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Income inequality in OECD countries with increasing public debt and varying economic performance

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ABSTRACT

This master's thesis focuses on changes in income inequality in OECD countries and how this has changed depending on public indebtedness and economic performance. Increase in public debt levels has happened simultaneously with the increase in income inequality since 1980's. However, the theoretical and empirical models related to these issues have shown remarkable divergence in results. This thesis analyses disposable income and market inequality Gini coefficients in OECD countries and it is related to domestic and external indeptedness of public sector and growth.

This thesis provides evidence that domestic and external debt have dissimilar effects to income inequality with public finance from external debt improving equality although plausible harmful for economic growth. Increasing indebtedness has thus been associated with lower disposable income inequality although market inequality has grown. These results indicate the complicated way that domestic and external debt relates to economic behaviour.

Introduction to the subject is provided in chapter 1. Chapter 2 provides background and broader history to economic inequality. Chapter 3 discusses differences between income and wealth inequality. Chapter 4 deals with historical development of inequality. Chapter 5 provides theories regarding inequality. Chapter 6 is similar but regarding public debt. Chapter 7 deals with previously done research and hypotheses. And in chapter 8 a regression analysis is used to analyze the effect of public debt to income inequality and their combined effect on economic performance. Final chapter summarizes conclusions and provides further research ideas.

KEYWORDS: public debt, economic performance, domestic debt, external debt, income inequality, Gini coefficient

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Helsinki, Finland 28th of April, 2018.

1. Introduction

Economic inequality has recently gained widespread attention. The World Economic Forum's Global Risk Report for 2018 starts with "Inequality and unfairness"[1] while just some years ago the executive summary in the same report said that the reason to worry was: "...high level of debt in advanced economies."[2]. It seems that there can only be one area of focus at any given moment. After financial crisis it was public debt, especially in Europe, and now it is inequality.

That singular focus on one economic topic until next one arrives has always been strange in my mind. It is as if these issues are not interlinked, and could be studied completely separately. This thesis tries to highlight some of the links between economic inequality and public debt, and how they ultimately may affect given country's economic performance.

Most, but luckily not all, research on these topics have also focused on one or the other, however a child can count the number of studies focusing on both of those issues. Piketty's magnum opus *Capital in the twenty-first century* (Piketty, 2014) was probably the book that helped spiral the current focus on economic inequality. The current interest rates for Greece's 10 year bonds are now below the rates required from United States. Has the world forgotten completely Greece's history regarding is debt obligations? Or is the current level of economic inequality in United States *the* reason for this?

Theories regarding how inequality is affected by indeptedness and economic growth are still being debated. History knows no place where absolute equality ruled, while too much of inequality gives worry to Ray Dalio (Fleming, 2017). I

[1] http://www3.weforum.org/docs/WEF_GRR18_Report.pdf

[2]http://reports.weforum.org/wp-content/blogs.dir/1/mp/uploads/pages/files/global-risks-2011.pdf

[3] https://www.linkedin.com/pulse/our-biggest-economic-social-political-issue-two-economies-ray-dalio/

[2]http://reports.weforum.org/wp-content/blogs.dir/1/mp/uploads/pages/files/global-risks-2011.pdf

[4] https://twitter.com/JeffDSachs/status/816271990382325760

also take solace from the fact that Gillian Tett, who warned FT Lex readers about the upcoming financial crisis before it happened, has started to worry about the relationship between inequality and public debt (Tett, 2018).

1.1. Objective of the study

Main purpose of this study is to review existing theoretical and empirical literature on inequality and its history and provide new empirical evidence on some of its determinants related to public debt and economic performance. The scope of this thesis is limited to OECD-countries between years 1980 and 2015. Some of the current OECD-members were left out of scope due to lack of data, or comparability issues. (Mexico is after all quite different from average OECD-member).

1.3. Structure of the thesis

Introduction to the subject is provided in chapter 1. Chapter 2 provides background and broader history to economic inequality. Chapter 3 discusses differences between income and wealth inequality. Chapter 4 deals with historical development of inequality. Chapter 5 provides theories regarding inequality. Chapter 6 is similar but regarding public debt. Chapter 7 deals with previously done research and hypotheses. And in chapter 8 a regression analysis is used to analyze the effect of public debt to income inequality and their combined effect on economic performance. Final chapter summarizes conclusions and provides further research ideas.

2. Historical overview on economic inequality

"…and growing inequality and lack of upward mobility that has jeopardized middle-class America's basic bargain that if you work hard, you have a chance to get ahead. I believe this is the defining challenge of our time." – Barack Obama, 2013

Economic inequality used to be a marginal subfield within economics, but during the last fifteen years it has gained prominence. This was not always so. The question of distribution was on the most important ones in economics in the end of 19th century and beginning of 20th century. Now that is has gained more focus the level of knowledge has grown. Too much economic inequality is bad for society. This is contemporary consensus view. But that consensus is severely limited as most questions within the topic are still debated around the globe. Questions such as how much economic inequality matters? Or why does it matter? Or even the most basic question of what economic inequality even means? And even if it mattered, how do you measure it? Is income or wealth inequality worse? Or could it be a symptom of even grander problem? Economic inequality is used today to explain various political events and while global inequality as measured by Gini index is decreasing, inequality within nations is increasing. (Milanovic, 2016: 125). Recently the billionaire founder of Bridgewater Associates, Ray Dalio, pointed out that inequality is our biggest economic, social and political issue[3], there might be a grain of truth involved. He is also one of the few, along with Janet Yellen (Fleming, 2017) who are worried, as this thesis writer is, about the relationship between inequality and public debt and their current trends. (Tett, 2018).

But before we venture forth I believe it is beneficial to go through what various thinkers have written about the topic. This is done in order to highlight that economic inequality is not only an economic question, but also a human

[3] https://www.linkedin.com/pulse/our-biggest-economic-social-political-issue-two-economies-ray-dalio/

question. While *homo economicus* might not be interested (anymore) in the question of distribution most of *homo sapiens* are. This separation of views is in itself a major problem in economics. With these forewords I will take the reader through a brief history of thinking about economic inequality.

2.1. Philosophical background of economic inequality

"Economics needs a big dose of Aristotle" – Jeffrey Sacks[4]

Current levels of inequality are not something new. Philosophers through the ages have pondered this issue. In the end of 19th century this question was one of the most important ones, not only in economics, but also in other spheres of life as well. Sometimes history can teach us a lesson, and therefore in the next 5 pages there is a brief summary of some of the most important philosophers regarding economic inequality.

2.1.1. Plato & Aristotles

"*Factional conflict is always the result of inequality…" – Aristotle, Politics.*

Classical Greek philosophers did not discuss economic inequality *per se*, but Plato touched the topic in *The Republic*. Plato (1951) wrote that different economic interests lead to development of different factions, which then might cause instability to the ideal city-state. Plato also believed that poverty causes revolutions. Aristotle (1995) is in general agreement with the idea that too much of poverty may cause revolutions. Aristotle was also strong believer in the balancing middle element *"…or to seek to increase the strength of the middle or intervening element. Such a policy will prevent the factional disputes which arise from inequality."* (Ibid: 203). Aristotles strongly believed that the

[4] https://twitter.com/JeffDSachs/status/816271990382325760

factional conflict whether between the rich (oligarchs) and the poor or between oligarchs themselves was driven by inequality. As manifested in Aristotles words: *"Factional conflict is always the result of inequality…It is the passion for equality which is thus at the root of faction."* (Ibid: 180). Thus he believed in the equality as if equality was removed that would then result either in tyranny or to the violent revolution and confiscation of the property from the rich. (Ibid: 234). Equality and numerous middle citizens acted as the balancing power that kept the city-state in balance between Scylla and Charybdis as Aristotles thought this middle to be free of faction. It must be noted that Aristotles understood inequality mostly in political terms, but he also understood that this political inequality would result in economic inequality: *"The most important rule of all, in all types of constitution, is that provision should be made – not only by law, but also by general system of economy – to prevent the officials from being able to use their office for their own gain."* (Ibid: 203-204). While many contemporary thinkers might find Aristotles writing inadequate, it is indeed remarkable that much of what he wrote two and half millennia ago has influenced our thinking about economic inequality still today. And his insights into causes of revolution also ring true, as Alesina and Perotti found in their study*: "As a result, mass violence and illegal seizures of power are more likely the more unequal the distribution of income is."* (Alesina & Perotti, 1994: 362, Hobbes would agree, 1902: 59).

2.1.2. Jean-Jacques Rousseau

Jean-Jacques Rousseau's writings about inequality are some of the most chronicled of all philosophers regarding this topic. He wrote heavily about the subject in *Discourse on the Origin and Foundations of Inequality among Men* and also touched the subject in *The Social Contract*. This makes summarizing his view easier, as he did not only write about the subject implicitly but explicitly. It is good to remember that he did not write about economic inequality per se, but about inequality in more general terms. However he clearly understood how wealth especially affected inequality as manifested in:

"*different privileges some enjoy to the prejudice of others, such as being wealthier…*" (Rousseau, 1997: 131).

Rousseau distinguishes two different types of inequality: natural and moral inequality. Of these natural inequality is caused by factors such as age and health and moral inequality by factors such as wealth, power or whether individual is honored or not (Neuhouser 2013: 194). It is good to remember that most if not all things that were natural were in Rousseau's view not only justified, but natural state was the utopia, even if reaching that would always stay impossible. So in other words natural inequalities were justified and therefore nothing to ponder on, but moral inequalities were based on convention and human consent, even if they were not explicitly agreed upon, and thus required closer scrutiny. This is due to the fact that Rousseau did believe some of the moral inequalities could be justified in so far as they were grounded in nature (Neuhouser, 2013: 195). In the end his view can be summarized as that equality is necessary only because freedom cannot exist without it. Therefore inequality of wealth is undesired only for the reason that they limit freedom for others. "It is, therefore, one of the most important tasks of government to prevent extreme inequality of fortunes" (Neuhouser, 2013: 199).

2.1.3. Adam Smith

Adam Smith is commonly known as the "father of economics" (Rasmussen, 2016: 342) but before his opus magnum *An inquiry into the Nature and causes of the Wealth of the Nations* he was known for his contemporaries as moral philosopher who had published *The Theory of Moral Sentiments* in 1759. So what was Smith's view on economic inequality? Many argue that Smith's main concern was not economic inequality per se, but alleviation of poverty. Indeed one of his main arguments for commercial society is its capacity to provide for the poor as manifested in this passage from *The Wealth of the Nations* "*they who feed, clothe, and lodge the whole body of the people, should have such a*

share of the produce of their own labor as to be themselves tolerably well fed, clothed, and lodged." (Smith, 1981: I.viii.36, 96.) But is this all there is on economic inequality?

Rasmussen argues in his recent paper that Smith did indeed argue against economic inequality, but this argument is not commonly heard in the contemporary discussion about ill effects of economic inequality but is rather different. Smith's main concern about economic inequality was that it distorts our sympathies and thus leads us to not only ignore the blight of the poor, but this very distortion leads us to admire the rich, which undermines both morality and common happiness. (Rasmussen 2016: 342-343. In Rasmussen's view Smith argued that too much of economic inequality would distort our sympathies. As in unequal societies rich would not need to act admirably to earn the esteem and approval of others as their wealth itself would make them admirable to others. Even their vices and follies would to be imitated by the vain men thus distorting our morality. "*Thus, it is precisely the presence of extreme economic inequality, and the distortion of our sympathies that attends it, that allows—perhaps even encourages—the rich to spurn the most basic standards of moral conduct. If they were nearer to the rest of society in terms of wealth and hence status, their incentives would be quite different.*" (Ibid: 349). One only needs to remember the current US president Donald Trump saying during a campaign rally: "*I could shoot somebody and I wouldn't lose any voters*" to see how this argument might be onto something. (Guardian, The, 2016).

Even as Smith was concerned about economic inequality for its distortion effects he would be against eliminating inequality in the distribution of income. It can even be argued that the Smith in *Wealth of the Nations* is different as to the Smith found in the *Theory of Moral Sentiments*. In *Wealth of the Nations* one of the central arguments for defense of commercial society is its capacity to provide for the poor and the welfare of the poor is uttermost issue. Whereas in *Theory of Moral Sentiments* Smith can be found arguing for the maintenance of "…order of society is of more importance than even the relief of the miserable." (Smith 1969: 226).

Smith also argued that economic growth would increase humanity and good will and thus allow morality and virtue to thrive in the society. (Baum, 1992: 148). This argument goes much in line with Benjamin Friedman's book *The Moral Consequences of Economic Growth* where his main argument can be summed up as "*Broadly distributed economic growth creates the private attitudes and public institutions that foster, not undermine, a society's moral qualities.*" (Friedman, 2005: 435). Or even that as economic growth fosters nations humanity and morals it is indeed morally right to seek policies that drive economic growth. (Ibid: 78). Both Friedman and Smith argue how morality of the society and economic growth are indeed interlinked and progress hand in hand.

It must be stated that this view of Smith's writing is not universal, indeed many argue that Smith was unmoved by inequality as his main focus was welfare of the poor and indeed some level of inequality would be inevitable result of flourishing commercial society. See for example (Hont & Ignatief, 1983: 1-4). We can however see that Smith's view into inequality is not as simplistic or one-sided as is commonly understood and his view into this issue somewhat changed between *Wealth of the Nations* and the *Theory of Moral Sentiments*.

2.1.4. Karl Marx

Karl Marx is today mostly forgotten in economics. His ideas however affected billions of people around the globe (whether they affected them negatively or not is a topic for another discussion which I will not touch here). For Marx the very idea of equality was just another bourgeois tool for class oppression (Wood, 2014: 2). For him the idea of equality under capitalist mode of production was beyond absurd as manifested in "To clamor for *equal or even equitable remuneration* on the basis of the wages system is the same as to clamor for *freedom* on the basis of the slavery system." (CW 20: 129). In his view the concept and relations of what is just or right arise out of economic ones, not the

other way around. And even if it was the other way around, we would not be able to know in Marx's view what kind of equality is needed, especially if we aim to equalize along one dimension as this might cause crave inequalities along other dimensions. (Wood, 2014: 8).
It is therefore possible to see how in Marx's view equality was useless goal. In bourgeois societies equality along rights and justice can be understood only in the specifically political identity. And this is wholly inadequate to the true human aspiration of a membership in a free community. (Wood, 2014: 10-11).

For Marx the real desire for equality is about the abolition of classes. *Class* is when certain people share common interests and act to defend them. "Separate individuals form a class only insofar as they have to carry on a common battle against another class" (CW 5:77). In this view the very existence of classes causes struggle between classes. In other words, in class society irreconcilably interests between individuals exist. But what happens if classes are abolished? For this Marx offers little answers. In his view the future (of classless society) is by necessity largely opaque to us. (Wood, 2014: 12).

To summarize Marx's view of inequality can be simplified as following. Marx was affected by the inequality of this era. But trying to find a remedy for one dimension of inequality would cause other inequalities (and selecting one above others was in the first place impossible) and the whole concept of equality was just another bourgeois tool for class oppression as the true goal was classes society, of which he offers little answers, as Stalin was bound to realize (New Yorker, 2017), and it can be argued that it did not even interest him. Perhaps it would have been as: "From each according to his abilities, to each according to his needs!" (CW 24: 86-87). Which by definition is not equal condition.

2.1.5. John Rawls

Unlike previous philosophers mentioned here John Rawls focused on justice, and his most important work *A Theory of* Justice deals directly with

inequalities. His view can be summarized as following. There are two principles in theory of justice. *The greatest equal liberty principle* is the first one: *"Each person is to have an equal right to the most extensive basic liberty compatible with a similar liberty for others"* (Rawls, 1972: 60). While the latter one has two components in it: "*social and economic inequalities are to be arranged so that they are both (a) to the greatest benefit of the least advantaged and (b) attached to attached to offices and positions open to all under conditions of fair equality of opportunity.*" (Ibid: 83). Of which (a) is known as *the difference principle* and (b) as *the equal opportunity principle*. These principles are arranged in serial order, i.e. former one overrides latter. Thus situations where certain individuals would trade their fundamental liberties for economic gains are not to be permitted.

Regarding *the difference principle* Rawls directly states that: "…distribution of wealth and income need not be equal," (Ibid: 61) only that, inequalities, whatever they are, must improve everyone's position. Rawls also touches the question of efficiency as commonly understood as Pareto optimality: "*The principle holds that a configuration is efficient whenever it is impossible to change it so as to make some persons better off without at the same time making other persons worse off.*" Rawls makes the important point that Pareto optimality does not allow us to rank different efficient points and thus does not offer much help when deciding between different efficient points. (Ibid: 67-68.) Therefore in justice as fairness the principles of justice are prior to considerations of efficiency in his view. Thus distribution that is closer to maximum fairness as depicted by Rawls two principles are to be preferred to an efficient distribution that is further away from fair distribution. (Ibid: 69).

2.1.4. Summary

There are broad differences between the previously mentioned philosophers and their stance towards economic inequality. However they all agree that too much of it will cause various ailments and the underlying reasons for it are as

important as the symptoms themselves. With the exception of Marx they all agree that some level of inequality is natural and even desirable, but the level of economic inequality that starts to cause problems is undefined. All fine for philosophizing, but not much help for the real world. However what these fellows might have better grasped is that actual inequality (for which they had not the data we have today) is not as important for the average person as the perceived inequality as later studies have found (Gimpelson and Treisman, 2015: 4, 28). And as economists discuss economic inequality, which by definition is quite technical metric, while for the common people inequality is not the defined by some "fancy" mathematical metric but by unfairness as Starmans, Sheskin and Bloom (2017:4-5) write: *"people are not troubled by inequality for its own sake; indeed, they often prefer unequal distributions, both in laboratory conditions and in the real world. What really troubles people about the world we live in today are considerations that are related to inequality… such as adverse social consequences, a corrosion of democratic ideals, poverty, and, of most interest to us here, unfairness."*

3. Economic inequality – Income or wealth?

In the previous chapter some of the philosophers talk about wealth, while others about income. As in most complex issues they are interlinked, but the strength of the link depends on circumstances. However most of the studies done on the subject have been about income. Mostly this is due to better data for income compared to wealth statistics. This paper focuses on income, but uses several studies about wealth inequality as well.

Simon Kuztner's influential paper in 1955 tried to answer a question that was unanswered at the time. The question was: "…how income inequality changes in the process of a country's economic growth…" (Kuznets, 1955: 3). It is quite amazing to realize that some of the questions Kuznets poses in 1955 have only been answered during the last few years (at least in economics, as Kuznets originally ponders if researchers in sociology or demography would have answers even during his time). See for example the phenomenal work by Chetty, Hendren, Kline, Saez and Tuner (2014) or Chetty, Gursky, Hell, Hendren, Manduca and Narang (2017). Especially as inequality and growth was one of the most important issues in classical economics, where inequality was seen as necessary so those higher in the economic ladder could save relevant amount of their income thus creating investment.

What Kuznets found (or thought he had found as he did admit later in his paper: "The paper is perhaps 5 per cent empirical information and 95 per cent speculation…") (Kuznets, 1955: 26) was that inequality of income distribution increases during the early stages of development (within countries) but decreases as these economies reach later stages of development (Ibid, 1955: 22-25). He also included his remarks that: "…speculation is an effective way of presenting a broad view of the field; and that so long as it is recognized as a collection of hunches calling for further investigation rather than a set of fully tested conclusions, little harm and much good may result." (Ibid, 1955: 26). If

only all who read his paper actually understood this caveat, as his findings were later used as stylized facts and illustrated as *Kuznets curve* as seen in Figure 1.

Figure 1. Kuznets curve

It was only during the 90's when better data allowed Deininger and Squire (1998) to conclude: "there appears to be little systematic relationship between growth and changes in aggregate inequality." In some specific regions the relationship was negative, so negative economic growth could increase inequality even at earlier development stages (in this case Eastern Europe and Central Asia after 1990 as they transition from central planning to something else). (Ravallion & Chen, 1997: 370).

There are two groups of reasons why inequality increases as nations develop economically according to Kuznets. First one is related to savings. As per Kuznets only upper-income groups save, and this inequality in savings is greater than in income (and which in turn is higher than in consumption. Indeed only the highest decile quantile has higher share of income than consumption according to Nino-Zarazúa, Roope and Tarp, 2017: 670). And over a longer term this could cause increased share of income-yielding assets to the upper-income groups thus increasing income inequality. (Kuznets, 1955: 7) Second group in Kuznets view is the industrial structure of income distribution. Meaning a shift away from agriculture to industrialization and urbanization. The more rural population also has narrower distribution of income than in urban settings, and

incomes tend to be higher in more urban settings thus as increasing share of population swift from agriculture to industrial production in more urban settings these two factors cause inequality to increase. (Kuznets, 1955: 7-8.).

Kuznets curve stayed within economics as long as it did probably because it was simple, sensible and fit the data available at the time, or as Piketty and Saez write: "*Kuznets' overly optimistic theory of a natural decline in income inequality in market economies largely owed its popularity to the Cold War context of the 1950s as a weapon in the ideological fight between the market economy and socialism.*" (Piketty & Saez, 2014: 842) and recent evidence does not fit with the inverted-U relationship between growth and inequality. This has been especially true for higher income countries since 1980's. (Ferreira, 1999: 4-5, Galbraith, 2007: 603, Milanovic, 2016: 46).

There are several ways to specify and calculate economic inequality. Gini coefficient (or index) is the most commonly used measure. Theoretically it can obtain value between 0 and 1. Where 0 depicts a situation where all individuals have exactly same income, and 1 a situation where one person receives all income. Usually these Gini coefficients are calculated based on data from household surveys. However these surveys are not perfect, as they suffer from various handicaps. One of those is so called "upper-end truncation" which depicts a situation where upper-end distribution of income is not to be trusted as the ones with the highest incomes either refuse to be interviewed or understate their income. (Milanovic, 2011: 7-8) And as Rachel Sherman found as researcher of inequality the wealthy tend to underestimate their income and wealth even to her, which would not have had any possible negative outcome unlike disclosing real income to tax authorities (New York Times, 2017). One way to counter this is to use fiscal data for the upper end of the income distribution. However this approach, while probably at least not worse than household surveys, (Milanovic, 2011: 7, Alvaredo, Chancel, Piketty, Saez, Zucman, 2017: 29-30.) is also severely limited according to research by Gabrial Zucman, Niels Johannesen and Anette Alstadsaeter (2017). Zucman et al found that the higher you go on the income distribution the higher the chance that a)

this group has assets (and thus income based on those assets) in off-shore accounts b) this group leaves those assets unreported to tax authorities in order to evade taxes. In their research they estimate that the wealthiest 0,01% of households evade 25% of taxes they are due to pay versus average of 2,8% for all households. (Ibid: 48). So together these two findings imply that official Gini coefficients, that are based on either household surveys or fiscal data are lower than actual reality implies. (Ibid: 9). It is rather ironic that previously just the opposite view held sway, as it was commonly believed that households in the upper end of income distribution would evade taxes less than average as they are more likely to be audited by the tax authorities. (ibid: 27). To explain this, Zucman et al (2017) built a model to incorporate not just demand for tax evasion services but also the supply for it. Their model is consistent with the data available, and helps us understand how the supply of these services would explain why the wealthiest 0,01% of households use offshore accounts more often than the 0,05% of households as the relative cost of doing it is comparable for both. (Ibid: 27-32).

Gini coefficient (G) is calculated as follows.

(1) $$G = \frac{2\ covar\ (y, r_y)}{N\bar{y}}$$

Where $covar(y, r_y)$ is the covariance between income (y) and ranks of all individuals according to their income (r_y) ranging from poorest individual (rank = 1) to the richest (rank = N). N is the total number of individuals and $\bar{y}$ is the mean income. (Milanovic, 1997: 45).

Gini coefficient can theoretically range from 0 to 1 while in real world it ranges from 0,244 in Iceland to around 0,465 in Chile for disposable income Countries limited to OECD (Organization for Economic Co-Operation and Development) members (OECD 2016a), and global Gini coefficient is around 0,7, which is higher than for any individual country. (Milanovic, 2011: 8). Before venturing forth I want to highlight one additional issue. Most (if not all) Gini coefficients

used in this paper will be calculated based on disposable income. This is due to the fact that taxes and cash transfers have sizable impact on disposable income and as these vary between countries. An example follows: Sweden had primary income Gini coefficient as 0,466 in 2005 and for disposable income a Gini coefficient of 0,237, a massive difference. While the opposite example comes from South Africa which had a Gini coefficient of 0,664 for primary income in 2012 and for disposable income a Gini coefficient of 0,572, which, while still sizable difference, is not comparable to Sweden. (Caminada, Wang, Goudswaard, Wang, 2017: 22).

Gini coefficient is of course just one way to study economic inequality, for someone else income shares of different quantiles might be of more interest. In table 1 the income shares for 1-5 quantiles for all OECD-members are listed as is disposable income Gini coefficient.

Table 1. Income quantiles for OECD countries; data for 2014 or newer (OECD, 2016a).

Income share in total income						Gini coefficient
Country	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile	
2014 or latest (%)						
Australia	7,22	12,17	16,94	22,77	40,90	0,34
Austria	8,68	13,97	17,88	22,74	36,73	0,28
Belgium	8,80	13,74	18,55	23,69	35,22	0,27
Canada	7,20	12,72	17,36	23,39	39,33	0,32
Chile	4,95	9,18	13,40	19,86	52,61	0,47
Czech Republic	9,66	14,39	17,67	22,17	36,11	0,26
Denmark	9,76	14,33	18,28	22,67	34,96	0,25
Estonia	6,34	11,29	16,40	23,55	42,42	0,36
Finland	9,53	14,28	18,16	22,77	35,26	0,26
France	8,74	13,51	17,24	22,04	38,47	0,29
Germany	8,61	13,44	17,44	22,66	37,85	0,29
Greece	6,47	12,33	17,08	23,20	40,92	0,34
Hungary	8,28	13,72	17,85	23,17	36,98	0,29
Iceland	10,10	14,63	18,25	22,50	34,52	0,24
Ireland	8,15	12,97	17,14	22,61	39,13	0,31
Israel	5,71	11,43	16,95	23,76	42,16	0,36

Italy	6,78	12,95	17,59	23,26	39,43	0,33
Japan	6,51	12,61	17,57	23,84	39,48	0,33
Korea	6,88	13,65	18,33	23,92	37,22	0,30
Latvia	6,60	11,73	16,63	23,16	41,87	0,35
Luxembourg	8,67	13,65	17,77	23,12	36,78	0,28
Mexico	4,96	9,35	13,65	20,33	51,71	0,46
Netherlands	8,64	13,79	17,90	22,72	36,95	0,28
New Zealand	7,64	12,09	16,47	23,07	40,72	0,33
Norway	9,15	14,95	18,62	22,79	34,49	0,25
Poland	8,10	13,30	17,53	22,87	38,21	0,30
Portugal	6,85	12,37	16,85	22,45	41,47	0,34
Slovak Republic	8,83	14,36	18,08	22,85	35,88	0,27
Slovenia	9,06	14,56	18,55	23,19	34,64	0,26
Spain	6,12	12,10	17,23	23,84	40,72	0,35
Sweden	8,71	13,77	18,04	22,79	36,70	0,28
Switzerland	8,64	13,42	17,34	22,29	38,33	0,30
Turkey	6,08	10,76	15,30	21,92	45,94	0,39
United Kingdom	7,23	11,83	15,97	21,83	43,14	0,36
United States	5,21	11,04	16,04	22,60	45,11	0,39
OECD	7,7	12,9	17,2	22,8	39,5	0,32
Average	7,68	12,87	17,20	22,75	39,50	0,32
STDEV	1,42	1,40	1,19	0,84	4,28	0,05
MAX	10,10	14,95	18,62	23,92	52,61	0,47
MIN	4,95	9,18	13,40	19,86	34,49	0,24

What is remarkable here is how similar share of income 4th quintile has in different OECD-countries. When income shares for each quintiles are plotted against Gini coefficient, the income shares follow Gini coefficients for all quintiles, except the 4th one. It is almost, that the 4th quintile, which can be understood as upper middle-class, is immune to the growing income inequality in OECD-countries, while all other quintiles are not. One could write a separate paper for the reasons behind this. Upper and lower tail shows more significant divergence between different countries. Chile in the mid 19th century was the most unequal of the different pre-industrial societies as figure 3 shows, and not much has happened since. Chile is the only OECD-member where the 5th quantile's share is over half of all income. With this insight in mind it is easy, if slightly too simplistic way, to see both the rise of Allende and subsequent coup

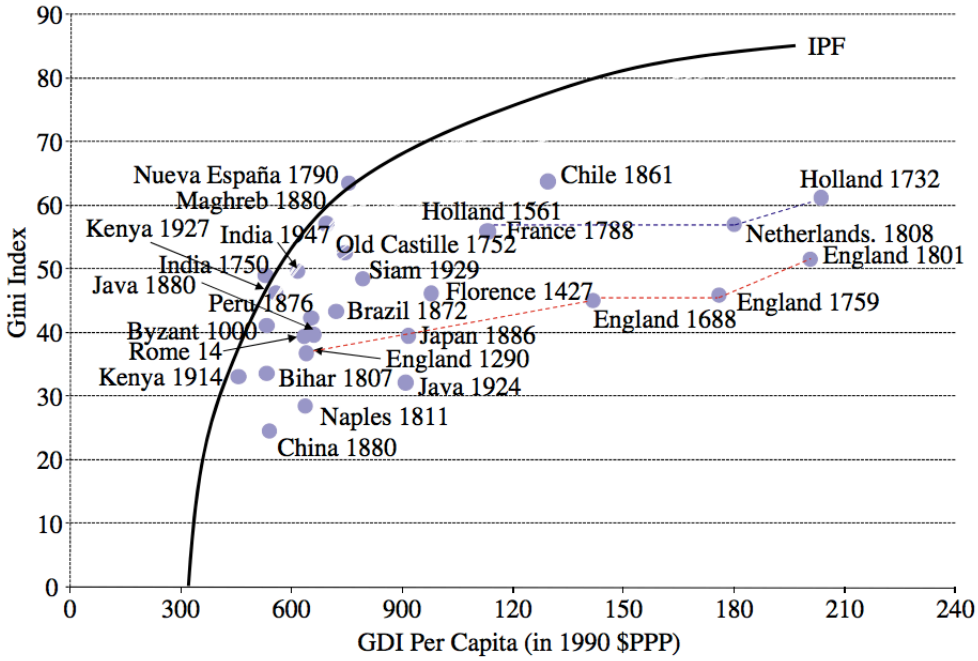
by Pinochet. And indeed Chile is the only South American OECD-member. Friedman would be proud. (Friedman, 1991).

Nino-Zarazua, Roope and Tarp (2017) provide comprehensive critique for the use of only Gini coefficient in inequality studies. The single biggest critique for use of Gini coefficient is following: "One especially important normative judgement regards the manner in which inequality is deemed to change as economies grow and the size of the "pie" to be divided increases…consider a situation in which everyone's income doubles. Many might feel that if this change in the distribution means that the richest person can now buy two yachts rather than one, while the poorest can simply buy two chickens instead of one, inequality has surely increased." (Nino-Zarazua et al, 2017: 665-666). In their terminology the use of Gini coefficient is "relative" measure and include that there are also "absolute" and "centrist" measures. However they also acknowledge that the use of Gini coefficient might be the most suitable when it comes to *unit consistency*. (Ibid, 2017: 666).

4. The development of economic inequality in history and modern times

The data becomes a problematic issue when looking at the years before 1970's. However, thanks to important research done by many there are reasonable estimates for several different countries for different years. Figure 3 plots Gini estimates against the estimates of GDI per capita and includes *inequality possibility frontier*, which is based on assumption of a subsistence minimum of $PPP 300 (solid line).

Figure 2. Pre-industrial inequalities: Estimated Gini coefficients, and the inequality possibility frontier. (Milanovic, Lindert, Williamson, 2011: 265)



What is remarkable in this figure it that it shows how current level's of inequality do not differ that drastically from the pre-industrial times. England's Gini estimate for year 1290 (0,367) is almost identical to United Kingdom's Gini coefficient for year 2014 (0,358). It is rather fitting that United Kingdom's Gini coefficient reached its highest point around 1860 (Milanovic, 2016: 49), around the same time as *Hard Times* by Charles Dickens was published. There are opposite examples as well. Holland had high level of inequality in 1732 in terms of Gini coefficient with value of 0,611 compared to current level of 0,283. (Milanovic et al, 2011:263, OECD 2016a). Overall level of inequality has decreased from pre-industrial times, at least for developed countries.

Economic inequality was long viewed as peripheral topic within economics, more as an outcome rather than actual variable that can affect the rate economies grow. It has gained growing interest since the turn of millennium. (Ferreire, 1999: 1).

What makes studying economic inequality hard is that there is no coherent data available for most countries. For the countries that the data exist it is often a mix of different estimates and studies. (Solt, 2008: 1) However recent years has seen great improvement in this area as economic inequality has gained more momentum and interest. (See for example the development of World Income Inequality Database, which recently updated to version 3.4 or WEF Global Risk report for 2013, which included "global income disparity" as most likely of the risks to occur during the next ten years).

While the situation is unique in each and every OECD-country, there are some trends to be spotted since 1970's. Income inequality first started to rise in the late 1970's in United Kingdom, United States and in Israel, while declining on average in OECD-countries (Galbraith, 2007: 605). Moving then years forward and this rise in inequality had touched most, but not yet all, OECD-members. In the 90's and 2000's the phenomenon had reached even the previously low-inequality countries such as Denmark and Sweden while at the same time strengthening even further in previously mentioned United Kingdom, United States and Israel. On average this meant that the Gini coefficient had average value of 0,29 in the mid 1980's and 0,314 in 2014 for OECD-membership countries. (OECD, 2011: 22, OECD 2016a, Cingano: 2014: 10). As usual these aggregate numbers do not tell the whole story, as within the OECD-countries there are countries that did not experience increase in Gini coefficient during this time period (1985-2008) (Greece and Turkey) and some countries have not increased changes in inequality (France, Hungary, Belgium). (OECD, 2011: 24).

Figure 3. Market incomes are distributed more unequally than disposable income. (OECD, 2011: 36)

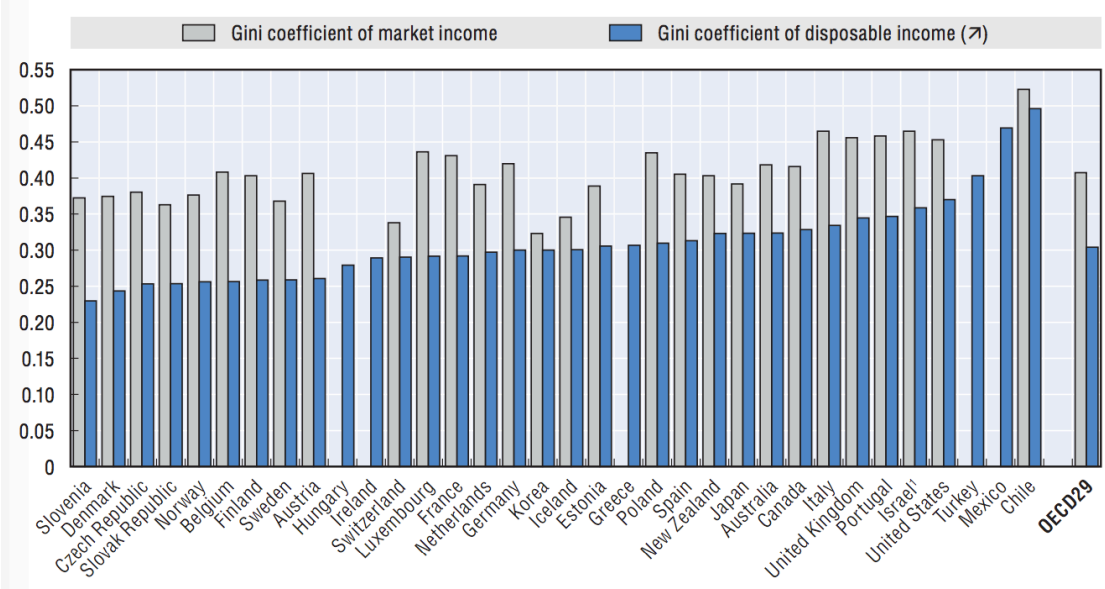


Figure 2[5] above shows the difference in Gini coefficients between market income and disposable income. While market incomes are higher in all countries, the situation varies strongly. In some countries, such as Slovenia, the disposable income Gini coefficient is way lower than for market income, while in Switzerland the Gini coefficient is similar for both.

There is growing number of pessimists who believe that the current levels of inequality are here to stay, and without dramatic negative developments current trends cannot be altered. This view gained much intellectual ammunition after Walter Scheidel's book *The Great Leveler: Violence and History of Inequality from the Stone Age to the Twenty-First century* was published in 2016. In it Scheidel writes bluntly: "*...throughout recorded history, the most powerful leveling invariably resulted from the most powerful shocks. Four different kinds of violent ruptures have flattened inequality: mass mobilization warfare,*

[5] Late 2000s refers to a year between 2006 and 2009. The OECD average excludes Greece, Hungary, Ireland, Mexico and Turkey (no information on market income available). Working age is defined as 18-65 years old. Countries are ranked in increasing order of disposable income inequality. (OECD, 2011: 36).

transformative revolution, state failure, and lethal pandemics…" (Scheidel, 2016: 6). Perhaps the future is as grim and somber as Scheidel writes. Hauner, Milanotic and Naidu (2017: 37) provide some empirical evidence to the classical theory of imperialism, in which inequality played a role in igniting the First World War. While Piketty (2014: 271-274) shows how first and second World War contributed to decreased inequality. However I believe Scheidel missed some positive developments in his book. Sweden is good example of a country where inequality decreased in the 20th century without major violence. (Alvaredo et al, 2017: 73-74). Sweden might be on the other hand a unique country in this retrospect as it was one of the only countries in Western Europe, which did not participate in Second World War. Perhaps one needs not to participate in great leveling, to gain the decreasing inequality, if all your neighbors do? Or perhaps social norms explain this, as it is rather easy to understand how the relative well off, compared to their neighbors, Swedish population would agree to broadly share the gains from productivity growth, especially given the fear of communism some few hundred kilometers to the east. (Piketty and Saez, 2003: 33-34).

5. Reasons for growing economic inequality

Increases in income inequality have been due to changes in distribution of wages, which on average explain 75% of household incomes (OECD 2011: 22). But this explanation is not very good or thorough. It is as if one tried to explain why Germany beat Brazil in the world cup semi-final of 2014 by saying "they made more goals", which is factually correct, but does nothing to explain the 6 goal difference. Luckily the same OECD paper provides a framework to look deeper into the issue of growing income inequality, which this paper follows in the next chapters.

5.1. Globalization

Traditional international trade theory (Heckscher-Ohlin) tells that increased trade increases wages for skilled workers in the higher income country, and decreases them for the unskilled workers. Opposite is true for the lower income country. Thus inequality increases in the higher income country and decreases in the lower income country, or this is what the theory tells us. (Kremer & Maskin, 2006: 2). Empirical evidence on the other hand does not show this expected reduction in inequality in poor countries. (Kremer & Maskin, 2006: 6). OECD (2011:24) also highlights studies showing that increased trade integration increases inequality for everyone involved. Jaumotte, Lall and Papageorgiou (2013: 273-274) on the other hand find that trade liberalization and export growth are associated with lower income inequality. They looked into the income growth for the 5 quintiles and found that export growth is associated with a rise for the bottom four quintiles, thus decreasing income inequality. (Ibid: 274) They also acknowledge that what is traded affect how inequality develops; agricultural exports especially decrease inequality in developing countries (Ibid: 301). Roine, Vlachos and Waldenström found that increased trade increases top share of income in Anglo-Saxon countries, but not in continental Europe. (2009: 29). Vivarelli (2007:1) argues that total aggregate

trade flows are weakly related with income inequality. Going to a more granular level they find that trade between developed and middle-income countries increases income inequality for the middle-income countries. The empirical evidence is mixed and seems to show that globalization is country, (sector) and time specific issue, and general theories, for some reason or another, does not cover this complexity.

5.2. Financialization and Financial Globalization

Financialization is commonly understood to have begun in the 1980's with deregulatory reforms in the US. It has many meanings but for the sake of clarity I will follow the one offered by Kus (2012: 482-483), which explains it as following: "*it encompasses several intertwined processes: (1) the growing share of the financial sector in the economy, (2) the growing reliance of non-financial firms' on financial activities as a source of revenue, (3) the emergence of a new corporate governance view that sees the firm as a bundle of tradable assets, and (4) the increasing of household engagement with financial markets as consumers of credit or as purchasers of investment products, seeking to generate income or sustain living standards.*" One of the easiest ways to understand this is to look at the profits made by the finance sector. For the US the profit share rose from below 20% in the 1980's to above 40% twenty years later, and how the share of portfolio income for non-financial companies rose from less than 15% in 1960's to over 40% in the 1980's. This was not limited to US, as all OECD countries took part in this development. (Kus, 2012: 483-484).

Kus provides four ways how financilization has contributed to growing inequality. First, the expansion of finance has come as expense of the real, productive economy, which has thus shirked profitability for non-financial companies and decreased wages for many middle-class and blue-collar workers. Secondly, this turn has weakened policies and institutions that have traditionally curbed income inequalities. Third, the dependence of non-financial

companies to the financial sector has encouraged focus on the short-term profits. Fourth is how stock market boom has contributed to the increased share of income to the top. And how the share of income gained from investments and capital has increased for the highest quintile, which is also taxed less heavily than ordinary sources of income. (Kus, 2012: 485). Roine et al also report in their blunt language: "*Financial development is also pro-rich"* (2009:21).

Financial globalization is the second half of this chapter. Especially as this development has also concurred with the rise of income inequality. External financial assets and liabilities have increased from 36% in 1960 to around 400% in 2015. (BIS, 2017: 100). Foreign investment liabilities as percentage of global GDP rose from 51% in 1995 to 183% in 2016. (McKinsey, 2017:7).

What is even more interesting is that this development has concentrated to the advanced countries, until 1990's external positions of both the advanced and emerging market economies were somewhat similar. After that the cross-border assets and liabilities of advanced economies rose more than by a factor of four, while in emerging market economies this factor was less than two. (BIS, 2017: 100-101).

Maybe this increase in cross-border assets explains the growing share of income for the top quintile, as we now know that bonds, into which the members of the top quintile have usually invested (Salti, 2015: 821-822), are not that good investment in terms of return in the long run, while equities are. (Jordà, Knoll, Kuvshinov, Schularick, Taylor, 2017: 13). And the majority (92% for US) of the domestic stocks are already owned by the top quintile (Wolff, 2014: 42). Wolff also found that between 1983 and 2013 the wealthiest quintile collected almost 100% of total growth in wealth in the US. (2014: 15). Jaumotte, Lall and papageorgiou (2013: 296) also find a positive relationship between financial globalization and rising inequality, and FDI assets in particular, seem to increase inequality. OECD (2011: 29) finds contradictory evidence, in their own words: *"…nor financial openness had a significant impact on either wage inequality or employment trends within the OECD countries*." But in the next

paragraph say that increased outward FDI was associated with increased wage divergence for the upper half of households.

5.3. Institutions, taxes and government transfers

Most OECD countries made regulatory reforms in the years between 1980 and 2008 to increase competition in various sectors and to increase flexibility in the labour markets. (OECD, 2011: 30). These reforms included loosened employment protection and relaxed product-market regulations for most OECD members. Some cut taxes for labour income for low-income workers and some others cut unemployment benefits. While these decreased minimum wages relatively to median wage, they also increased employment levels. They also increased wage inequality. OECD (2011: 31) makes the point explicit by writing how regulatory and institutional changes "*…tend to have contrasting effects on employment and wage distribution.*" Rather unsatisfactory finding as income inequality growth has varied heavily between OECD membership countries. (OECD, 2011: 23). Only increase in educational levels seems to be the silver bullet that dances through Scylla and Charybdis. (OECD, 2011: 31, Neves, Afonso & Silva, 2016: 398).

Looking at the United States Levy and Temin (2007) found that income distribution is strongly shaped by a set of economic institutions. They argue against the skill-biased technical change (and globalization) being the most important factor for income distribution changes since 1980's. (Ibid, 5). In their view, how the set of institutions affect can be compared to how gravity in different planets in our galaxy works. It affects in each and every one of them, but the thrust needed for the spacecraft to escape gravity varies between planets. Only a change to this set of institutions can create less inequitable distribution of income, where the fruits of productivity gains are spread more equitably. (Ibid, 43-44).

Immervoll and Richardson (2011) studied how *ex post* policies of different OECD countries have accelerated or slowed the trend towards more unequal income distribution. Overall they found that government policies have become more redistributive over the past 20 years (around 1986-2006), but this increase was at most half of the increase in market-income inequality. And while the trend of increasing income inequality was slowing in the last ten years (around years 1996-2006), the disposable income inequality increased faster during this period due to reduced redistribution. (Immervoll and Richardson, 2011: 65-67). They also found that benefits play a stronger role in reducing income inequality than taxes, even if the size of the latter is bigger in aggregate terms. (Ibid: 62) (This probably is due to the fact that Gini coefficients are sensitive to the "fatness of tails", Taleb, 2015: 1). This is in line with the results found by, Roine et al (2009: 5) as in their research they found that government spending increases income share for the first four quintiles. They also found that top marginal taxes affect disportionately (and positively) income shares for the first 9 deciles. This is somewhat against the findings of OECD (2011: 38), which found that income taxes seem to play relatively minor role in reducing income inequality. Wang and Caminada (2011: 2) find in their research that out of 100 % of income reduction, taxes reduce income inequality by 15% and transfers by 85% on average. Their study included 36 LIS countries.

5.4. Technology

Technological development has often been seen as the biggest driver in the increase of income inequality. (OECD, 2011: 26). This is due to the fact that technology, especially ICT, is seen as being skill-biased. The same OECD paper lists it as being bigger factor than globalization or "*closer trade integration*". Jaumotte et al found in their calculations that technological development is by far biggest contributor to the increase in income inequality (2013: 300). Their findings demonstrate the theory of how technological demand increases demand for higher skills and substitutes low-skill labour with technology.

However they also acknowledge that the effect may vary from sector to a sector, and lack of comprehensive data makes it hard to say at this point, but on average the effect is clear. (Ibid: 302-303). FDI and technological progress seem to walk hand in hand as OECD (2011:29) and Jaumotte et al find in their research (2013: 302). Dabla-Norris, Kochhar, Suphaphiphat, Ricka and Tsounta (2015:19) find similar findings; skill premium has risen in most OECD countries from the level seen at the end of last millennium, for some reason this premium decreased in Finland and Sweden, and this rise is seen as being driven by technological development. *Per se* technological development, without the increase in skill premium, is seen as having rather mild effect on income inequality for advanced economies, but stronger effect for emerging and developing countries. (Ibid: 27). Korinek and Stiglizt are one of the firsts to wonder how ongoing artificial intelligence (AI) development might affect income inequality in their paper published in December 2017. In it they discuss the possibility that AI will supercharge current trends in terms of income inequality. The reasoning behind this is that while human intelligence is distributed quite narrowly, AI might not be. It is imaginable to assume that the wealthiest humans will become, in their words: "*orders of magnitude more productive*". (Korinek and Stiglizts, 2017: 34-35). Acemoglu and Restrepo (2018: 33) offer support for this hypothesis. In their view the biggest contributor is *"mismatch between technology and skills"*, which contributes to decreasing labour demand and growing income inequality (2018: 2)

5.5. Fall of labour share

One of Kaldor's *stylized facts* said that the share of output going to labour would stay same. (Kaldor, 1961: 173). As often happens with old "truths", has happened to this *stylized fact* as well, it no longer is true. Autor, Dorn, Katz, Patterson and Van Reenen provide handy international comparison for this phenomenon. (2017: 31). Out of 16 countries they plotted for years between 1970 and 2010, only in two the labour share increased, and even there it was minimal, (one could almost say that it stayed at the same level as in the

beginning of the time period), while in others the labour share decreased. And as usual, while there is disagreement to the degree this fall is due to measurement metrics, there seems to be consensus that this fall is real and significant. (Ibid: 1). This is worrying trend as it means that wages and salaries represent decreasing share of total output, and as wages and salaries represent majority of total income for most people as seen in chapter 4.6., and as wealth is more unevenly distributed than income. (Wolf, 2014: 50, OECD, 2015a: 5).

Autor et al provide evidence for the theory that this fall in labour share is due to increased market concentration within different sectors, which in turn is caused by "superstar" firms. In their view the markets have changed so that the "superstar" firm within sector gain disproportionate "rewards" compared to prior times, and as their market share increases labour share decreases. (Ibid: 25). This issue is thus not only macroeconomic, but also microeconomic. De Loecker and Eeckhout also find supporting evidence for the hypothesis that increased market power causes labour share to decrease. (2017: 17-19).

5.6 Summary of reasons behind growing inequality

Table 2 provides summary of research mentioned in the previous chapters. As seen in the table there is growing amount of research done by the reasons behind growing income inequality.

Table 2. Summary of reasons behind growing inequality.

Theme	Researcher(s)	Effect
G	Kremer and Maskin (2006)	Increase in global trade increases (+) income inequality for all countries involved.
G	Jaumotte, Lall and Papageorgiou (2013)	Trade liberalization (-) and export growth (-) have effect on income inequality.
G	Roine, Vlachos and Waldenström (2009)	Increased global trade affects inequality (+) for Anglo-Saxon countries and (-) for continental Europe.
G	Vivarelli (2007)	Trade has weak effect on income inequality.
F	Kus (2002)	Affects income inequality by: 1. the expansion of finance has

		come as expense of the real, productive economy (+) 2. Weakened policies and institutions that have traditionally curbed income inequality (+) 3. Increased focus on the short-term profits (+) 4. The share of income gained from investments and capital has increased (+).
F	Jaumotte, Lall and Papageorgiou (2013)	Financial globalization (+) and foreign direct investments (+) have effect on income inequality.
F	OECD (2011)	Financial openness (=) has no effect on wage inequality or to employment.
I	Levy and Temin (2007)	Current set of institutions increase income inequality (+).
I	OECD (2011)	Regulatory reforms tend to have contrasting effects on employment (-) and wage distribution (+).
I	Immervoll and Richardson (2011)	Government transfers and distribution decreased the speed of income inequality in the 1980's and 1990's but later that effect was slower. Transfers more effective in curbing income inequality than taxes.
I	Roine, Vlachos and Waldenström (2009)	Government spending (-) and taxes (-) have effect on income inequality.
I	OECD (2011)	Taxes have minor role in income inequality (=).
I	Wang and Caminada (2011)	Transfers (-) have much bigger role than taxes (-) do in curbing income inequality.
T	OECD (2011)	Technology (+) increases income inequality.
T	Jaumotte, Lall and Papageorgiou (2013)	Technological development (+) is the biggest contributor to income inequality. This development goes hand in hard with the increase in FDI (+).
T	Dabla-Norris, Kochhar, Suphaphiphat, Ricka and Tsounta (2015)	*Per se* Technological development, has dissimilar effect in developed countries (=) and emerging countries (+), but it increases skill premiums in all countries (+), which has significant effect in income inequality.
T	Korinek and Stiglizt (2017).	AI (+) will supercharge current trends in terms of income inequality.
T	Acemoglu and Restrepo (2018).	Mismatch between technology and skills decreases labour demand (+).
L	Autor, Dorn, Katz, Patterson and Van Reenen (2017).	Labour demand has decreased in most developed countries (+) due to market concentration (+).
L	Loecker and	Market concentration (+) causes labour share to decrease (+).

	Eeckhout (201)	

Legend: G = Globalization, F = Financialization and financial globalization, I = Institutions, taxes and government transfers, T= Technology and L= Fall of labour share.

5.7. Theoretical reasons why economic inequality affects economic growth

In the previous chapters the most important reasons for growing inequality were listed. All well and good, but what matters most is how all these affect economic growth. And the reason for this is not just economic growth for growth's sake, but as Benjamin Friedman has written, economic growth is beneficial for various reasons for the whole society. And the lack of it brings many ills, misfortunes, mischiefs and a whole range of undesired behaviors forth in fellow citizens. (Friedman, 2005: 5, 50, 293, 325).

OECD (2015b: 61-62) lists three theoretical reasons for why inequality harms economic growth.

Theory A is usually referred as "*endogenous fiscal policy theory*". This theory states that as inequality reaches levels not acceptable for voters, they demand higher taxation and regulation, which reduces incentives to invest, thus leading to decreased economic growth. (OECD, 2015b: 61; Ostry, Berg and Tsangarides, 2014:8).

Theory B is referred as "*human capital accumulation theory*". In this theory poorer households lack the funds and income to invest appropriately into themselves (usually this is seen as lack of investment to education), and as chapter 5.3., shows, education seems to be the sole silver bullet for both growth and smaller inequality. (OECD, 2015b: 61; Ostry et al, 2014:8).

Theory C states that adoption of new technology depends on certain level of domestic demand, if domestic demand is below this threshold, these

technologies have no chance to be adopted widely, thus leading to decreased economic growth. (OECD, 2015b: 61).

The same OECD paper also lists two theories that say that inequality might increase economic growth.

Theory D says that higher inequality provides incentives to work harder, and if education provides higher rate of return, then this might incentivize people to invest in education thus leading to higher economic growth. (OECD, 2015b: 61; Ostry et al, 2014: 7).

Theory E argues that higher inequality increases savings, as individuals with higher incomes tend to save more and have lower propensity to consume their income, which in turn leads to capital accumulation. (OECD, 2015b: 61, Ostry et al, 2014:7).

Out of these three theories, this paper focuses and continues on the theory C, which is clearly linked to theory E as output Y can only be saved or consumed, but not both.

5.8. Empirical evidence for negative link between inequality and economic growth

In the following chapter I will list several empirical papers and their findings regarding inequality and economic growth. As inequality has gained more focus, the amount of empirical papers regarding this issue has grown, but what is remarkable is that the previously mentioned Kaldor (1955) and Kuznets (1955) are cited in almost all of them, even if their findings (*stylized facts*) have been shown to be incorrect by later research. Perhaps Max Planck was wrong by saying: "*Die Wahrheit triumphiert nie, ihre Gegner sterben nur aus*". The progress seems to be even slower. This paper follows the road set by others.

As with the theoretical literature, the empirical evidence is also mixed. Following the structured used by Ostry et al (2014: 10-11) for separate mechanisms that might affect economic growth negatively this paper starts with redistribution.

Ostry et al (2014: 17) find evidence that contradicts the common classical theory, which says there is a trade-off between redistribution and growth. In their findings redistribution is statistically insignificant (although slightly positive), while net inequality has negative coefficient for growth. In other words, they find no evidence that there exists a negative relationship between redistribution and growth. Babu, Bhaskaran and Venkatesh (2016: 109) find similar results. Their findings also contradict the theory of negative relationship between redistribution and growth, and indeed find a statistically significant (at the 5% level) and tiny positive effect for growth on redistribution. These findings are contradictory to the earlier findings, which found that more inequality causes more redistribution (in OECD-countries). (Persson and Tabillini, 1994: 616) Ostry et al find evidence that the effect is nonlinear and current levels of redistribution seen in OECD-countries are less than optimal for growth. They also find that it is indeed possible to have level of distribution that is detrimental to growth, in their own words: "*the overall effect of redistribution is pro-growth, with the possible exception of extremely large redistributions.*" (Ostry et al, 2014: 21-23). Cingano (2014: 19-20) find similar evidence and that redistribution at worst is neutral to growth.

Bagchi and Svejnar (2015: 506) are one of the few who note that not all Gini coefficients are equal in this regard. In their example they point that Gini coefficient is similar in UK and Indonesia, but political connections play hugely larger role in latter than in the former country. Bagchi and Svejnar (2015: 524-525) find empirical evidence that wealth inequality caused by politically obtained wealth is significantly detrimental for economic growth, while income inequality is not found to be statistically significant. This is what Aristotle warned about a few millenniums ago. (Aristotle, 1995: 203-204). Glaener,

Scheinkman and Shleifer (2003: 199-200) find empirical evidence for the effect. When politically connected *con* the rules for their own benefit, it causes all kind of ills and general feeling, which is illustrated magnificently by a character *Bodie* in the TV-show *The Wire: "This game is rigged, man. We like the little bitches in the chessboard"*[6]

Time aspect of inequality is another point that has gained more focus. Ostry et al (2014: 23), find that inequality increases risk that growth spells end and that inequality is *"powerful determinant…of medium term growth."* (Ostry et al, 2014: 25). Babu et al find that inequality has negative effect on growth in the long run, but is insignificant in the short term. Redistribution in their model is pro-growth in both timeframes; their data included 29 emerging economies (2016: 109). Halter, Oechslin and Zweimüller (2014: 81) find that inequality promotes growth in the short term, but reduces it in the long run, and the long term effect is stronger. Kennedy, Smyth, Valadkhani and Chen (2017: 119) find that inequality reduces growth, but only after few years delay. Kirschenmann, Malinen and Nyberg find evidence that income inequality is relevant predictor for financial crises, which are never pro-growth events. They end their paper with worrying note: "*Alarmingly, if income inequality has the destabilizing effect that our results suggest, then the current trend of increasing inequality could set the stage for further financial turmoil*". (2016: 178-179). Drennan (2017: 97-98) finds that growing income inequality was major factor behind the financial crisis. Brennan also points that as middle-class incomes stagnated: "*that rising prices above the rate of inflation for key necessities – shelter, healthcare, and education –pressed households to maintain their consumption through massive borrowing. And one reason for that run-up in prices was because higher income households were capturing a much larger share of income than in the past…so their demand soared for those categories."* (Drennan, 2017: 106). Amronin, De Nardi and Schulze (2018) find some evidence that increased wealth inequality played role in lengthening the

[6] *The Wire: Season 4, episode 13.*

downturn after the financial crisis due to borrowing constraints for the less wealthy.

Forbes (2000: 885) and Li and Zou (1998: 332) on the other hand found positive link between inequality and growth, while Castelló (2010: 293) finds a pro-growth relationship for inequality and growth in higher income countries. Given the quite straightforward language of the papers that find negative link, the words used by Forbes, Li & Zou and Castelló seem quite careful. As seen in these comments: "*…we shall admit that the association between income inequality and growth is a very complicated matter*" (Li and Zou, 1998: 332) or "*it is too soon, however, to draw any definite policy conclusions.*" (Forbes, 1998: 885) compared to "*On the other hand it indicates that policies that help limiting or – ideally – reversing the long-run rise in inequality would not only make societies less unfair, but also richer. In particular, the present analysis highlights the importance of two pillars of a policy strategy for tackling rising inequalities and promoting equality of* opportunities." (Cingano, 2014: 28-29). Or perhaps this careful language is the reason Forbes has her article in *American Economic Review*, while Cingano has his in less prestigious OECD *OECD Social, Employment and Migration Working Papers.*

Perhaps it is as Neves et al (2016: 398) found in their meta-analysis on the existing empirical literature on the relationship between inequality and growth, that the one and only truth in economics, seems to hold in this case as well, in their own words: "*Policy makers should avoid thinking of a global, single pattern for the inequality–growth relationship because such a pattern does not exist. Instead, they should take into consideration the existence of specific and particular effects that differ from country to country and region to region and that vary with the type of inequality and the time span considered.*" Or as one could summarize their finding: ***It depends***.

6. Public debt

6.1. Public deficits

The following chapters follow the direction set by Karlin (2013) and add to it. Public debt can mean either central government debt or other public debt, such as one taken by state or municipality. In this study however public debt will stand for central government debt for the case of consistency and understandability.

Budget deficit is born when government purchases and transfers exceed government revenues. Government purchases and transfers is G_1, state revenues are T_1 and rD_1 denotes interest payments of public debt in the period 1. The government budget can thus be represented as seen in formula (1).

(2) $$rD_1 + G_1 - T_1 = \text{Government budget balance}$$

If government purchases and transfers exceed government revenues we have a deficit budget. If government revenues exceed government purchases and transfers we have a surplus budget. In the case of budget deficit central government has to rely on debt to cover the expenditures. This is done by issuing government bonds. Budget deficit can be divided into two different subgroups which are 1) primary deficit which means a situation where $G > T$ and 2) deficit which is caused by interest payments from existing public debts. From this it can be seen that budget deficit is possible even in a situation where state revenues exceed government purchases and transfers (Burda & Wyplosz, 2009: 167).

Governments usually target certain debt-to-GDP ratios. In the following formula one can easily understand how economic growth and budget deficit are tied together when pursuing those target ratios. P stands for primary deficit, r

for real interest rate for existing public debt, g for economic growth, DEBT for existing public debt and S for central bank profits.

(3) $$P/GDP = (r - g)\ DEBT/GDP - S/GDP$$

One can easily see how higher debt-to-GDP ratio requires either higher economic growth g or lower interest rates r for the P/GDP to remain unchanged.

6.2. Short and long term effects of public debt

Budget deficits and the resulting increase in the public debt can in the short term be economically justified, if the deficit is due to stagnation as a result of economic cycle. In a previously described situation, public sector can increase aggregate demand and public investments with debt financing, and thus alleviate consequences of stagnation in Keynesian manner. Effectiveness of this fiscal expansion depends whether or not monetary policy is aligned to this expansion. Theory states that if central bank moves to offset the impact of fiscal expansions through monetary tightening, then private investments will suffer from "crowding out"-effect. This effect is due to increase in interest rates, which will decrease private investment. If monetary policy is aligned to fiscal policy, this "crowding out"-effect will decrease the effectiveness of fiscal expansion, but will not completely offset it (Samuelson and Nordhaus, 1995: 632-633). Developing nations can benefit even more than developed nations from reasonable levels of borrowing as they lack capital and are more likely to have investment opportunities with rates of return higher than in advanced economies (Pattillo, Poirson and Ricci, 2004: 5). Whether or not fiscal expansion is effective way to increase aggregate demand in the first place depends on fiscal multipliers. If the multiplier is less than 1, any increase in fiscal policy will actually reduce aggregate demand, on the other hand if multiplier is larger than 1, fiscal expansion of 1 € will increase aggregate demand for more than 1 €. "A multiplier well in excess of one is possible when monetary policy is constrained by the zero lower bound, and in this case welfare

increases if government purchases expand to partially fill the output gap that arises from the inability to lower interest rates.“ (Woolford, 2011: 1).

In the long run the effect of debt is different. Consider the following example, if the budget is balanced and net exports of goods and services (NX) are zero, domestic savings must equal investments.

(4) $$S+(T-G)=I + NX$$

In a situation described above, budget deficits will lower domestic savings, which would otherwise be directed to private investments. As domestic savings decrease the interest rate must rise to balance the demand and supply of capital. This rise in interest rates will compress investments and hence over a period of time will result in a smaller domestic capital stock and thus in a smaller future national income (Elmendorf and Mankiw, 1998:16–17). The decline in domestic saving can be financed by increased capital inflows from abroad, which could dampen and perhaps even eliminate the increase in domestic interest rates. Foreign capital inflows entail a different economic cost as they represent a reduction in net foreign investment and hence a reduction in future national income. From this it can be conducted, that even if interest rates remain unchanged the decreased domestic savings will reduce the capital owned by domestic actors. Only in the absolute case where an increase in the budget deficit is entirely offset by an increase in private savings there won’t be a reduction in the future national income, in all other cases the budget deficit will reduce the capital stock owned by domestic actors and thus lead to reduced future national income (Gale and Orszag, 2002: 7-8).

6.3. Historical development of public debt

Sovereign governments and countries have issued government bonds for centuries (Reinhart and Rogoff, 2010: 8) while history tells us how Alexander the Great borrowed much of the money he needed to conquer the Persian Empire during the fourth century B.C (MacDonald, 2006: 156, 43). From this it can be easily conducted that public debt is definitely not a new invention. Also problems relating to public debt are not new ones, as they have occurred previously in the history for hundreds of years. While outright defaults are getting more rare compared to historical norm, they still do happen. One of the latest countries to default was Argentina in 2014 (D'Alessandro and Kraul, 2014), but such is the demand for high yielding bonds, that just three years later, the same country in question rolled a 100-year bond which was oversubscribed. (Cohen and Rabouin, 2017) In OECD countries[7], the average debt-to-gdp ratio in 2015 was 88 %. Economic crisis, which started in 2007 have had a major impact on this, as the average debt-to-gdp ratio in OECD-countries was only 67 % back in 1995 and 36% in 1980. On average the debt-to-gdp ratio increased by 31 % between 1995 and 2015. (OECD, 2018).

6.4. Public debt and its variations

The ideal debt classification made by Panizzi (2007: 5) as seen in Figure 4. has four major factors.

[7] Countries included are: Australia, Austria, Belgium, Canada Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, United Kingdom, United States.

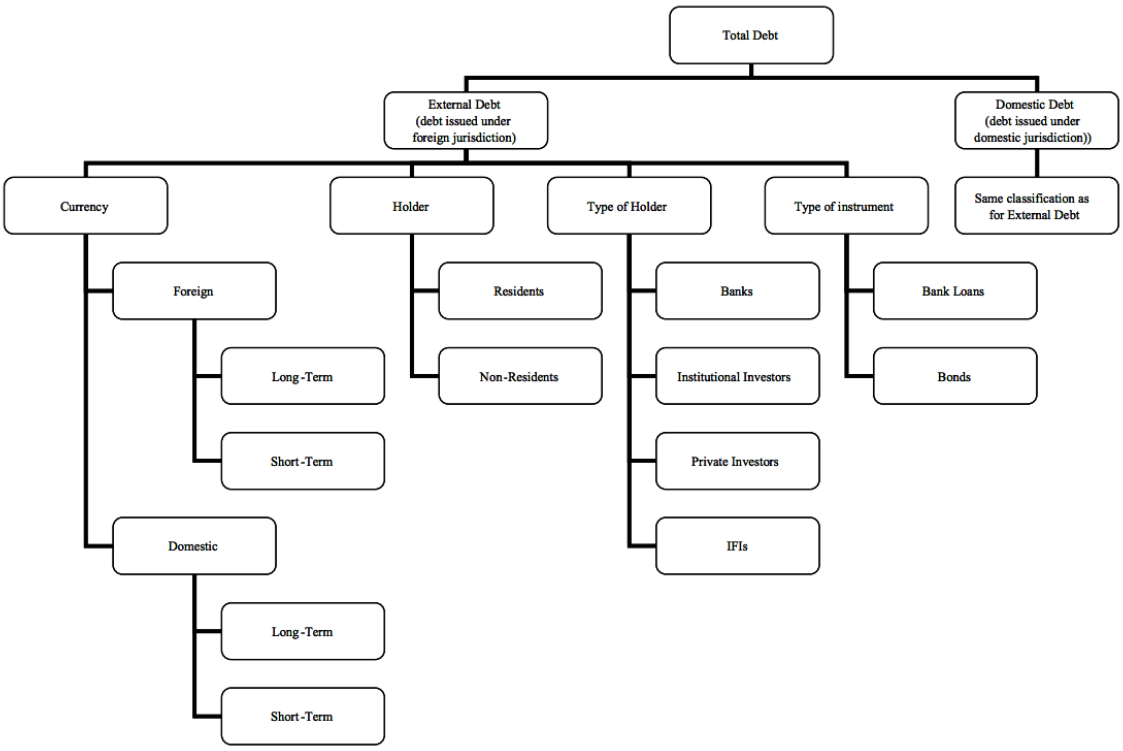


Figure 4. Ideal debt classification (Panizzi, 2007: 5).

First of those is the currency the debt is issued in. Countries have two choices, either to issue the debt in domestic currency or in foreign currency (Usually US dollars, but Eurobonds are also used as are some other currencies). This choice matters heavily as seen in the currency crises in East Asia, Russia and Mexico in the 90's where external debt was seen to exacerbate the severity of the crises. (Bordo, Meissner and Stuckler, 2010: 642). On the other hand domestic debt seems to be costlier in terms of interest rates. (Panizzi, 2007: 9).

Second difference regards the holders of the bond in question. Are they residents of the country, or non-residents. (Panizzi, 2007: 5). Often the terms used in this context are domestic- and external debt. This is somewhat against the model seen in figure 2. Panizzi offers three different definitions for the term *domestic debt* (2007: 4). First to mean bond issued in local currency, second to mean bond hold by resident of the country, and third to mean the domestic legislation where the bond was issued. This paper uses the second definition. In real life governments tend to issue bonds in their own currency, under their own jurisdiction, but the lenders are increasingly international lenders (Bordo et al,

2010: 642-643), thus in the data used for this paper these cases are seen as being *external debt*.

Third difference is about the type of holders. Whether they are banks, institutional investors, private investors or international finance institutions (such as World Bank, European Investment Bank etc.). (Panizzi, 2007: 5).

Fourth and last factor is about the type of instrument used by sovereign governments. Choices are either bank loans or bonds issued to markets. (Panizzi, 2007: 5).

6.5. Domestic and external debt

Domestic or internal debt means public (or government) debt, which is in the possession of country's own residents. Domestic debt is usually seen as less burdensome as compared to external debt. Reasoning for this can be summed up in a phrase "we owe it all to ourselves". But even domestic debt requires payments of interest to bondholders and thus taxes must be levied for this purpose. Taxes then introduce microeconomic distortions, and therefore the result is less favorable compared to a situation, where there would not be taxes levied for interest payments (Samuelson & Nordhaus, 1995: 636). Barro (1974: 1116) argued in his classical paper, "that there is no persuasive theoretical case for treating government debt, at the margin, as a net component of perceived household wealth."

Due to its limited role in defaults and other economic crises (or so it was thought for quite long) data on domestic debt was sporadic and mostly ignored until the late 2000's. Research done by Reinhart and Rogoff (2011: 320) has shown this to be wrong, as domestic debt has usually played bigger role than external debt in debt crises.

Even though most major economies have counted on their own citizens when issuing public debt, international debt markets have existed for centuries (Bordo, Meisner and Redish, 2003: 7).

The prime reason why external debt can be seen as more harmful than domestic debt can be summed up in the following phrase "*This debt does involve a net subtraction from the resources available to people in the debtor nation*" (Samuelson and Nordhaus, 1995: 636). There are also fewer tools for reducing the external debt, as neither inflation nor financial repression is feasible (Reinhart et al. 2012: 5). And domestic debt does not in case increase the risk of foreign gunboats making demands, as external debt used to do (Hauner et al, 2017: 48).

Of the over 300 defaults Reinhart and Rogoff (2011: 327-328) combined in their data for their research. Of those only 68 were *de jure* defaults to domestic debt holders. The authors emphasize the difficulty spotting these defaults, as their data goes back to 19th century, and therefore believe the number to be lower than actual number. The difference is still quite a large, as they include 250 external debt defaults in this data. However domestic debt that is issued in own currency can also be dealt with inflation, so why the *de jure* defaults then? Reinhart and Rogoff believe this to be due to the fact, that high inflation causes all sorts of problems to the banking and financial sector. Governments have other options to deal with domestic debt, including financial repression. However even that has its own costs, as inflation and financial repression go hand-in-hand according to research. (Reinhart and Rogoff, 2011: 328).

6.7. How public debt affects economic growth?

Theoretical literature tends to point to a negative relationship between public debt and economic growth. Following is a short review of theoretical literature on the issue.

Following previous work made by Buchanan and Meade, Modigliani argued that public debt is burden for next generations, as it reduces the flow of income due to lower stock of private capital and he also pointed out the non-linear impact of public debt to the interest rates. Meade had shown in his own research how removal of debt could increase economic growth due to increased incentives of households to work and save more and how this could possible lead to lower taxation, as less capital would be needed for interest payments, which in turn would increase growth as providing even more incentives to work and save more (Checherita & Rother, 2010: 9-10).

Diamond studied the effect of public debt (external and internal) on economic growth and found that both types of public debt reduce the available consumption and savings and thus capital stock. He also found how internal debt can produce a further reduction in the capital stock as individuals substitute physical capital to government debt (Diamond, 1965: 1147).

Paul Krugman coined the term “debt overhang” which describes a situation where country’s expected repayment ability falls below the contractual value of debt. In his research external debt accumulation can promote investment, while beyond certain point the debt overhang will decrease foreign capital inflow and thus capital accumulation and economic growth (Krugman, 1988: 29-31).

Other channels through which public debt may have effect on economic growth are total factor productivity and increased uncertainty about future policy decisions, which may negatively affect investment decisions and thus growth. Private saving and public investments are also found to be affected by public debt and thus also affect economic growth. (Checherita & Rother, 2010: 11, 19).

Some researchers also point out how the public or government debt can alter the political process that determines fiscal policy. They point that the possibility of government borrowing reduces the discipline of the budget process. “When additional government spending does not need to be matched by additional tax

revenue, policymakers and the public will generally worry less about whether the additional spending is appropriate" (Elmendorf & Mankiw, 1998:20).

7. Previous research and research hypotheses

7.1. Previously done research

As we have seen in previous chapters redistribution is major reducing factor for inequality, and that public debt usually grows in downturns when taxes drop quicker than public spending. Those two are clearly linked, even if papers published regarding this issue can be counted on the fingers of one hand. Luckily they are not completely non-existent. Probably the first paper to study this relationship was by Salti (2014). In his paper Salti argues, and provides evidence for, that domestic debt and external debt are dissimilar regarding their effect on income inequality. This is straight due to the fact that majority of domestic debt held by private investors is heavily top skewed. Indeed Michl (1991: 358) found that the 5th quintile received almost 90% of all interest payments in US in 1982. The top one percent of households received over 40 % of all interest payments, while 1-3th quintile households in aggregate received less than 5 % of all interest payments. And since that year wealth inequality has only grown in terms of Gini coefficient, from 0,799 in 1983 to 0,871 in 2013. (Wolf, 2014: 50). While inequality is exaggerated in United States compared to average OECD country, the situation is similar in all countries.

Salti (2014: 822) goes so far as to state: *"…lead domestic debt to have more of a regressive effective on income distribution than external debt*." The data set Salti (2014) uses is broader in terms of countries included, but narrower in the years included compared to this paper, so this paper continues in the footsteps first taken by Salti.

Ostry et al (2014: 15) provides similar empirical evidence regarding public debt and its effect on economic performance. This thesis continues in these footsteps.

7.2. Hypotheses

Using a panel data set, this paper investigates the impact of debt composition on measures of income inequality (market and disposable income) and tests the hypothesis that domestic debt is more regressive than external debt. And uses the same panel data to investigate the combined effect of inequality and public debt to economic performance.

H1: Domestic debt has more regressive effect on income inequality than external debt.

H2: Domestic and external debt have negative effect on economic growth and disposable and market inequality have dissimilar effect on economic growth.

8. Empirical analysis of determinants of inequality

This chapter includes the empirical part of this thesis. Based on the theories, empirical results and methods presented in previous chapters. The key objective of this chapter is to present a statistically significant evidence of the hypotheses presented in the previous chapter.

8.1. Data

For analysis this paper uses version 6.1 of Standardized World Income Inequality Database (SWIID) data, which is the most comprehensive dataset for income inequality available. It includes both disposable and market Gini coefficients. (Solt, 2016). Countries will be limited to OECD members[8] for data quality and comparability reasons. Beside SWIID, this paper uses International Monetary Fun (IMF) data for public debt and gross domestic product growth statistics, Federal Reserve Bank of St. Louis data for domestic share of public debt, OECD data for savings rate and World Bank data for foreign direct investments. Following the example set by Immervoll and Richardson (2011: 40) Redistribution is calculated as the absolute difference between market and disposable Gini coefficients. These values are calculated for all countries and years, when both market and disposable Gini coefficients are available. External debt is calculated as the remaining part of public debt that is not domestic debt. External debt is calculated for all countries and years when both domestic debt and public debt as % of GDP is known. There were few cases where the external debt share as % of GDP turns to a negative share when those calculations are done. However as the IMF data for public debt is more comprehensive, those negative values are omitted from the data.

Table 3 provides a definition of the variables, their sources and the labels used in the regression tables. Our sample contains data on 22 countries for the period

[8] Due to data limitations and consistency reasons countries included are: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Netherlands, Norway, Poland, Portugal, Sweden, Slovakia, United Kingdom and United States.

1980-2015. We end up with an unbalanced panel data set of 8313 observations. Table 3 provides summary of data used.

Table 3. Variable definitions

Variable	Label	Description	Source
Gini	disposable	Disposable income Gini coefficient	SWIID 6.1
Gini	market	Market income Gini coefficient	SWIID 6.1
Gini	redistribution	Absolute redistribution (calculated as absolute difference between market and disposable income Gini coefficient)	Based on SWIID 6.1
Domestic public debt	domestic	Domestic public debt as % of GDP	Federal Reserve Bank of St. Louis
External public debt	external	External public debt as % of GDP (calculated as remaining share of public debt as % of GDP)	International Monetary Fund (Total public debt)
Foreign Direct Investment	fdi	Foreign direct investment, net outflows (% of GDP)	World Bank
Saving rate	saving	Net saving rate	OECD
GDP growth %	growth	GDP – Annual growth rates in percentage	OECD
1st quintile income share	quintile1	Income share of the 1st quintile as % of total income.	World Bank
5th quintile income share	quintile5	Income share of the 5st quintile as % of total income.	World Bank, WID (France, Poland & USA)
Consumption	hh_cons	Household final consumption expenditure, etc. (% of GDP)	World Bank
Consumption	g_cons	General government final consumption expenditure (% of GDP)	World Bank

8.2 Methods used in this thesis

This thesis uses regression analysis for this empirical part. We use similar regression model as used by Salti (2014: 828-829) for hypothesis H1 and similar regression model as used Ostry et al (2014: 15).

8.3 Analysis and research results

Empirical analysis done for this thesis was done using Stata14 software, which is commonly used for economic research and allows all necessary regressions and other analysis to be done efficiently. Data was combined and edited as panel data in MS Excel. Manual calculations (for redistribution and external debt) were done in MS Excel.

8.4. Descriptive statistics

Table 3 provides descriptive statistics for the variables used in this thesis. The number of observations varies quite strongly between different variables. Ranging from 239 for 1st quintile income share to 751 for household and government expenditures as % of GDP. All in all the panel data includes 792 rows.

Table 4. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
domestic	504	44,357	28,83377	2,34	202,46
external	486	23,173	15,96554	0,18	124,21
public	749	63,965	35,36022	9,68	249,11
fdi	736	3,1547	6,88633	-18,92	72,012

market	457	0,4701	0,54123	0,216	0,6156
disposable	637	0,2931	0,46957	0,16725	0,4205
redistribution	457	0,1745	0,52283	0,32	0,375
saving	739	6,264	5,01017	-13,027	27,5837
growth	744	2,1576	2,40064	-11,6149	10,7996
quintile1	239	0,0806	0,012737	0,051	0,12
quintile5	291	0,4256	0,06880	0,313	0,6204
g_cons	751	20,0171	3,03868	12,725	27,935
hh_cons	751	55,870	6,31204	38,363	70,772

Figure 5. Domestic debt as % of GDP, per country

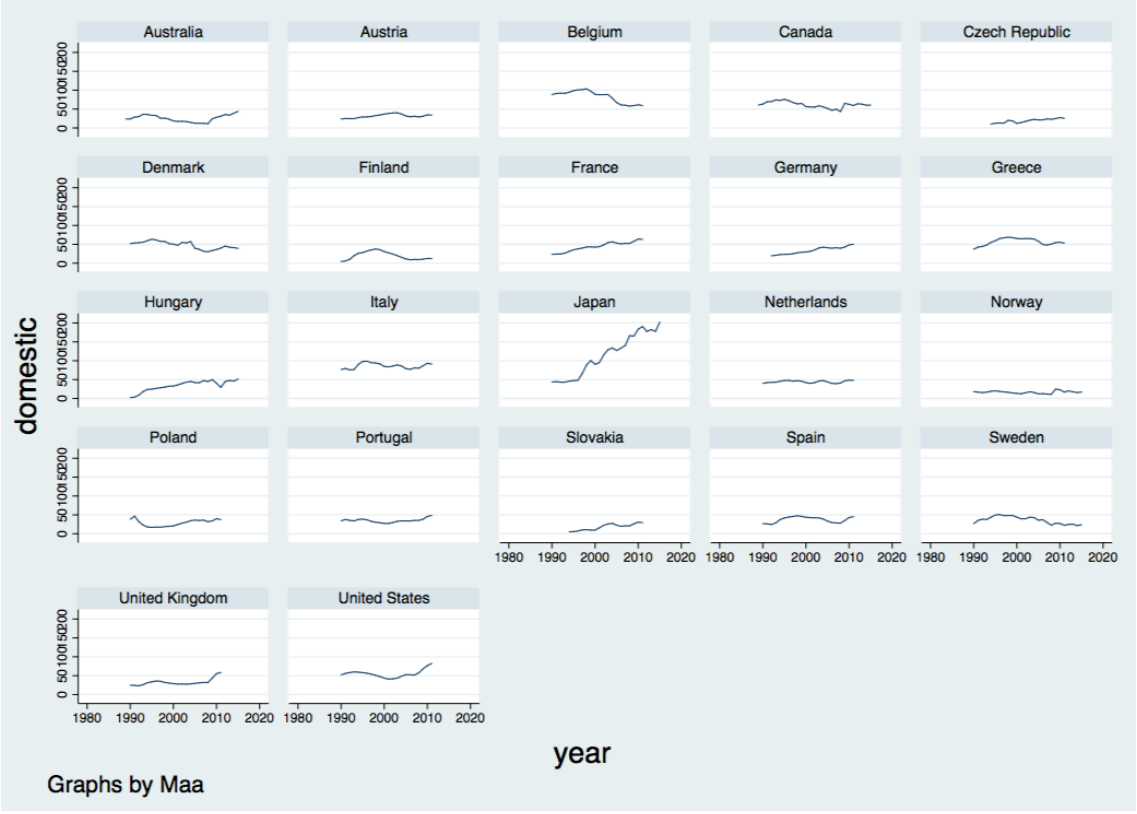
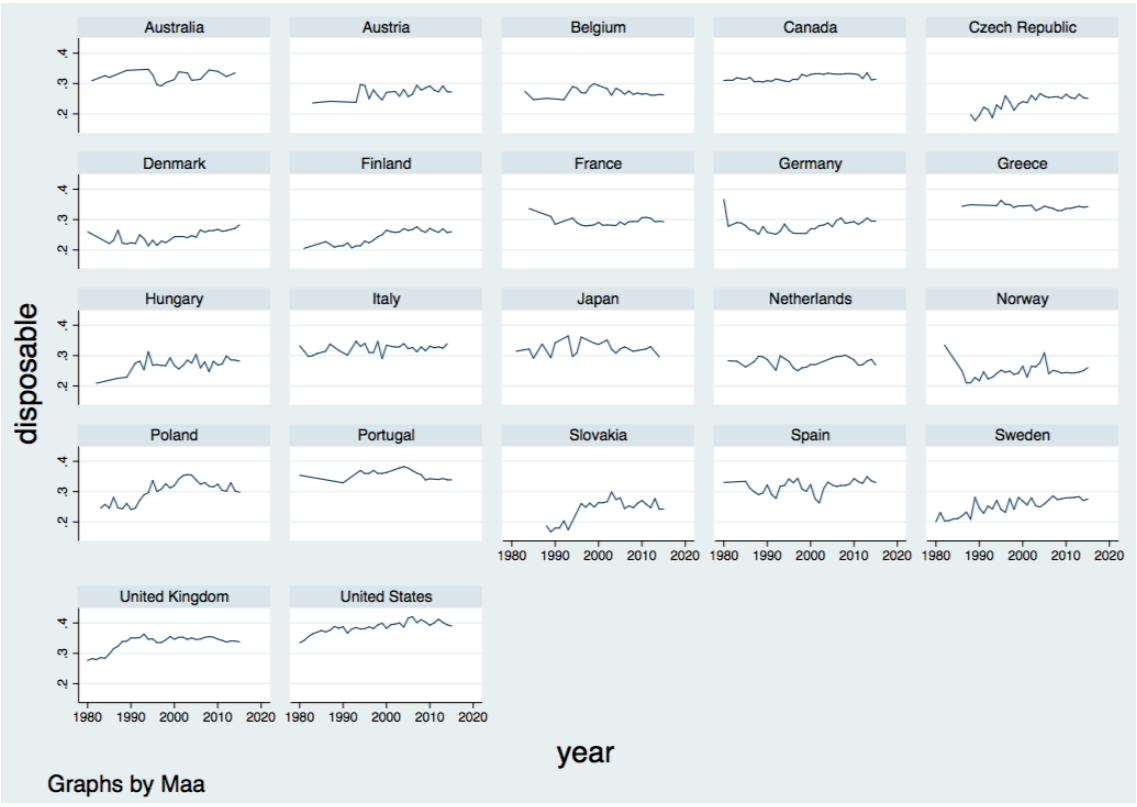


Figure 6. Disposable income Gini coefficient, per country



8.5. Hypothesis testing and regression analysis

We start first with testing hypothesis H1: *Domestic debt and external debt are dissimilar regarding their effect on income inequality.*

We run reduced form regressions of inequality on public debt composition and other controls, in the fixed effects form:

(5) $Disposable_{it} = \beta_1 domestic_{it1} + \beta_2 external_{it2} + \alpha_1 + u_{it}, t = 1,2...,T.$

Where $disposable_{it}$ is disposable income Gini coefficient for country i, and year t. $domestic_{it1}$ is domestic debt as % of GDP and $external_{it2}$ is external share as % of GDP, a_1 is the unobserved time-invariant individual effect and u_{it} is the error term. We choose this model over random effects regression model after computing the Hausman test, of which results are seen below in figure 3. We compute this test for all columns (1-3) and find similar results.

Figure 7. Hausman test results for disposable income Gini coefficient

	Coefficients (b) disposable~e	(B) disposable~e	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
domestic	-.0001464	-.0001219	-.0000245	9.46e-06
external	-.0001931	-.0001817	-.0000114	5.76e-06

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 11.01
Prob>chi2 = 0.0041

We find mixed results for hypothesis 1. Table 5 shows results of regressions of equation (5) with the disposable income Gini coefficient as $disposable_{it}$, $domestic_{it1}$ as domestic debt as % of GDP and $external_{it2}$ as external debt as % of GDP, and different set of control variables X_{it} in each column. Column (1) depicts a fixed-effects regression of (1) with domestic and external debt as % of GDP. Both variables have statistically significant and negative effect on the disposable income Gini coefficient. Domestic has a mean of 44,35, so even having domestic debt at the mean level decreases disposable income Gini coefficient by 0,6. Effect is even stronger for external debt. However we fail to notice any supporting evidence for hypothesis H1. Both domestic- and external debt decreases disposable income Gini coefficient. So in column (2) we add foreign direct investments (fdi) as a control variable and find that the coefficients on the domestic- and external debt are hardly changed from column (1). Fdi increases disposable income Gini coefficient, as was discussed chapter 5.3. However the effect is only significant at the p<0,1 level. In column (3) we add government expenditure as share of GDP (g_cons). The results are virtually unchanged from column (2) for domestic debt and fdi, but now external debt is no longer statistically significant. Government expenditure is not statistically significant.

Table 4. Disposable income Gini coefficient regression results

	(1)	(2)	(3)
Domestic dept/VA	-0,000146	-0,000141	-0,000125
	(0,018)**	(0,022)**	(0,049)**
External debt/VA	-0,001931	-0,00189	-0,000150
	(0,012)**	(0,026)**	(0,100)
FDI		0,002145	0,000221
		(0,081)*	(0,073)*
Public expenditure/VA			-0,000747
			(0,283)
_cons	0,30776	0,30653	0,32014

	(0,000)***	(0,000)***	(0,000)***
Countries	22	22	22
n	427	426	426
R^2	0,0268	0,0356	0,0384

legend: * p<0,1; ** p<0,05; *** p<0,01

For market income inequality we use random effects model as seen in equation (6).

(6) $market_{it} = \beta_1 domestic_{it1} + \beta_2 external_{it2} + \alpha_1 + u_{it}, t = 1,2...,T.$

Where $market_{it}$ is market income Gini coefficient for country i, and year t. $domestic_{it1}$ is domestic debt as % of GDP and $external_{it2}$ is external share as % of GDP, a_1 is the unobserved time-invariant individual effect and u_{it} is the error term. We choose this model over fixed effects regression model after doing the Hausman test, of which results are seen in figure 8. For this model we also make an assumption that the unobserved effect a_i is uncorrelated with each explanatory variable (equation 7 below). (Wooldridge, 2012: 492).

(7) $Cov(x_{tij}, \alpha_i) = 0, t = 1,2, \dots, T; j = 1,2, \dots, k.$

Figure 8. Hausman test results for market income Gini coefficient

	Coefficients (b) market_fe	(B) market_re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
domestic	.0002892	.0002282	.0000611	.0000452
external	-.0000334	-6.13e-06	-.0000272	.0000533

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 3.29
Prob>chi2 = 0.1933

In order to decide whether to use random effects regression over OLS-regression we do Breusch-Pagan Lagrange multiplier test. For which results are seen in figure 9, and thus decide to use random effects model. We do this for all columns (4-6) and find similar results.

Figure 9. Breusch-Pagan Lagrange multiplier test for market income

```
Breusch and Pagan Lagrangian multiplier test for random effects

        market[country,t] = Xb + u[country] + e[country,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                  market |   .0019263       .0438895
                       e |    .000914       .0302319
                       u |   .0010213       .0319573

        Test:   Var(u) = 0
                                chibar2(01) =   574.29
                             Prob > chibar2 =   0.0000
```

Table 6 reports results of regressions of equation (6) with the market income Gini coefficient as $market_{it}$, $domestic_{it1}$ as domestic debt as % of GDP and $external_{it2}$ as external debt as % of GDP, and different set of control variables X_{it} in each column. Column (4) depicts a random-effects regression of (1) with domestic and external debt as % of GDP. Only domestic debt has a statistically significant and positive effect on the market income Gini coefficient and thus supports the hypothesis H1. In column (5) we add foreign direct investments as variable and find positive, but not statistically significant result for it. Adding fdi changes outcome for domestic debt as well as it is no longer meaningful variable. In column (6) we include government expenditure as share of GDP (g_cons). Now both domestic and external debt are statistically significant and

have positive effect on market income inequality as discussed in chapter 6. Government expenditure has significantly significant and negative effect on market income. Based on the results we find mixed results for hypothesis 1. Domestic and external debt seems to decrease disposable income inequality, but also on the other hand increase market income inequality.

Table 5. Market income Gini coefficient regression results

	(4)	(5)	(6)
domestic	0,000228	0,000174	0,000266
	(0,043)**	(0,125)	(0,021)**
external	-0,000006	0,000316	0,000480
	(0,970)	(0,097)*	(0,013)**
fdi		0,000181	0,000176
		(0,487)	(0,490)
g_cons			-0,004164
			(0,001)***
Countries	22	22	22
n	296	295	295
R^2	0,0206	0,0244	0,0681

legend: * p<0,1; ** p<0,05; *** p<0,01

We then turn to test hypothesis H2: Domestic and external debt have negative effect on economic growth and disposable and market inequality have dissimilar effect on economic growth.

We run reduced form regressions of inequality on public debt composition and other controls, in the fixed effects form:

(8) $growth_{it} = \beta_1 domestic_{it1} + \beta_2 external_{it2} + \beta_3 market_{it3} + \beta_4 disposable_{it4} + D_t + \alpha_1 + u_{it},\ t = 1,2\ldots,T,$

where $growth_{it}$ is GDP growth as percentage change from next to current year for country i, D is year t dummies, $domestic_{it1}$ is domestic debt as % of GDP and $external_{it2}$ is external share as % of GDP, $redistribution_{it3}$ is the absolute difference between market income and disposable income Gini coefficients, $disposable_{it4}$ is the disposable income Gini coefficient, a_1 is the unobserved time-invariant individual effect and u_{it} is the error term. We choose this model over random effects regression model after computing the Hausman test, of which results are seen in figure 10.

Figure 10. Hausman test for GDP growth regression

	Coefficients (b) growth_fe	(B) growth_re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
domestic	-.0137606	-.0088677	-.0048929	.0090199
external	-.0811636	-.0531686	-.027995	.0133503
market	13.64264	2.278376	11.36427	5.124589
disposable	4.930959	2.156554	2.774405	12.50573

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 14.38
Prob>chi2 = 0.0062

We find mixed results for hypothesis 2. Table 6 shows results of regressions of equation (8) with $growth_{it}$ is GDP growth as percentage chance from previous year, $domestic_{it1}$ as domestic debt as % of GDP and $external_{it2}$ as external debt as % of GDP, $redistribution_{it3}$ is the absolute difference between market income and disposable income Gini coefficients, $disposable_{it4}$ is the disposable income Gini coefficient and different set of control variables X_{it} in each column. Column (7) depicts a fixed-effects regression of (1) with domestic and external

debt as % of GDP and redistribution and disposable income Gini coefficients. Domestic debt is shown to have positive, but not statistically significant role. External debt on the other hand has significant and negative effect on economic growth. Redistribution is shown to be positive for growth and is statistically significant as is disposable income Gini coefficient, however the effect is only significant at p<0,1 level. So in column (8) we add income shares of quintile1 and quintile5 and find that the coefficients on the domestic- and external debt have similar effect as seen in column (7). Income share from 1st quintile is positively related to economic growth, while 5th quintile income share does not explain anything. In column (9) we add household expenditure as share of GDP (hh_cons) and saving as percentage of GDP. Now neither domestic debt nor external debt is statistically significant anymore. Redistribution is still positively related to economic growth. Saving is highly significant and positive for economic growth, while household expenditure is neither. Overall the results are light and mixed. External debt seems to be a burden to economic growth, while domestic debt is not. Redistribution is positively linked to economic growth, but so is disposable income Gini coefficient. More research is needed for the relationships between income inequality, public debt and economic growth.

Table 6. Economic growth regression results

	(7)	(8)	(9)
domestic	-0,01376	-0,05825	0,28358
	(0,230)	(0,130)	(0,425)
external	-0,08116	-0,13182	-0,04434
	(0,000)***	(0,000)***	(0,122)
redistribution	13,6426	32,0506	24,3763
	(0,051)*	(0,020)**	(0,041)**
disposable	18,5736	41,8058	41,354
	(0,093)*	(0,214)	(0,155)
quintile1		228,52	85,4025
		(0,060)*	(0,424)

quintile5		2,1311	-23,7319
		(0,935)	(0,318)
saving			0,74318
			(0,000)***
hh_cons			0,31935
			(0,220)
Countries	22	22	22
n	292	155	155
R^2	0,1015	0,2154	0,4238

legend: * p<0,1; ** p<0,05; *** p<0,01

To test the robustness and in order to control for heteroscedasticity we use similar model as equation 8, but this time with lagged time variable (t+1 and t+2).

(10) $$growth_{it+1} = \beta_1 domestic_{it1} + \beta_2 external_{it2} + \beta_3 redistribution_{it3} + \beta_4 disposable_{it4} + D_t + \alpha_1 + u_{it},\ t = 1+1, 2+1 \ldots, T+1,$$

(12) $$growth_{it+2} = \beta_1 domestic_{it1} + \beta_2 external_{it2} + \beta_3 redistribution_{it3} + \beta_4 disposable_{it4} + D_t + \alpha_1 + u_{it},\ t = 1+2, 2+2 \ldots, T+2,$$

where $growth_{it}$ is GDP growth as percentage change from next to current year for country i, D is year t dummies, $domestic_{it1}$ is domestic debt as % of GDP and $external_{it2}$ is external share as % of GDP, $redistribution_{it3}$ is the absolute difference between market income and disposable income Gini coefficients, $disposable_{it4}$ is the disposable income Gini coefficient, a_1 is the unobserved time-invariant individual effect and u_{it} is the error term. We choose this model over random effects regression model after computing the Hausman test, of which results are seen in figure 10.

Here we find similar results as previously. Table 7 shows results of regressions of equation (10) with $growth_{it}$ is GDP growth as percentage chance from previous year, $domestic_{it1}$ as domestic debt as % of GDP and $external_{it2}$ as external debt as % of GDP, $redistribution_{it3}$ is the absolute difference between market income and disposable income Gini coefficients, $disposable_{it4}$ is the disposable income Gini coefficient and different set of control variables X_{it} in each column. External debt has a statistically highly significant negative effect on growth, while disposable income inequality has a positive effect. In other words the effect is similar as in non-lagged regressions, but still weak. Equation (11) adds income quintiles, which are found to be non statistically significant.

Table 7. Economic growth regression results

	(10)	(11)
domestic	0,0109213	-0,02103
	(0,187)	(0,555)
external	-0,372172	-0,053514
	(0,01)***	(0,045)**
redistribution	3,620262	-6,291776
	(0,460)	(0,565)
disposable	17,89967	4,720661
	(0,030)**	(0,849)
quintile1		31,8315
		(0,726)
quintile5		-14,14668
		(0,519)
Countries	22	22
n	293	155
R^2	0,5683	0,6094

legend: * p<0,1; ** p<0,05; *** p<0,01

Here we find similar results as previously. Table 8 shows results of regressions of equation (10) with $growth_{it}$ is GDP growth as percentage chance from previous year, $domestic_{it1}$ as domestic debt as % of GDP and $external_{it2}$ as external debt as % of GDP, $redistribution_{it3}$ is the absolute difference between market income and disposable income Gini coefficients, $disposable_{it4}$ is the disposable income Gini coefficient and different set of control variables X_{it} in each column. Debt is found to be statistically significant, but domestic and external have opposite effect. Whereas domestic debt is seen as growth enhancing, external debt is shown to have adverse effect on growth. Disposable income has similar effect as previously, statistically significant and positive effect. Equation (13) adds income quintiles, which are found to be non statistically significant.

Table 8. Economic growth regression results

	(12)	(13)
domestic	0,0232794	0,0483676
	(0,003)***	(0,195)
external	-0,0234264	-0,087668
	(0,022)**	(0,0742)
redistribution	-2,93569	-18,28007
	(0,528)	(0,119)
disposable	13,8511	11,33651
	(0,070)*	(0,660)
quintile1		2,424718
		(0,979)
quintile5		6,670257
		(0,771)
Countries	22	22
n	287	152
R^2	0,6005	0,5963

legend: * p<0,1; ** p<0,05; *** p<0,01

9. Conclusions

The purpose of this master thesis was to investigate the combined effect of public debt and income inequality to economic performance within OECD countries. This was done first by addressing the effect of public debt to income inequality (hypothesis 1). Here we found mixed results. While both domestic and external debt seemed to decrease the level of income inequality, as measured by disposable income Gini coefficient, the effect was stronger for external debt, as our hypothesis pointed in the first place. For market income the effect was opposite. Here external debt seemed to have a stronger and positive effect to market income as compared to domestic debt.

Results regarding the combined effect of inequality and public debt to economic performance is also mixed (hypothesis 2). This thesis did not find evidence that domestic debt would be detrimental, while external debt on the other hand causes clear negative consequences. In similar fashion redistribution has positive effect to economic growth, which is against theory, but this thesis is not the first one to find this effect. (see chapter 5.8.). When using time-lagged models (t+1, t+2) we find somewhat contra dictionary results. Here redistribution is not statistically significant, while disposable income inequality is and it has positive effect on growth. External debt is seen in both models as a negative contributor to economic growth.

The biggest contribution of this thesis is that it gives clear indication that using aggregate public debt is not sufficient, as the effect of external and domestic debt seem to vary. In similar terms income inequality should be studied between disposable- and market income Gini coefficients. It seems that too much market income inequality is harmful for growth. No wonder OECD and others recommend investments to education, as that is one of the biggest contributors to reduced market income inequality. However current levels of disposable income inequality in studied OECD countries are neutral to growth, or even too low for optimal (see tables 7 & 8).

9.1 Further research ideas

The lack of data, even as this paper uses the most comprehensive data for income inequality available at the moment, causes difficulties and raises more questions than this paper can answer. And the inequality data is not the only problem, while public debt data is already at quite good level, the data for domestic and external share of it is still lacking. Given more comprehensive data a more thorough research could be done. Also this paper only focuses on limited set of OECD countries, so the effect of income inequality for less developed countries could be a good research idea.

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