to a shrinking and less diversified labor pool. The tendency of the fertility rate to fall, which is inherent in all capitalist societies and has the potential to eventually fail societies and market economies, therefore demands to be countered by governmental action.

The finding of an inverse relation between capitalism and fertility rates around the globe triggers the question, what the right dose of capitalism is for different population territories in the world? With reference to groups like the World Wide Fund for Nature and Global Footprint Network that state that the carrying capacity for the human population has been exceeded as measured using the Ecological Footprint,[41] in light of estimations that the current world population is using 40 percent more than what Earth can regenerate, introducing capitalism to overpopulated parts of the world could

[41] http://wwf.panda.org/news_facts.cfm/publications/living_planet_report/index.cfm

aid in order to naturally lower fertility rates.[42] Capitalism could be used as a natural, self-chosen birth control mechanism in those parts of the world, where overpopulation is currently pressing governments to find ways how to lower the fertility rate. In addition, the results hold potential for recommendations to curbing capitalism as means to avert the falling rate of fertility in capitalist societies with a shrinking population in the light of an aging Western world population. Finding that capitalism crowds out fertility rates and therefore eventually lowers the labor force and consumption, triggers the need to draw attention how to avert the falling rate of fertility in capitalist countries in order to align capitalism with societal advancement and economic prosperity demands.

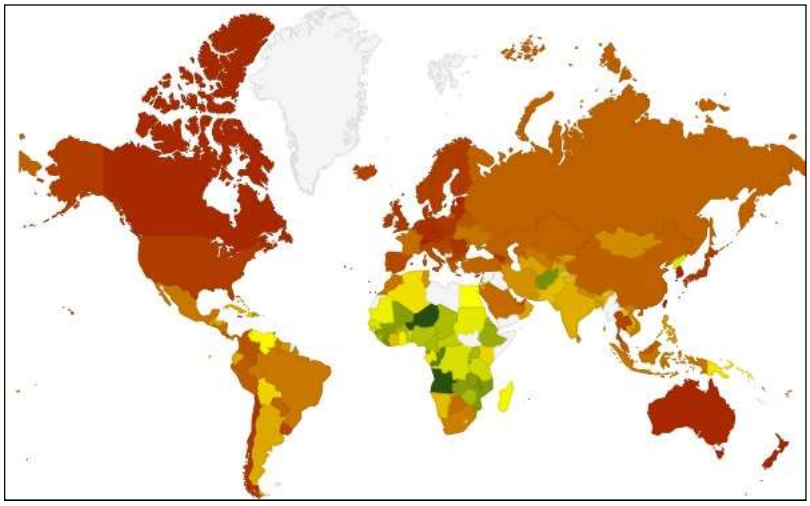
In order to give more concrete recommendations what areas around the world are advised to curb capitalism and what regions should encourage free market access in order to lower overpopulation, a Capitalism-Fertility Index was calculated for 175 countries around the globe based on the following equation 2

$$CF_i=(ef)*(fr), \qquad \text{(Equation 2)}$$

whereby CF_i is the Capitalism-Fertility Index, *ef* represents the inverse 2017 Economic Freedom Index,[43] and *fr* the fertility rate in the world. Graph 1 outlines the spectrum of capitalistic-low fertility countries (in red) versus non capitalistic-high fertility territories (in green).

[42] www.footprintnetwork.org/atlast
[43] https://www.heritage.org/index/download

Graph 1 Distribution of Capitalism-Fertility combinations around the world[44]



In a socio-econo-engineering attempt, infusing capitalistic market freedoms as birth control in overpopulated, non-market economies (in green) but also taxing capitalist activities to fund parenthood through direct investment in social benefits and subsidies to alleviate the falling rate of fertility in the eye of capitalism in aging, shrinking populations (in red color) is recommended concurrently, depending on the starting level on the low capitalism-overpopulation versus high capitalism-under-reproduction spectrum.

In the overpopulated areas, international aid may lead to increasing fertility rates if not coupled with access to and education about contraceptive means. Overpopulation may cause the discussed economic and social miseries such as starvation and malnutrition, environmental degradation, species extinctions and contracted biodiversity, higher infant and child mortality, lower life expectancy and a deterioration in living conditions, unemployment, homelessness, lacking medical care, education, epidemics, pandemics, infectious diseases, poverty, unhygienic living conditions, conflict over scarce

[44] Please find interactive graphic solution at https://juliampuaschunder.com/econo-engineering/

resources and crowding, food insecurity and food riots, socio-psychological stress and diminishing the quality of life, to name a few.

Non capitalistic-high fertility territories should focus on adopting free market structures and capitalism but with attention to sustainability and renewable energy usage. As a correlation study of the author shows, international development aid[45] is highly significantly positively correlated with fertility rates ($r_{Pearson(121)}$=.229, p<.006). International aid may therefore not crowd out overpopulation, but markets can as was found. Phasing in markets into overpopulated societies and granting their populace access to markets may thus be a better means to curb overpopulation. However, in order to not inflate the plague of overpopulation into a plague of overconsumption, we will need to find sustainable market alternatives. Rolling in capitalism may thereby naturally curb the rate of fertility while granting access to all luxuries of advanced economic markets. Hereby, however, free market opening endeavors must be aligned with sustainability needs.

In the inclusion of new overpopulated area in international markets, new trade theory should be implemented with respect for human rights provision and equality of free markets (Shaikh, 1979, 1980, 2016). Anwar Shaikh (1980), a proponent of New Trade Theory, outlines basic inequalities in countries that trade, which are negated in standard economic trade theories. Shaikh (1979, 1980, 2016) highlights inequality in free trade patterns, which feature persistent trade deficits for underdeveloped capitalist and trade surpluses for developed capitalist countries. Free trade between developed and underdeveloped capitalist countries thus triggers a gold inflow into developed capitalist countries and out from underdeveloped capitalist countries. Bank reserves rise and interest rates fall in developed capitalist countries, conversely, bank reserves fall and interest rates rise in underdeveloped capitalist

[45] https://en.wikipedia.org/wiki/List_of_countries_by_Official_Development_Assistance_received

countries, therefore effective demand is stimulated in developed capitalist countries and lowered in underdeveloped capitalist countries (Ho, 2010; Moudud, 2014).

Shaikh (1979) rejects the labor theory of value, as the same rules regulating relative value of commodities in one country do not regulate the relative value of the commodities exchanged between two or more countries. Different national systems of regulation have to be taken into consideration. Free trade is likely to lead to persistent trade imbalances that may impose uneven development between countries as those countries benefit that have trade surpluses and thus higher rates of capital accumulation. Shaikh (1979) refuses to accept Ricardo's law of comparative costs, on which the structure of the analyses of direct investment is built. Shaikh (1979) assumes free trade to breed uneven development on the world scale by unequal export of direct investment. Shaikh expends on Emmanuel (1972) in his theory of uneven development. Ricardo's (1821/1996) analysis, Shaikh (1979) notices, is predicated on the assumption that both labor and capital are immobile between regions of the world. Shaikh (1979) then argues a market deficiency due to the current immobility of labor but mobility of capital between different countries and regions of the world. These conditions of "pure" foreign trade – as only commodities flow between nations – Shaikh (1979) contests as to give rise to large and persistent differences in wages among the developed and underdeveloped regions of the capitalist/dominated world, whilst the relative mobility of capital equalizes profit rates across regions. With the modern international mobility of capital, profit rates are now equalized such that profit rate will be lowered in the underdeveloped regions and raised in the developed regions. Thereby profits in form of surplus value are transferred from underdeveloped to the developed regions. Since profits are an important source of growth, the transfer of profits out of the underdeveloped regions there reduces growth relative to what it could have been in the absence of the intrusion of foreign capitals. Unequal exchange through trade and international capital flows are seen as fundamental causes of international

inequalities. Questions arise how the unequal exchange value transferred can be repatriated, which needs to be answered before infusing overpopulated areas with capitalism and rolling in access to international trade.

As export of capital and value lie are the core of uneven development theories, gaps between rich and poor capitalist countries could be overcome by transfers of savings from developed to underdeveloped countries. Shaikh (1979) extends the theory of uneven development due to export of capital on a world scale by incorporating direct investment. Foreign direct investment transfers monetary value at the expense of potential outcompeting domestic firms' initiative industries, development of the indigenous production and local trade (Shaikh, 1979). Foreign investment can thus be seen as to tighten the grip of the strong over the weak through free trade and competition itself (Shaikh, 1979).

Shaikh's promotes the role of the state, since there are no 'automatic' market mechanisms that correct the downsides of trade imbalances – such as international differences in unit labor costs, access to technological advances as well as social expenses. Labor productivity is shaped by technology and political-institutional ability to promote technological change. As markets forces in the wake of competition will not allocate resources efficiency and socially optimal, states should regulate trade according to Shaikh (1979). Under the assumption of imperfect competition, market failure necessitates state intervention leading the New Trade Theory proposing strategic trade policies (e.g., see Krugman, 1987a; 1987b). Heterodox economics needs to theorize the state capacity and discuss economic policy alternatives of state intervention (Moudud, 2012). Problematic appears that only a selective group of nation states seem to have the ability to push them through effectively. Predictions are hard as political and legal frameworks shape the state agency.

To this day, perfect markets but also concurrent governmental failures open up a free trade laissez faire versus state intervention protectionism debate. The heterodox policy literature features foreign trade and industrialization theories to elicit productivity growth. International trade theories and business competition provide an analysis of the political and legal environment, in which businesses operate. Theories of price formation are crucial to the analysis of business power and corporate competition. Political implications link the theory of the firm and the power of governments. In a compromise, policies should be mixed to promote investment and provide social welfare policies with widespread political acceptance. Pieces of social and business investment should meet the needs of the state, which should set the tact on international trade patterns.

As free market itself will not change relative advantages based on competition and automatically diffuse technology internationally, the state has a role in harnessing newer technologies through a political and institutional policy mix. State intervention can foster capital accumulation, determine protectionist policies and involve social capital through progressive policies that determine the workforce and business costs. Governmental policies can leverage innovation through interventions and technological change or raise productivity through taxation advantages, labor conditions that determine wage rates (Mazzucato, 2015). Thus state policies could bring about improved trade performance balanced trade. Neo-liberalism proposes a policy framework with benchmarking, which ensures that firms do not engage in aggressive behavior and no one solely can set the price.

As for granting access to markets to an overpopulated part of the world, basic cores of capitalism, such as consumption, must be aligned with sustainability demands. Renewable energies and sustainable products could feature market approaches for the developing world. Bringing people closer to education and societal advancement should be detached from consumerism. Interesting

concepts like the Gross National Happiness as a framework for sustainable development should be explored in order to derive recommendations how to couple the benefits of markets, such as access to education and freedoms, with sustainability pledges for overpopulation societies (Cook, 2017; Frayn Harries, work in progress; Gamber, work in progress; St. Clair-Voiers, work in progress). Intangible market assets with a light carbon footprint should be found for those new emerging market communities. Social norms and religious values may play a key role in the introduction of sustainable goods and services to consumers (Paluck, 2009; 2016).

In the parts of the world, where capitalism is developed and under-reproduction prevails, procreation should be promoted. Capitalistic-low fertility countries are advised to curb capitalism via taxation of superfirms in order to fund parenthood through direct investment and social benefits subsidizing parenthood. Incentivizing fertility through direct monetary transfers and subsidizing parenthood would allow to participate in markets yet procreate.

As a pro-natalist policy approach, incentivized parenthood through direct and indirect aid but also work-life balance support alongside of the strengthening of the intergenerational glue are recommended. A pro-natalist policy approach that incentivizes parenthood could fund parenthood and childcare for female and male alike. Directly, parenthood could be supported through tax revenue allocations.

In order to avert the falling rate of fertility in the wake of capitalism spread online, taxation may smooth some of the outcomes of capitalist economies on fertility. Taxing capitalism would allow to incentivize fertility through direct transfers and subsidies with the goal of enabling to participate in markets while engaging in parenthood. For one, the gains of capitalism could be tapped into by taxing online super-firms. An online social media transaction tax would allow to reap benefits from the young, who are more likely to be social media users, in order to counterweight lacking retirement funds

and elder care given missing children of tipping age pyramid countries. Social media gain super-super-rents as social media offers lower marginal costs and exponentially rising marginal utility gains from an additional user. Taxing these social media moguls could concretely be enacted by collecting a corporate tax from the corporations that each additional user is signing up for the social network in order to benefit from the young (Puaschunder, forthcoming b).[46] Taxing firms as nexus of contract would allow reaping benefits from transaction cost advantages, which will also evade the problem of crushing social media monopoly power leading to lower governmental oversight control opportunities.[47] Overall, corporate tax will on the short run decrease GDP but on the long run lead to a more diverse human pool and hence retirement support.

From the collected tax revenues, direct monetary transfers could be allotted to parents in order to alleviate the falling rate of fertility in the wake of capitalism. Thereby children and their upbringing would appear more affordable. At the same time, financial incentives in relation to children and childcare may crowd out love and social capital (Sandel, 2012). Social benefits for families will improve child upbringing quality but may lead to discrimination against female and young in the labor market based on corporation's fear of them getting pregnant or young parents imposing costs on corporations. Offering and promoting social benefits to male and female could alleviate gender-based job hiring discrimination. Granting women career windows as intergenerational learning and bonding times with children will strengthen the intergenerational glue as future implicit intangible retirement asset. Female could get basic-income funded time to devote to family creation during their fertility window. Women entering careers later on in life should then oblige them to work longer for a public

[46] https://www.nytimes.com/2017/11/14/business/dealbook/taxing-companies-for-using-our-personal-data.html?rref=collection%2Fsectioncollection%2Fbusiness&action=click&contentCollection=business&region=stream&module=stream_unit&version=latest&contentPlacement=8&pgtype=sectionfront
[47] https://www.economist.com/news/leaders/21730871-facebook-google-and-twitter-were-supposed-save-politics-good-information-drove-out

pension claim. Since female tend to live longer than men (2.56 years on average in the U.S.), this should not impose gender inequality as female longevity then would equal out the later starting point of entrance in their career and the relatively older retirement age in contrast to their male colleagues.

Immigration may also rejuvenate an aging Western world population. But when phasing in immigrants into a society, attention should be paid to the intergenerational glue to improve emotional well-being as better care is given by family care givers (Barnes & Henwood, 2015; Bernard & Harding Davies, 2000; Brannelly, 2006, 2011; Calasanti, 2008; Duncan, 2008; Gullette, 2011; Hurd Clark & Griffin, 2008; Twigg, 2004). These efforts have pressing urgency in light of social cut-backs triggering a care deficit in the aftermath of the 2008/09 world financial recession and subsequent austerity plans, which pits generations against each other (Baars, Dohmen, Grenier & Phillipson, 2014; Dannefer & Phillipson, 2010; Gibney, 2017; Glendinning, 2008; Nare, 2013; Phillipson, 2015; Ray, Milne, Beech, Phillips, Richards, Sullivan, Tanner & Lloyd, 2015; Walker, 2013; Williams, 2010).

Fertility as a prerequisite for intergenerational transfers is an undescribed future retirement equity provision. Lacking procreation not only decreases the labor force but also erodes the intergenerational glue in the Western world given a tipping demographic pyramid in most advanced capitalism territories. As public and private sector retirement equity solutions crowd each other out as found in a cross-sectional study of a world dataset, the absence of familial intergenerational glue may raise retirement poverty from the economic but especially from a social perspective (Puaschunder, 2016). While immigration is found as panacea to rejuvenate aging Western world populations, an absence of vital parent-child bonds may have widespread and undescribed implications ranging from health – as solitude is related to sickness and earlier death (Litwin, 2010) – wealth (Ghilarducci, 2015) and social well-being (Barnes, forthcoming). Breeding intergenerational virtues and ethics of care for elders is essential beyond simply caring for the financial well-being of elders (Ash, 2010; Barnes, 2012;

Birditt, 2010; Blood, 2013; Engster, 2015; Giuntoli & Cattan, 2012; Humphries, Thorlby, Holder, Hall & Charles, 2016; Lloyd, 2012; Mol, 2008; Ryan & Sapp, 2007; Taylor, 2011; Thornton & Tozer, 1995; Tronto, 1993, 2010, 2013; Twigg, 2017; Ungerson & Yeandle, 2006; Woolham & Benton, 2013; Woolham, Daly, Sparks, Ritters & Steils, 2016; Woolham, Steils, Daly & Ritters, 2016).

Fostering a vital intergenerational contract enables a successful aging in a holistic environment – based on nested dependencies and familial care ethics. Aging is thereby understood as relational process within the social compound and the familial network. Nurturing the intergenerational glue improves elders' lives by familial reciprocity of favors and the virtue of intergenerational care that aids societal well-being. In societies with shrinking populations, filling in intergenerational gaps with dialogues and intergenerational trainings with those who work in health and care services, who are not related by familial ties to those in need, could aid in order to boost the vanishing intergenerational glue (Abramson, 2015; Puaschunder, forthcoming a). Housing communities for and aging population without enough offspring to care, have become prominent among the aging baby boomers without offspring. Supportive environments and active social participation of elder are thereby meant to strengthen the intergenerational glue in bottom-up approaches and social networks between generations (Buffel & Phillipson, 2016; Puaschunder, forthcoming b).

As for the implementation of the outlined policy program, widespread stakeholders need to be embraced. The young could favor the proposal for social benefits, yet could experience even more social pressure to procreate due to heightened attention to fertility. Parents and families could favor the child support and bonding time with their children. Female and male alike could enjoy career time windows and social benefits. Feminists could see defining female as reproduction vehicles as critical. The elder could appreciate elder care ethics and intergenerational responsibility attention in the proposed policy program. Legislators could draft legislation for social benefits and bonding time in

order to ensure to strengthen the social compound and intergenerational glue. The corporate sector could gain from subsidies for child supportive environments. These incentives could create a positive race to the top among corporate competitors. Social media moguls may be opposed to the proposal as for higher taxation would lower their profits. The Gerontological Association of America could support intergenerational glue research and practice. Retirement equity specialists may gain information about human capital as implicit retirement support.

Future research may look deeper inside what is happening to social relations in an economy. What changes when pricing human goods and services? Attention must be drawn to how the equilibrium changes people's relations with one another but also how the anticipation of future price negotiation points changes us today. These insights will have ample implications for aiding people to improve their wealth, health but foremost their work-life-relation and hence will contribute to intangible and sustainable consumption assets.

As a future-oriented outlook, the presented research also points towards acknowledging the value of human reproduction in the artificial age. The findings have innovative and futuristic implications in the age of artificial intelligence. Robotics and artificial intelligence slowly taking over human capital labor activities but not being able to reproduce a human DNA is argued to increase the future value of humanness – and with that human fertility – in the artificial age.

Human reproduction is expected to become more valuable in the future as robots and artificial intelligence slowly take over idle labor activities. Acknowledge human reproduction as production gratified by governments and markets is projected to improve mothers' legal and economic status in the years to come. As a future-oriented outlook, one could propose a polarized society comprised of artificial intelligence, human mothers and a female workforce that gains from specialization and trade in comparative advantage bundling strategies. Thereby, (1) Robots do not need retirement as can live

eternally but lack empathic care for elder. (2) Mothers focus on reproduction of humanness, which breeds intergenerational glue. (3) A female workforce strengthens diversity and specialization in markets with key female traits, qualities and qualifications.

APPENDIX

Raw Data

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