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**Do the Tails Matter? Revisiting the Relationship Between Income  
Inequality and Economic Growth**

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## Abstract

This thesis looks to re-examine the oft-discussed relationship between income inequality and economic growth. Much of the research to date has relied upon the Gini coefficient as *the* indicator of inequality. I go into detail discussing why the Gini coefficient may not be capturing some of the nuances that a country's income distribution deserves. In the demonstrable cases of some countries, a simple 0-1 scale, giving disproportionate sensitivity to movements in the middle-tail of the income distribution, is simply inadequate. I propose the usage of the Palma measure of inequality, being the ratio of the top 10 per cent share of income to the bottom 40's share. Utilising a pooled OLS model, including income inequality in a growth regression, I find that the tails do indeed matter and that the relationship between income inequality and economic growth is strongly negative when using the Palma and weakly positive when using the Gini.

### **Acknowledgements**

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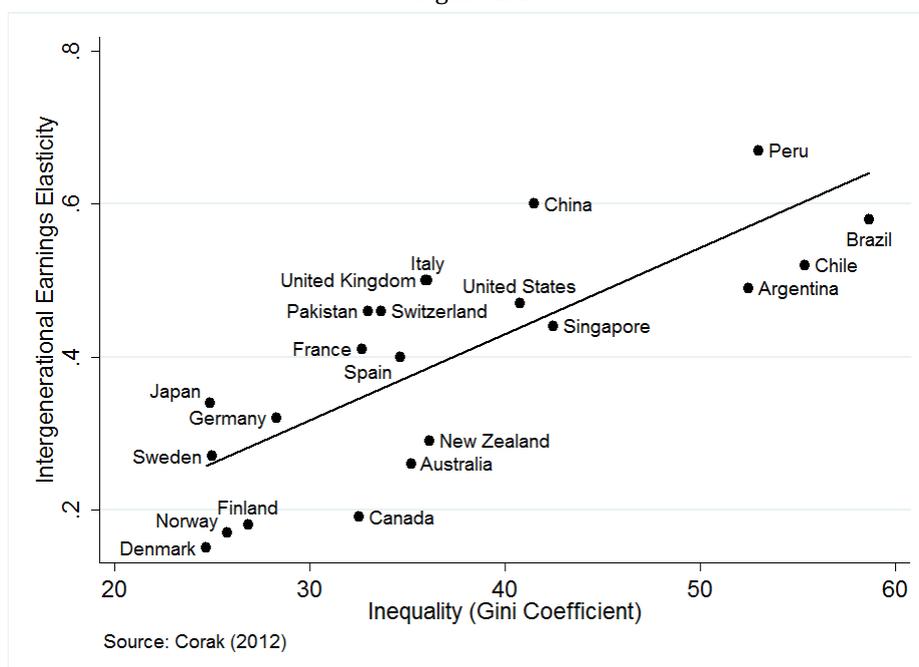
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# 1 Introduction

The field of economics has conventionally seen a trade-off between equity and efficiency. In a rather zero-sum manner, one cannot have more equity without reducing inefficiency. There are numerous reasons to take issue with Arthur Okun's proposition which I delve into quite considerably. This retort, however, is generally one levelled at concerns over growing income inequality. Making considerable headlines, Thomas Piketty, author of "Capital in the 21<sup>st</sup> Century", released a tome revealing meticulous data collection spanning over two centuries for Western developed economies. His book was revelatory in some sense. The discussion surrounding inequality has been one with considerable history in economics, but the true scale of its implications, globally, was ostensibly underappreciated given the almost nascent nature of inequality research, only in the past decade or so taking more prominence.

Now many avenues of inquiry have opened up with a lot of research into the externalities of inequality, both negative and positive. For one thing, it appears to be negatively correlated with levels of social mobility. The "Great Gatsby Curve" is very pertinent in portraying this. That a negative association exists implies that it is harder for individuals to climb the rungs of the social ladder, with indeed some rungs clearly missing. Hence, higher levels of inequality may be undesirable from this point of view.

Figure 1.1



In its extremes, it could lead to societal disorder. Indeed, Chang and Wu (2016), for instance, propose that one of the reasons that dictators in autocracies engage in preferential trading

agreements that increase the share of income of the relatively abundant factor (labour in such countries) is to mitigate the protesting of an excess concentration of income. This can decrease the likelihood of the autocratic regime breaking down and hence lower inequality can protect the elite. There is then, a role for political economy considerations when studying the topic of income inequality.

But how has income inequality come to be measured? Conventionally, the Gini coefficient is used. This 0-1 scale is essentially the integral of the entire income distribution of an economy, with 0 indicating complete equality and 1 indicating complete inequality. To an untrained eye, this scale can be somewhat confusing, especially in comparison to other, seemingly incomparable countries. A country like Ukraine is supposedly more equal than Denmark according to this scale (WIID, 2017). Many researchers have hinted at the possibility of hidden inequality that this measure simply does not reveal.

This was brought into the spotlight by Esteban and Ray (1994) when they expound on the concept of polarisation. In its essence, and more pertinently in the context of inequality, one can conceive of groups in the form of classes, with various gradations. These gradations encompass similar attributes as well as dissimilar attributes. An imbalance between these can form where for instance there are classes with many more dissimilar attributes than similar. They adopt somewhat of an augmented Marxian lens to suggest that when income inequality rises, or tensions between classes rise, this leads to possibilities such as revolts, rebellions as well as general unrest (ibid.: 20). This is what the authors mean by polarisation and they believe it holds particular relevance when the variable of attributes is that of wealth and income.

They make the point illustrating diagrams where two different types of income distributions emerge. One is a distribution where incomes are allotted equally across 10 deciles and one in a bi-modal form where income is spread across either a poor or rich group which can be thought of as the income deciles 3 and 8. It is the latter of these groups which displays polarisation and the admission that such a distribution is possible must depart one from inequality orderings in the form of the Gini. But the ability of the indicator to accurately capture the phenomenon of income inequality also paves the way for many other issues.

Indeed, the suitability of such a measure to policy analysis can be quite difficult as it is not easily translatable into a policy goal. This piece of research will look to analyse inequality using a rather novel measure in the Palma ratio or the ratio of the top 10 per cent's income share to the bottom 40 per cent's income share. Jose Gabriel Palma being the eponymous researcher pointing to its advantages supports it empirically with one core contention. Regardless of

developmental stage or economic size, the income shares of the middle 40 per cent (income deciles 5 to 9) have a roughly stable share of the income distribution (Palma, 2011).

Inequality, thus, is something manifesting in the tails of the distribution. This gives inspiration to my title. Indeed, do the tails matter? This would imply that a measure of income inequality better suited to capturing it lies not in its ability to capture the whole distribution, but its ability to focus on specific segments. If Palma's argument has merit, then the tails do matter, for income inequality. But what else could they matter for? This research will look to empirically investigate the relationship between inequality and economic growth, to return one to Okun's equity-efficiency trade-off. Research using the Gini measure has quite recently delivered the counter-intuitive result that higher levels of income inequality produce a drag effect on growth (Ostry et al., 2014), though this is at odds with prior research (Forbes, 2000; Banerjee and Duflo, 2003). The direction of the relationship is thus a point of contention in the literature.

In any case, these findings need to be taken with a pinch of salt, however, if some sort of policy prescription surrounding inequality itself is to be conceived of. I argue that the Palma ratio is better suited to this particular task as it can tell one, in a rather concise way, how much the top 10 per cent own of the income share times the share of that of the bottom 40 per cent. Take the simple case of a country with a ratio of 4. This implies that the top 10 per cent have an income share four times that of the bottom 40 per cent. This makes it easier for both laymen and policymakers to convey in more practical language a more accurate portrayal of the inequality dynamics of an economy. Does income inequality as measured by the Palma ratio reveal something different about the effects on growth as compared to the Gini coefficient?

I find that it does, with my empirical results suggesting a positive relationship between income inequality and economic growth, when using the Gini coefficient, but negative when using the Palma ratio. Despite these results, it is worth interrogating some of the other ways in which inequality may have negative externalities. Even if the equity-efficiency trade-off holds, how much efficiency should be gained at the behest of increasing concentration of income? Questions such as this and their derivatives inevitably have normative answers but they are worthy of consideration. Moreover, I use a panel dataset of around 100 countries with over 800 observations. I obtain the data from the WIID database (2017) as well as the Penn World Tables (Feenstra et al., 2016) and World Bank (2016). With this comprehensive dataset, I was able to perform a pooled OLS regression with a host of typical growth regression regressors, with annual economic growth as the outcome variable.

My results appear to be in line with much of the previous literature when it comes to estimating the relationship between income inequality and growth using the Gini, though it is at odds with

more recent research (Ostry et al., 2014). Unquestionably, data reliability has been increasing with time when it comes to income inequality. For this reason, newer research is likely more robust and hence my findings are best compared with this. This paper explores a number of interesting questions such as whether income inequality is associated with economic growth, what the Palma ratio has to say about the dynamics of income inequality and the potential other outcomes that inequality is associated with. This is discussed in a global context and a key assumption here is that the Palma indicator is reliable across countries.

What follows is a summary review of the literature on income inequality and its relationship to economic growth, and the dynamics of different income groups, followed by a discussion of some of the theoretical mechanisms. Thereafter, I present my methodology to be used and go into more detail on data issues as well as econometric issues. This will provide the foundation for me to present the data in descriptive form and formulate a narrative around the dynamics of income inequality a la the Palma ratio in comparison to the Gini coefficient. Following this are regression analyses which document some of my key quantitative results and this will form the basis for a discussion of the findings and its contribution to the literature in providing a better glimpse into what economists discuss as income inequality. In my discussion, I go over the results and conjecture amongst other things about the potential policy implications that may be brought about through my findings. I conclude that usage of the Palma ratio suggests a strongly negative relationship with economic growth and that this in contrast with using the Gini coefficient, indicating that there are some issues with how income inequality is measured and defined.

## **2 Literature Review**

### **2.1 A Brief Overview**

Inequality, of both wealth and income varieties, has in recent times seen a significant increase in research. But even going back to the grandfather of economics, Adam Smith, one can find a rationale for distributional concerns. In the *Theory of Moral Sentiments*, he writes:

“This disposition to admire, and almost to worship, the rich and the powerful, and to despise, or, at least, to neglect persons of poor and mean condition, though necessary both to establish and to maintain the distinction of ranks and the order of society, is, at the same time, the great and most universal cause of the corruption of our moral sentiments. “

This passage, remarkable in its clarity, rather presciently presents moral impulses conducive to movements such as Occupy Wall Street as well as the charity Oxfam’s (2018) heightened

campaign against excessive levels of inequality. Implicit in much of Smith's work, is that whilst there is a sufficient basis for being ambivalent towards certain levels of income inequality, there are levels at which the gap between rich and poor is so stark as to concern civil society and governments. Whilst Smith's emphasis here is on the corruption of individuals' moral sentiments, one can conceive of this as a foundation upon which to rest concerns about distributional concerns.

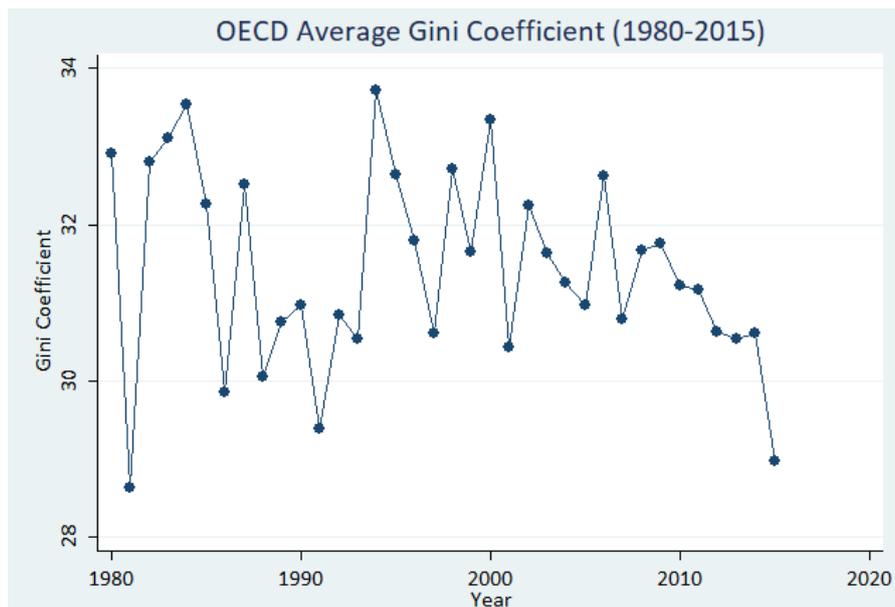
Simon Kuznets (1955) first attempted to construe some mechanisms by which one can understand the dynamics of income distributions. He conceives of a simple model of it whereby the total population is split across rural and urban lines. Given the scarcity of data at the time at which he was writing, much of his input can be considered as hypothesising. Though what was known led Kuznets to present some starting assumptions. One is that the average per capita income of rural populations tends to be lower than that of urban ones and the other that the distribution of it is narrower with the former as compared to the latter. This leads him to derive some predictions. *Ceteris paribus*, an increasingly urban population implies an increasing share of the total population that is inherently more unequal.

However, there is no reason to think that relative average per capita income differences between the two groups are ones that close through the process of economic growth. Hence, as an economy goes through a process of development, it becomes more urbanised and inequality lessens. Or this is as predicted by Kuznets. But Kanbur and Stiglitz (2015) argue that these stylised facts no longer apply to advanced economies such as the United States and the United Kingdom. Even one of the famous Kaldor stylised facts in the constancy of the share of capital to output has failed to hold in advanced economies. The share of capital, hence, is rising and so has income inequality. These provide a stark rebuke to the predictions of Kaldor (1957) and Kuznets insofar as the dynamics haven't been in accordance with some basic stylised facts that have become conventional wisdom in contemporary economic discourse.

Piketty (2014), quite recently, introduced a novel approach using a neoclassical growth model and argues that so long as the rate of return on private capital or  $r$ , is greater than the growth rate of the economy,  $g$ , then the wealth of higher income groups will grow at an ever-increasing rate, resulting in a wider gap between them and lower income groups of labourers. Piketty then goes onto present results derived from a laborious data-collection process, obtaining data spanning more than two centuries for 6 developed countries. He documents rising trends of inequality, at least in advanced developed nations, in the past few decades.

Interesting in the results he presents, is that generally speaking  $r$  tends to be greater than  $g$  though there is a point in time where this was untrue. The two World Wars that rocked the

world economy resulted in much diminishment of capital stocks due to mass destruction of



infrastructure among other things. Here one can see that the rate of return on capital was actually lower than the rate of growth and not coincidentally, the following decades saw periods of relatively stable and moderate levels of inequality. But questionable in Piketty's thesis is whether an inexorable spiral of deepening income and wealth inequality is a necessary corollary of  $r$  being greater than  $g$ .

Figure 2.1

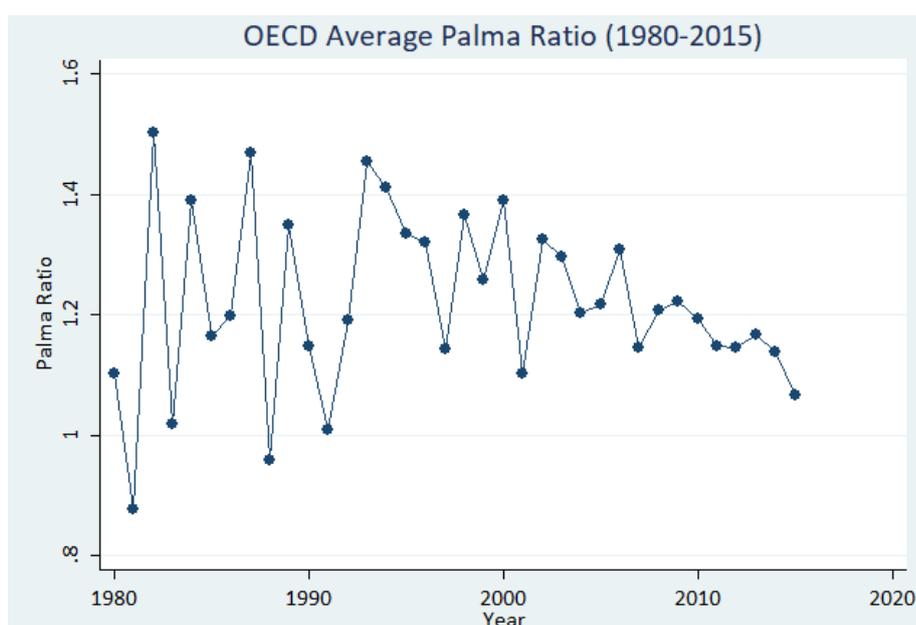
The data appear to be in support of his narrative, at least insofar as widening inequality has been observed in developed countries. One can observe this in figures 2.1 and 2.2 where both measures appear to show an upward trend in inequality though this is considerably more pronounced when using the Palma ratio. But this says nothing about the future dynamics of inequality and whether counter-measures to address inequality will mitigate the concentration of income and wealth. But this does raise questions as to whether this is a new normal and given a higher rate of return on capital as compared to the rate of economic growth, whether it can be reversed.

Figure 2.2

Stylised facts or mechanisms, here, can be just as flawed as those introduced by Kuznets and Kaldor. Indeed, Mankiw (2015: 43) introduces some caveats to Piketty's pessimism. Even if the rate of return on capital is greater than the growth rate, widening inequality isn't an inevitability. He argues that one needs to factor in some more assumptions such as the rate of inheritance tax, the marginal propensity to consume wealth and how many descendants share the wealth to be inherited. This can imply that wealth becomes diluted as the generations go by, resulting in somewhat of a plateauing of income inequality.

Piketty, however, does acknowledge that his predictions may encompass a range of plausible scenarios, some more dystopian than others. Novel in his approach, as compared to Kuznets, is the revisiting of the direction of causality in the relationship between economic growth and income inequality. Kuznets views it as uni-directional, with growth affecting inequality and not the converse. The adoption of the Kuznets framework in the former Bretton-Woods institutions implied a certain nonchalance towards inequality insofar as the remedy was seen as measures manifesting themselves as growth-enhancing, not necessarily as inequality-reducing (Palma, 2014). This is a clear distinction that is relevant to the concerns motivating Piketty.

His concern regarding excessive levels of both income and wealth inequality is that of the consolidation of influence in the political process, raising concerns about the erosion of democracy. Hence, absent even an effect on economic growth rates, excessive levels of inequality should raise political as well as economic concerns. To return to the nature of the



relationship, Piketty goes a step beyond Kuznets in seeing inequality not just as a bug of

capitalism, but an innate feature, assuming that the rate of return on capital is higher than the rate of economic growth. Piketty sees as the remedy to this systemic tendency a tax on wealth, though one can put the specific issue of the exact remedy to inequality to one side and contribute to the turning focus away from merely growth-enhancing policies.

Framing this in terms of the dichotomy between old and new in Kuznets and Piketty inevitably conceals much of the subsequent theoretical work on income inequality and economic growth. I delve into this more, in section 3 and discuss a range of transmission mechanisms that will help inform the statistical analyses.

## 2.2 Empirical Literature

A considerable empirical literature has emerged over the past two decades or so, looking to quantify the relationship between income inequality and economic growth. Deininger and Squire (1996) represent one of the earliest contributions to the literature that managed to utilise reliable panel data for a host of countries, in different regions. Going further, they even rebuke one of the aforementioned stylised facts in rural populations being more egalitarian than urban populations. Their dataset finds it to be violated in the cases of countries such as China and Poland where they are less egalitarian. Their data utilise household data to obtain Gini coefficients and they hence look at countries for which they have at least a decade of data. They find an insignificant relationship between changes in income inequality and aggregate income growth. But what they were able to find evidence for is the poverty-reducing role of economic growth, essentially enabling them to claim the converse in that economic decline is detrimental to the poor.

Forbes (2000) comes to slightly stronger conclusions, framing her own work in light of equity-efficiency trade-off i.e. that there is a trade-off between measures to reduce inequality such as redistribution, and efficiency, within the broader economy. The contention is that redistribution requires higher taxation on income and that this results in the taking away of private sector savings that could be used for investment. In other words, redistribution increases the amount of deadweight loss in an economy. She utilises the data collected by Deininger and Squire to conduct some regression analyses. The specification utilises inequality in the Gini coefficient, lagged income growth, male & female education and purchasing power parity stability as explanatory variables.

She utilises fixed effects (FE), random effects (RE) and Arellano and Bond specifications in addition to others, and finds significant positive coefficients, hinting at a positive relationship between per capita income growth and income inequality. A Hausman test reveals random effects to be the most efficient estimator when comparing FE and RE, though the dataset is

plagued by cross-sectional dependence implying issues with the efficiency of the RE estimator. Hence, the Arrelano and Bond estimation proves to provide the most robust set of results, which informs Forbe's discussion. A further sensitivity analysis, trying the same regression by dropping some outliers, confirms the positive and significant coefficient she finds.

Banerjee and Duflo (2003) model the relationship between inequality and growth using two different models of which more pertinent is perhaps the political bargaining game, in which one of two competing political groups holds up the economy, at random, wherein each period a growth opportunity is made available that the chosen group either pursues, or puts off to gain concessions from the opposing group. If the opposing group concedes nothing, the growth opportunity is foregone, but if concessions are made, the opportunity is taken up, though at a discounted rate.

They argue that such bargaining is akin to the poor consistently voting for higher levels of redistribution despite this redistribution having adverse effects on growth. They show this in notational form in it being more likely for either group to demand redistributive transfers when its share of output is low. Their most key result in this model is the prediction of an inverted U-shape relationship between the level of inequality and future economic growth. This is rather similar to the dynamics portrayed by Kuznets with the development of an economy implying initially increasing levels of inequality and then falling levels as income per capita rises. In terms of empirical results, the authors utilise multiple models to assess the relationship between income inequality, as measured by the Gini coefficient, and economic growth.

In addition to using fixed and random effects, and first differences, an Arellano and Bond regression is also included, in a similar manner to Forbes. Taking inspiration from prior research on this relationship (Alesina and Perotti, 1996; Barro, 2000), they use two different specifications, Perotti and Barro. The former comprises of less explanatory variables whereas the latter is considerably more extensive in involving socioeconomic variables such as rule of law, colony and fertility. The authors find a positive effect of income inequality on economic growth, with all of the models estimated, bar random effects, exhibiting statistical significance. This lends some support to the argument that a certain level of inequality is indeed growth-enhancing.

Hence, up until the mid-noughties, most evidence pointed against the growing-reducing effects of income inequality. What there was evidence for, however, was a reduction in poverty and increases in income per capita. As mentioned in the introduction, there has recently been a shift in the zeitgeist. Even institutions such as the International Monetary Fund have begun to produce research calling into question these results. Quality in data is a recurring theme in

much of the inequality literature and indeed many of the older papers tended to look at too short a cross-section. Recent work, however, such as that by Solt (2009) has resulted in one of the best accumulations of inequality data, across countries and time periods.

Ostry et al. (2014) use data from his Standardised World Income Inequality Database (SWIID) and are able to conduct a far more rigorous analysis of the inequality-growth relationship, making use of the clear distinction between inequality before and after taxes, as measured by a Gini coefficient. Indeed, they use the difference between the two to arrive at a measure of redistribution i.e. how much do redistributive measures reduce inequality after taxes? Contending net inequality, or inequality after taxes, to be the more reliable indicator for assessing the relationship between income inequality and economic growth, they utilise descriptive statistics to show that the relatively more unequal societies redistribute more, with OECD countries particularly engaging in more redistribution. Additionally, post-tax inequality is negatively correlated with subsequent income per capita growth, with redistribution weakly related to income per capita growth.

This allowed the authors to question the Kuznetian equity-efficiency trade-off, seemingly finding results that suggest measures to improve equity needn't manifest itself in adverse growth performance. But they go a step further, finding growth to be adversely affected by high levels of income inequality. These results, utilising a better dataset, appears to find more robust results and I manage to replicate their results in table 1 of the empirical specification section, at least in the pooled OLS version of my estimation. At this point, however, it is worth stressing that the direction of these relationships tells us nothing about the precise economic dynamics at play nor whether inequality, as captured by the Gini, is a questionable indicator. I go into this, in the next section, in discussing some of the theoretical mechanisms of inequality and how various researchers have come to term it and capture it in variable form.

### **3 Theoretical Bases for the Inequality-Growth Relationship**

One can discuss numerous possible channels through which the relationship between income & wealth inequality and economic growth manifest. The previous section briefly laid out how Kuznets, in a rather seminal contribution, thought about this issue, seeing the evolution of inequality through a dichotomy between urban and rural populations. But one can be more precise in exploring the reasons for why such differences in average per capita incomes may emerge.

#### **3.1 Imperfect Credit Markets**

Galor and Zeira (1993) explore such differences in the context of imperfect credit markets where interest rates are higher for borrowers as compared to lenders. In a model comprising of groups with higher and lower levels of wealth, they contend that it is the latter of the two that is more likely to invest in higher amounts of human capital. This investment offers a higher share of the wealth distribution and allows for greater inheritances which perpetuate higher wealth groups' statuses. In such an economy, with the assumption of imperfect credit markets and indivisible human capital, groups with lower levels of wealth simply face higher barriers in obtaining credit, thus making the accumulation of funds elastic to the rate of interest. This implies a greater concentration of wealth during periods of high interest rates, and scarce investments in human capital. The long-run equilibrium predictions are that of an economy initially poor staying so, and initially rich also staying so. However, the severe concentration of wealth implies poorer economic growth in the long-run, as in the case of initially poor societies.

A more egalitarian share would suggest better growth prospects. In this framework, credit constraints play a pivotal role. Despite coming in various forms, the authors posit their predictions to hold as long as borrowing has a rate of interest attached to it. The parallels with Piketty are immediately apparent, with a disjuncture between the rate of return to the owners of capital (human in Galor and Zeira's case) and to lower income groups leading to a widening income distribution. What can thus be further discussed are the potential remedies, though not the focus of this work, of which one can more broadly conceive of as measures to reduce barriers to human capital accumulation.

### 3.2 Fertility

Closely related to the human capital mechanism, fertility is somewhat of a curious though intuitive channel affecting macroeconomic variables. Becker and Barro (1988) explore its role in a model where utility is maximised by a dynastic family comprising of multiple generations. The fertility rate of a given generation is contingent upon the net-costs of producing offspring, which reveals itself in the model through consumption per person. Within generation variations in the net-costs of producing off-spring emerge through changes in interest rates as well as the degree to which a parent may be described as altruistic. Hence, fertility is increasing in these and decreasing in technological progress and the expansion of state welfare systems.

The link with inequality can be noticed when one considers the case of a developing country with initially high levels of it. Lower-income families may find it harder to invest in human capital due to resource constraints and as a result produce more off-spring as an effective safety-net, in anticipation of a retirement where family income is meagre. Conversely, higher-income families are able to make investments in human capital, and hence intergenerational immobility within a society arises. Kremer and Chen (2002) adumbrate the link, noting these fertility differentials between low-skilled and high-skilled workers empirically, and argue that higher fertility amongst low-income families implies a greater share, at least initially, of low-skilled workers. This raises inequality as average human capital becomes diluted. Ergo, a fertility-inequality spiral emerges, where higher inequality leads to higher fertility rates amongst low-income families, pushing down the wages of low-skilled workers, making it harder to make investments in human capital.

### 3.3 Socio-political Unrest

Another mechanism by which inequality may have an effect on growth is through socio-political unrest. Alesina and Perotti (1996) built upon an already existing literature on the influence of political stability on economic growth by linking such stability to the presence of tolerable levels of income inequality. Political instability can be measured in multiple ways with the “propensity to observe government changes” and social unrest in the form of violence or political disarray being but a few. They adopt the latter approach to measuring political instability and hypothesise that increasing income inequality raises socio-political stability which by extension contributes to economic uncertainty amongst investors. Instability raises the spectre of postponed investments and even capital flight, factors that can stymie the rate of economic growth. Indeed, the authors find empirical support for these conjectures.

One can extend the concept of political instability to analyse the role of the wealthy in having disproportionate influence over the political process. Excessive levels of wealth and income inequality can lend itself to encouraging rent-seeking activities, allowing the richest to entrench and consolidate their influence in the political process. Gilens and Page (2014) look at the context of the US finding support for the idea that the political theory of Economic-Elite Domination best characterises the political system there.

It is special interest groups that are able to lobby and embark upon the spending required to pursue those interests. Income inequality exacerbates these tensions as there is far less of a balancing influence from the rest of civil society to counteract such subversion of political institutions due to the dearth of resources relative to the super-wealthy. Glaesar, Schienkman and Shleifer (2002) discuss precisely this breakdown in institutional incorruptibility, finding a more pronounced negative effect of inequality on growth in countries with weaker institutions.

### 3.4 Fiscal Transfers

Endogenous fiscal policy also reveals itself as a potential mechanism in the influence of increasing levels of income inequality on economic growth. Arthur Okun (1975) presented the notion of an equity-efficiency trade-off, where efforts to redistribute and increase equity may have the unintended consequence of reducing efficiency and the incentive to engage in entrepreneurial activity due to the requirement of higher taxes to fund such redistributive measures. Meltzer and Richard (1981) argue that demand for redistribution increases as inequality reaches higher levels, which in democratic countries is expressed through the ballot box. If governments pursue such policies, and if the equity-efficiency trade-off holds, then economic growth would be adversely affected. Perhaps an interesting area for further research is that of the contributing factors towards the demand for redistribution and whether there are lagged effects from shifts in inequality to it.

### 3.5 Summary

Hitherto I have presented some of the ways in which the relationship between inequality and growth can be viewed and more precisely some of the dynamics that influence the sign and or magnitude of it. Accumulation of human capital is but one where high levels of inequality can make it tremendously difficult and this can be affected by fertility rates as well as credit constraints for lower-income groups that tend to need to borrow in order to improve their income levels. Socio-political instability whether manifesting through the breakdown of the political process, frequent snap elections, violence or even capture of institutions by political elites presents a further avenue through which inequality can adversely affect economic growth by decreasing investor confidence. Further still, I have explored the possibility that one of the

remedies for high levels of inequality i.e. redistribution may backfire in reducing economic growth, that is if Okun's trade-off holds. I present my methodological approach in the next section, detailing how I capture some of the aforementioned concepts in variable form and where the data is obtained from.

## **4 Methodology**

This analysis primarily relies upon data obtained from the World Income Inequality Database (2017) as well as that from the renowned Penn World Tables (Feenstra et al., 2015) and the World Bank (2018). To delve into some of the issues surrounding data reliability, it is worth noting that income inequality data has somewhat of a history behind it. Up until the mid-1990s, most efforts to model the relationship between income inequality and economic growth had been cross-sectional ordinary least squares (OLS) regressions (Benabou, 1996; Alesina and

Perotti, 1996; Persson and Tabellini, 1992), relying on the gold standard for the time in the Luxembourg Income Study (LIS). This posed numerous issues given the limited statistical analysis one could conduct with any interpretation of results evoking caution. Deininger and Squire (1996) were the first to compile a fairly comprehensive panel dataset, amassing data for 135 countries over the years 1947-1994 including Gini coefficients and income shares as measured by quintiles.

Deininger and Squire breathed new life into the literature, spawning a plethora of research papers conducting more detailed analyses (Forbes, 2000; Banerjee and Duflo, 2003; Barro, 2000). Results tended to be ambiguous, with fixed and random effects yielding different results depending on the precise specification that was used. But the data were not without their issues. Deininger and Squire expected this in writing the following:

*“Although we have attempted to be as objective as possible, we have undoubtedly either missed or misinterpreted a piece of available information in some cases. We hope that making available all the original data reviewed will allow interested readers to correct those lapses or to adapt the data to suit their more specific needs” (1996: 572).*

Atkinson and Brandolini (2001) discuss some of the pitfalls (as the title of their paper suggests) of using such data.

A few issues surround the conflation of pre-tax and post-tax incomes as well as that of individual and household estimates and those based on income and expenditure. Here it is worth distinguishing between data quality and data comparability. Though closely related concepts, the former refers to differences in accuracy across the country-year dimensions, the latter refers more to the varying definitions used in household surveys. One example of data quality being sub-optimal is mentioned where Atkinson and Brandolini find that some surprising Gini coefficients emerge particularly for Scandinavian countries when compared to, say, the UK. Going by some of the observations in this dataset, a country like Norway appears no less unequal in comparison, this despite numerous factors indicating otherwise (ibid.: 14). The latter point can be generalised to a broader critique of the Gini, as an indicator of income inequality, which I discuss later on in this section but one can see in table 4.1 where a country like Russia appears as less unequal than the United Kingdom.

Table 4.1 Gini and Palma data for 2014

Indicator	United Kingdom	Russia
Gini Coefficient	32.7	30.4

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Branko Milanovic adapted the Deininger and Squire dataset to include data from the WIDER and World Income Distribution (WID) sources with the aim of making more comprehensive and reliable the Gini coefficient data. At the heart of this was an attempt to address some of the data reliability issues. This data spans from 1950 to 2012 and contains over 200 countries. A particularly good feature for researchers is the ability to choose between different sources for a particular year's measure of income inequality and this allows for some mitigation of biasedness in the estimating procedure.

However, a dataset reliant on data for the Gini still proves to be too restrictive in studying income inequality. Whilst the inclusion of quintile shares of income proves helpful, it makes an analysis of the very top of the income distribution quite difficult. Thankfully, the WIDER WIID dataset includes data on deciles, which as mentioned earlier, allows one to construct the "Palma" ratio. Doubtless, the WIID dataset used still suffers from some unavoidable general issues such as sample selection bias or underreporting but it presents some of the most reliable yet comprehensive datasets to date in the literature.

The predominant issue of relying on the Gini coefficient to provide an accurate portrayal of the dynamics of income inequality proves unrelenting. Whilst long-acknowledged by many researchers as an indicator where the 0-1 value can churn out some remarkable numbers, with the variable overly sensitive to changes in the middle of the distribution, its use is ubiquitous and is still the main indicator that shows up when one searches the websites of international institutions such as the World Bank for inequality. Much of its persistence is probably down to its unwitting acceptance or more charitably nonchalance by the economics profession, as well as the period of time for which records of it have been kept.

Inevitably, one could argue that all indicators purporting to measure inequality suffer from some methodological issues but this neglects certain facts about the dynamics of the income distribution as well as the fact that different indicators – including even the Theil and Atkinson indexes – give different weights to different parts of it. A subtler critique is the demographic distribution of a population with countries that have an ageing population. Elderly people are far more likely to receive transfer payments than the working age population and this can imply higher levels of income inequality than may be the case. Indeed, I hope to contribute to the turning tide towards a more nuanced conversation surrounding the issue of income inequality, with my usage of the Palma ratio.

Jose Gabriel Palma (2014) lays out a plethora of reasons for why it is a reliable measure. To give the reader the idea behind it, one can express it as the following ratio:

$$\text{Palma Ratio} = \frac{D10}{(D1 + D2 + D3 + D4)}$$

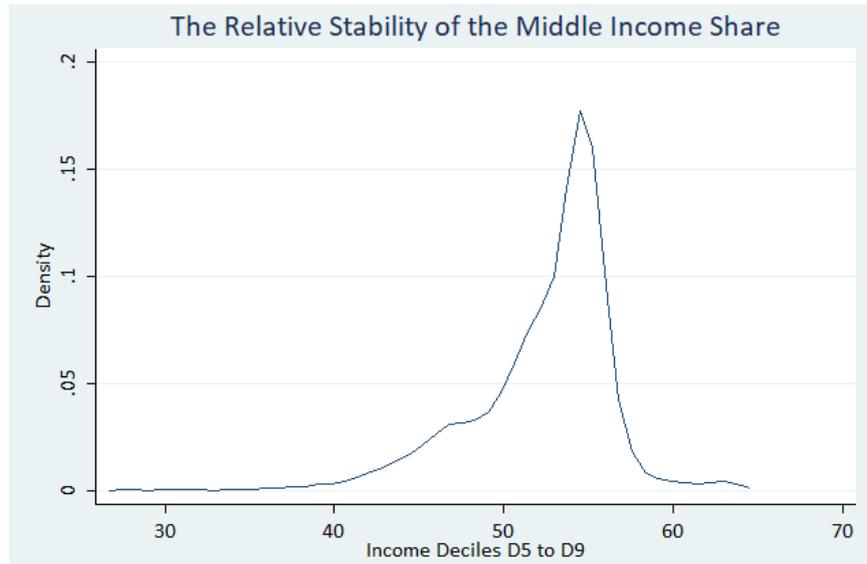
Where D refers to income decile.

Hence, the ratio expresses as a numerical value the income share of the top 10 per cent over the product of the income share of the bottom 40 per cent. As an example, if the value of the Palma ratio were 4, this would be tantamount to saying that the top 10 per cent have a share of income that is four times the combined share of the bottom four deciles.

Palma (ibid.: 10) goes onto layout a key stylised fact of the income share distribution. He argues that the stability of the income shares of deciles 5 to 9 is one that can be noticed over time to hold fairly reliably. It tends to be around 50 per cent of the overall income share. An immediate critique here could be levied in whether it is wise to assume such relative homogeneity. After-all, extrapolating from one data point is premature. Branko Milanovic (2015) makes exactly this critique, arguing that there is nothing stopping this shape of the income distribution remaining so. He asks the corollary question which is whether the measure will be subject to including different deciles if the homogeneous part of the distribution shifts.

This is pertinent as an issue to raise given my criticisms of the Gini coefficient. Whilst this is likely something to pose an issue for future research, I justify its use on the grounds that as of recent data, it does seem persistent in holding. Cobham, Schlogl and Sumner (2015) take a look at the empirics of the matter, finding over the past two decades the relative stability of the middle deciles. The dataset from the WIID finds similar results when a Kernel Density plot is used to corroborate this (figure 4.1).

Figure 4.1



As one can see, one of Palma’s stylised facts is confirmed. Hence, usage of the Palma ratio as a way to overcome an issue surrounding the Gini in that of oversensitivity to changes in the middle of the distribution seems to be reasonable. Another stylised fact one can find support for in the data is that of the diverging tails of the income distribution (Krozer, 2015) and insofar as the question in my title has an answer, it would appear that the tails do indeed matter. Cobham et al (2015) make a further interesting point and one that perhaps provides another answer as to why the Gini has been so popular, that Gini coefficients tend to be constructed using quantiles such as quintiles. Ergo, much of the picture painted by indicators of income inequality is one influenced by which parts of the distribution one is considering, not necessarily what is accurate or methodologically sound.

But a critique that Palma has also faced is that of the possible conflating of median incomes with middle class (Hazeldine, 2014). This brings us to an area where this might pose an issue if one is taking seriously the notion of identity, more specifically class identity. Indeed, if one were to propose income deciles 5 to 9 as some sort of coherent identity holding across time and country, it would be very hard to rationalise it. Palma retorts

*“Basically, it seems that a schoolteacher, a junior or mid-level civil servant, a young professional (other than economics graduates working in financial markets), a skilled worker, middle-manager or a taxi driver who owns his or her own car, all tend to earn the same income across the world – as long as their incomes are normalised by the income per capita of the respective country.”*

Moreover, even if the middle-incomes represent different social identities in different countries, it does not undermine the usage of the Palma ratio. Indeed, Cobham et al (2015) argue for its use on policy grounds, as a way of identifying where redistributive policies in the form of government transfers should be targeted. One could go further in arguing that paying close attention to the top 10 per cent is also a boon as it can pose policy questions such as whether the share of the top 10 per cent is “too high”. Given the much higher standard deviation for decile 10, this would suggest a lot of activity in the right tail of the distribution, worthy of interest.

Table 4.1 Deciles D1-D4, D5-D9 and D10 Average Share of Income (Global Average)

Indicator	Mean	Standard Deviation
D1-D4	17.64	5.1
D5-9	52.36	4.14
D10	30.14	8.35

Such a question inevitably has a normative answer, but it at least provides a starting point for a conversation that entertains ways of mitigating some of the negative side-effects of extreme levels of inequality such as the phenomenon of rent-seeking elites as well as the improvement of social mobility, something almost linearly negatively correlated with the income inequality. Palma (2014: 25) extends this as a broader critique of what he sees as Washington Consensus institutions’ unjustified focus on the middle deciles. Viewed in the context of Thomas Piketty’s recent work, one can make a link, tenuous albeit, between the issue of income inequality being brought into greater prominence in public discourse and the research attention given to it by international institutions such as the IMF (Ostry et al, 2014) and the World Bank (Glenn-Marie et al., 2018).

Hence, this provides some backdrop as to my choice of dataset as well as my choice in inequality indicator. The next section presents my empirical specification in which I use an augmented economic growth regression of a Barro (2000) type and add income inequality as a regressor. The primary findings result from a pooled OLS model and I find a significant negative relationship between income inequality and economic growth, as measured by the Palma. Whilst determining causality would be desirable, my findings can only allow me to go as far to claim that the tails of the income distribution do indeed matter, insofar as I fail to replicate these findings using similar analysis with the Gini.

## 5 Empirical Specification

My estimating equation takes inspiration from a number of sources. Taking the form of a growth regression with as one of the covariates an indicator of income inequality, I utilise a number of commonly used additional regressors (Alesina and Perotti, 1996). With the previous section outlining much of the issues with data reliability as well as quality, I have taken particular caution in adopting an empirical approach that does not suffer from the pitfalls of much of the prior empirical literature on this issue. The World Income Inequality Database (2017) is a worthwhile resource for researchers, looking to conduct more robust analyses, with there not being a data source as expansive as this one.

The equation I seek to estimate takes the form:

$$Growth_{it} = \alpha + \beta_1 Inequality_{it} + \beta_2 FDI_{it} + \beta_3 Exports_{it} + \beta_4 HC_{it} + \beta_5 TFP_{it} + \beta_6 Pop_{it} + \varepsilon_{it}, \quad i = 1, \dots, N, \quad t = 1, \dots, T$$

Where  $Growth_{it}$  refers to average annual growth (data obtained from the Penn World Tables 9.0, hereafter PWT);  $\alpha$  a constant term not varying across countries;  $Inequality_{it}$  either as defined by the Gini coefficient or Palma ratio (obtained from the WIID); FDI and Exports measuring flows as proportions of  $GDP_{it}$ ;  $HC_{it}$  a human capital index (PWT); TFP the total factor productivity measured at constant purchasing power parity rates (PWT);  $Pop_{it}$  the rate of population growth (WIID). Identity  $i$  refers to countries where time  $t$  refers to yearly observations.

Something key motivating this thesis is scepticism over the ability of the Gini coefficient to satisfactorily capture the phenomenon of income inequality. Hence, equation one's coefficient of interest is that yielded by  $\beta_1$ . I estimate different variants of this equation, one including the Gini coefficient and the other the Palma ratio. This allows one to compare and contrast the resulting coefficients to see if indeed there are any differences of note.

Despite the advantages of this dataset, however, it still poses some issues for statistical analysis. The sample I use contains gaps and as a result, the panel data is unbalanced. This doesn't stop one from attempting to draw *some* inferences from the results but it does entail that one should approach said results with caution. Moreover, econometric modelling of any such relationship between economic growth and income inequality faces numerous stumbling blocks, not all that are easy to overcome. I explored the use of multiple estimating procedures but only in any great detail discuss the Driscoll and Kraay pooled OLS model, which is the method this particular analysis relies on for empirical support.

Models such as Generalised Least Squares with random effects assume that differences between countries are random, with such differences uncorrelated with the explanatory variables (or that the error term is uncorrelated with the predictors). This has the benefit of allowing one to add variables that do not vary over time to the regression equation. Conversely, fixed-effects estimations control for observable time-invariant characteristics by allowing each country to have its own intercept term. This allows for inferences as to the relationship between variables, within countries, rather than across, as with random effects.

One could, for instance, posit that due to the relative stability of middle-income deciles' share of income, regardless of country, there is justification in utilising random effects on the basis that individual country characteristics do not affect the relationship between income inequality and economic growth. However, these are quite strong assumptions, with fixed and random effects models being rather liable to suffering from issues such as cross-sectional dependence,

heteroscedasticity and autocorrelation. All variables, though, using Fisher unit root tests, are found to be stationary, implying that one can be less concerned about spurious regression results.

To find out which particular estimator is least biased and robust to the previously mentioned issues, I utilise a Hausman test to choose between fixed and random effects as well as a Breusch and Pagan Lagrangian Multiplier test to choose between the latter and a pooled OLS estimation. A Hausman test indicated that a random effects model is more suitable over fixed effects for this particular type of estimation, which tends to be the case with shorter panels, given the many countries (large  $N$ ) and few time periods (small  $T$ ) in the sample I look across. A Breusch and Pagan multiplier test for random effects, however, could not reject the null hypothesis and hence I could not use it, with the more efficient option to utilise a pooled OLS. This is as the presence of cross-sectional dependence, for instance, can lead to overly optimistic results being yielded. The Driscoll and Kraay standard errors account for this and are actually rather suited to the unbalanced nature of the panel dataset used.

The reason for this is a reliance over large  $T$  asymptotics in the other models. Given the large  $N$  of countries, and the number of cross-sectional dependencies rising at a rate  $N^2$ , utilising models such as Generalised Least Squares and Arrelano and Bond's Generalised Method of Moments can be foolhardy. This is because such models can only correct for cross-sectional dependencies in a parametric manner. The use of random effects is such a parametric correction but even with this the null hypothesis of the Pesaran test of cross-sectional independence was rejected. Luckily, the Driscoll and Kraay standard errors overcome the issue of cross-sectional dependence by adjusting the covariance matrix in such a way as to make it consistent, even as  $N \rightarrow \infty$  (Heochle, 2007).

The focus of this work, then, to underline it, is that of the aggregate relationship between income inequality and economic growth, which cannot allow one to comment on particular cases of countries, but rather whether one can discuss broadly what the hitherto best available datasets seem to suggest is the direction of the relationship. I do also include regression analyses on the basis of OECD and non-OECD countries, in the appendix. This was to see if the relationship varies across this dimension but this still only really allows for inference on particular groups of countries. Here, I do manage to replicate a finding from Barro (2000), in that of the relationship differing across the two different groups, with the relationship significantly negative for non-OECD countries and insignificantly positive for OECD countries.

Table 5.1 reports the results of equation 1, where the Gini coefficient is used as a regressor measuring income inequality. I document the results of the different regression estimations

using Generalised Least Squares with country fixed effects and random effects as well as a pooled OLS model with Driscoll and Kraay standard errors. Unlike the estimation with the Palma ratio as the inequality variable, a Hausman test indicated fixed effects to be the most efficient estimator, with a joint significance test suggesting it performs better than a pooled OLS. Covariates such as total factor productivity and FDI flows show the expected signs and is significant though others such as human capital appear to show the “wrong” sign in the RE and pooled OLS models.

The estimated  $\beta_1$  coefficient in these regressions is positive in both FE and RE models, though only significant in the former. The pooled OLS yields a negative sign for the Gini but is insignificant and small in magnitude. This is broadly in line with research utilising similar methods and dependent variables in annual economic growth. There is a likelihood that estimations may differ if, say, five-year growth averages are used (Forbes, 2000; Ostry et al, 2014), though my own dataset fails to find this. To the extent that one would expect increasing levels of inequality to be associated with lower economic growth, these results suggest that this expectation is wrong. Yet this may reveal issues with the Gini coefficient as a measure of inequality.

Table 5.1 The effect of inequality on growth using the Gini

Independent Variables	Fixed Effects (1)	Random Effects (2)	Pooled OLS (3)
Gini	0.116** (0.049)	0.015 (0.025)	-0.004 (0.020)
FDI	0.017** (0.005)	0.018*** (0.004)	0.017** (0.007)
Exports	-0.0003 (0.040)	0.011 (0.014)	0.004 (0.009)
HC	5.318** (2.273)	-0.438 (0.463)	-0.668 (0.554)
TFP	6.243*** (2.284)	4.203*** (1.043)	4.288*** (1.446)
Pop	-0.381 (0.339)	-0.485** (0.199)	-0.389*** (0.102)

Constant	-17.199 (6.064)	1.446 (2.148)	2.818 (2.241)
R <sup>2</sup>	0.04	0.04	0.04
Countries	98	98	98
Observations	1229	1229	1229
Period	1960-2015	1960-2015	1960-2015

Notes: Dependent variable is annual real GDP. Standard errors are in parentheses, where \*, \*\* and \*\*\* indicate statistical significance at the 10, 5 and 1 per cent levels, respectively.

R<sup>2</sup> is within for fixed effects, overall for random.

Country fixed effects and random effects utilised performing a GLS model

Pooled OLS uses Driscoll and Kraay robust standard errors.

Source: Penn World Tables 9.0 (PWT), World Income Inequality Database (WIID) 3.4, and World Bank Databank

I find some support for this in my regression results with the Palma as an indicator of inequality, and sign-reversal of the Gini is something documented in the empirical literature as somewhat frequent in panel estimations (such as mine) as well as in differenced specifications. Nonetheless, the results in table 5.2 are similar insofar as covariates such as TFP are significant in all of the models. More interestingly, however, is that the  $\beta_1$  coefficients all show negative signs, as well as a considerable magnitude (bar FE). It is significant in both RE and the pooled OLS models, though insignificant in the FE model. However, given that the FE was revealed to be the least efficient estimator, one can overlook its results. This provides strong evidence that the tails of the income distribution do indeed matter.

Table 5.2 The effect of inequality on growth using the Palma

Independent Variables	Fixed Effects (4)	Random Effects (5)	Pooled OLS (6)
Palma	-0.032 (0.249)	-0.265** (0.135)	-0.416*** (0.159)
FDI	0.017*** (0.004)	0.016*** (0.003)	0.011 (0.007)
Exports	0.008 (0.037)	0.015 (0.010)	0.003 (0.008)
HC	2.618 (2.812)	-0.684 (0.840)	-1.162* (0.645)

TFP	9.143** (4.607)	5.371*** (1.989)	5.283*** (1.128)
Pop	-0.026 (0.374)	-0.524** (0.267)	-0.420*** (0.112)
Constant	-8.764 (7.514)	2.551 (2.624)	4.631 (2.340)
R <sup>2</sup>	0.03	0.05	0.06
Countries	94	94	94
Observations	865	865	865
Period	1960-2015	1960-2015	1960-2015

Notes: Dependent variable is annual real GDP. Standard errors are in parentheses, where \*, \*\* and \*\*\* indicate statistical significance at the 10, 5 and 1 per cent levels, respectively.

R<sup>2</sup> is within for fixed effects, overall for random.

Country fixed effects and random effects utilised performing a GLS model

Pooled OLS uses Driscoll and Kraay robust standard errors.

Source: Penn World Tables 9.0 (PWT), World Income Inequality Database (WIID) 3.4, and World Bank Databank

As an aside, it is interesting to note that the human capital index variable appears as negative in all but one of the models in table 1 and 2 (regression 4). This result is counter-intuitive given that the index is constructed by PWT is based on secondary schooling data, which one would a priori assume to be associated positively with economic growth. De la Fuente (2011) points out that there are some issues with human capital as a measure of skills attainment which can result in estimations where the variable has the “wrong” or an unexpected sign.

A larger issue appears to be that of the sensitivity of results to the chosen specification. Barro (2000) notes that typical results emanating from attempts to measure the relationship between income inequality and economic growth are sensitive to something as simple the inclusion of the fertility variable from the right-hand side of the equation to be estimated. This appeared not to make too much difference in the particular dataset I use, as one can see in section A1 of the appendix. The results with the Gini remain generally the same with the same true for the Palma though the random effects regression results no longer find significance for income inequality. The sign of the coefficient, though, remains negative throughout the estimates.

As mentioned previously, one thing that Barro notes that I do seem to find evidence for is the different nature of the relationship when splitting the sample on the basis of being OECD members or not. This approach tends to find positive coefficients in the OECD sample, though negative for the non-OECD sample. I find this to be the case when either the Gini or Palma is

used. Interestingly, the relationship is significant for OECD and insignificant for non-OECD countries despite the fact that the converse is true for the Palma results (see section A2 of the appendix). In other words, the relationship appears to be significant in non-OECD countries when using a measure better capturing of the nuances of the income distribution. This poses the question whether the particular measure of income inequality is more suited to countries at different developmental stages.

## 6 Discussion

What can one take away from the results of this research? Consternation about the widespread use of the Gini coefficient is one thing I hope is evoked in the reader. In the literature review, I presented some of the theoretical mechanisms discussed in the relationship between inequality and economic growth. These include things such as lower social mobility in the form of imperfect credit markets, with incentives that benefit richer as compared to poorer groups, through differential human capital accumulation rates. This is interrelated with fertility rates, whereby incentives may perpetuate poor families having considerably higher birth rates than richer families, as a way of maximising lifetime income. These are the predominant factors I consider in my empirical specification, with socio-political unrest and fiscal transfers something I overlook due to data limitations.

Concerns about excessive levels of income inequality can be found in all of these mechanisms, and something my results are able to confidently rebuke is the notion of an Okunian trade-off between equity and efficiency. This would suggest a positive association between a measure of inequality and economic growth if indeed one assumes efficiency to be best measured by economic growth. However, this is not what I find when using the Palma ratio, an indicator of inequality I argue does a better job of capturing the phenomenon of income inequality. Ostry et al. (2014) make this point, able to justify it using the Gini as a measure of inequality. Whilst divergent results can likely be explained by data source, one can argue that the trade-off is a

misleading guide as to the dynamics of income inequality and growth, and hence for policy prescriptions.

In other words, the default assumptions of much of the prior research emanating from the former Bretton-Woods institutions appear to be flawed. In earlier sections, I show income inequality to have only really risen, since the 1980s, in OECD countries. However, that it isn't rising, as measured by the Palma, in non-OECD countries, isn't a reason for ignoring some of the harmful effects of it. As Paul Krugman (2015) argues, even if income inequality were positively associated with economic growth, this would not be a reason to overlook some of the issues associated with rising inequality. That economic growth could possibly be a motive in pushing for redistributive measures to mitigate inequality should be beside the point.

Some of the core issues motivating this piece of research are the dangers of excessive levels of income inequality. In terms of the human capital accumulation transmission mechanism, there are clear issues arising from unequal access to this accumulation. As the Great Gatsby curve demonstrates, this poses problems for social mobility, a barometer of the ability of one to move up income deciles. That this ability is lacking in many countries prompts concerns about fairness and inevitably leads to greater segregation across the lines of class, which is starkly reminiscent of Esteban and Ray's (1994) concept of polarisation. Whilst they predict socio-political instability in its extremes, I would emphasise the segregating effects of inequality where it leads to lower social cohesion (Dabla-Norris et al., 2015).

This can have unintended consequences. Some level of inequality may, in fact, be necessary, as a way of incentivising "moving-ahead" (ibid.), particularly in the context of developing countries where it is only a few individuals that are able to accumulate sufficient levels of human capital that foster innovation and economic growth. But to underline this, the point at which "unnecessary" inequality, however defined, emerges, is one where sub-optimal incentives are promoted. These can manifest themselves in the form of greater rent-seeking activity as well nepotism and inherited wealth playing a greater role in determining lifetime incomes.

Gilens and Page (2014) paint a somewhat dystopian picture of the political system in the United States. This is a good example of a developed country that has seen increasing levels of inequality over the past two decades, whether measured by Gini or Palma (WIID, 2017). They contend that the system conforms more so to the political theory of Economic-Elite Domination. This can have huge ramifications for democratic legitimacy. If political affairs are led by the interests of economic elites, the principle of one person one vote faces intense pressure if the interests of the lower income deciles are not given enough voice. This could erode trust in institutions and possibly fuel socio-political instability.

Recent research also links rising inequality with populism of the nativist kind (O'Connor, 2017). It is possible in some instances for working-class voters to become disenfranchised with the political system and tend to vote more for political parties with policies such as tighter immigration control and tax cuts. These are policies which are seen to be in their interests but this may not be the case when they are actually implemented in practice. This is best seen in the case of the United Kingdom, post-Brexit, where much of the supposed gain from trade disintegration will manifest itself in less efficient redistributive policies due to a lower tax base (Heald, 2018). With recent research linking government austerity and propensity to vote for Brexit, this is another clear example of how Esteban and Ray's (1994) concept of polarisation can manifest.

To return, then, to the Palma ratio, one needs to appreciate the different parts of the income distribution, something typically overlooked by economists and taken as a given, as evidenced by the widespread use of the Gini coefficient as an indicator of inequality. As mentioned in the introduction, there is an issue with essentially taking the integral of the whole income distribution, with the middle deciles of the income distribution disproportionately sensitive to changes in income share. The resulting 0-1 coefficient hence can be highly inaccurate. I argue for the usage of an indicator that provides proportionate sensitivity to the relevant parts of the income distribution.

This thesis uses the Palma ratio for this exact reason but there is merit to Milanovic's (2015) hesitancy to accept it on the basis that the relative stability of the middle-income deciles may not be something that is time-invariant. Ergo, should one prefer a ratio of the top 10 per cent to the bottom 30 or 50, rather than 40? Indeed, the Palma has its own iterations such as "Palma v2" or "Palma v3" where these are respectively the top 5 and top 1 per cent's share of income as a proportion of the bottom 40 per cent's share (Krozer, 2015). I satisfy doubts as to the accuracy of the Palma by noting the up till now relative stability of the middle-income deciles. Given little deviation from shares of 50-52 per cent, one can have confidence in the Palma ratio as an indicator of inequality.

The area of income inequality, hence, deserves greater attention, with the trend of inequality data collection being one increasing over time. This should be capitalised upon in order to further economists' understanding of both income and wealth inequality, as well as to aid the policy-making process and veer it towards a direction that allows for those countries most in need of inequality-reducing measures to receive them in a more targeted manner (Cobham et al., 2015). The impetus for this direction is my finding that income inequality is significantly negatively associated with economic growth, when a more accurate indicator of income inequality is used, in the Palma ratio, and this I contend goes some way to answering my

research question of whether the tails of the income distribution matter. Whether they continue to matter or matter less is something that further research will indubitably explore when data restrictions are less and data collection is more rigorous.

## 7 Conclusion

Income inequality is associated with a range of undesirable outcomes, then, and whilst my empirical results suggest a strongly negative relationship with economic growth, it is worth being cautious in interpreting these results as causal. They only indicate an association. But to channel Krugman (2015), this shouldn't make much difference to perceiving excessive levels of income inequality as undesirable. Even if my results were interpreted causally, falling income inequality wouldn't dampen economic growth, to say the least, and measures to make it fall further may have the potential of operating on growth through different channels such as higher capital accumulation and higher socioeconomic stability.

This will be subject to intense debate, in the future, no doubt, but what should be further considered are the particular nuances of the income distribution. This will likely aid the policy-making process a great deal more than reliance on the Gini coefficient, the integral of the entire income distribution. If excessive levels of income inequality are an issue, which I hope to have demonstrated, then it makes sense to appreciate more those aspects of the distribution in which there is greater activity, i.e. the tails of the distribution. In so doing, I found a different relationship with economic growth, when using the Palma ratio as compared to using the Gini coefficient as an indicator of inequality.

Researchers could be at risk of using indicators that present a much less worrying picture of income inequality. Given a divergence between the measures in terms of the sign of them in a growth model, this should provide pause when studying the topic of inequality. Jose Gabriel Palma's (2011) contention of the relative stability of the middle-income deciles is one that appears a stable stylised "fact" and hence indicators of inequality emphasising the top and bottom deciles are likely to allow for the economic literature to present a more accurate account of the dynamics of income inequality as well as when and where their excesses emerge. We should care about these matters if we are attuned to those most affected by the negative consequences of income inequality.

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## Appendix

### A1

Table A1.1

Independent Variables	Fixed Effects	Random Effects	Pooled OLS
Gini	0.102** (0.047)	0.015 (0.025)	-0.003 (0.021)
FDI	0.017*** (0.005)	0.017*** (0.004)	0.0157** (0.007)
Exports	-0.0002 (0.04)	0.014 (0.014)	0.008 (0.011)
TFP	6.741*** (2.238)	4.567*** (0.993)	4.572*** (1.486)
HC	3.437 (3.186)	-0.459 (0.426)	-0.671 (0.546)
Pop	-0.317 (0.366)	-0.399** (0.208)	-0.312*** (0.113)
Fert	-0.754 (0.893)	-0.196 (0.139)	-0.152 (0.107)
Constant	-9.962 (9.932)	1.553 (1.889)	2.756 (2.243)
R <sup>2</sup>	0.04	0.04	0.04
Countries	95	95	95
Observations	1180	1180	1180
Period	1960-2015	1960-2015	1960-2015

Notes: Dependent variable is annual real GDP. Standard errors are in parentheses, where \*, \*\* and \*\*\* indicate statistical significance at the 10, 5 and 1 per cent levels, respectively.

R<sup>2</sup> is within for fixed effects, overall for random.

Country fixed effects and random effects utilised performing a GLS model

Pooled OLS uses Driscoll and Kraay robust standard errors.

Source: Penn World Tables 9.0 (PWT), World Income Inequality Database (WIID) 3.4, and World Bank Databank

Table A1.2

Independent Variables	Fixed Effects	Random Effects	Pooled OLS
Palma	-0.169 (0.233)	-0.228 (0.139)	-0.315** (0.139)
FDI	0.016*** (0.003)	0.016*** (0.003)	0.010 (0.008)
Exports	0.012 (0.035)	0.018* (0.01)	0.009 (0.009)
TFP	9.972** (4.671)	5.570*** (2.004)	5.395*** (1.168)
HC	-2.166 (3.813)	-0.729 (0.814)	-1.057 (0.641)
Pop	0.225 (0.388)	-0.409 (0.263)	-0.397*** (0.144)
Fert	-2.268** (1.145)	-0.364* (0.191)	-0.148 (0.148)
Constant	10.003 (12.604)	3.232 (2.478)	4.209 (2.386)
R <sup>2</sup>	0.04	0.06	0.07
Countries	91	91	91
Observations	829	829	829
Period	1960-2015	1960-2015	1960-2015

Notes: Dependent variable is annual real GDP. Standard errors are in parentheses, where \*, \*\* and \*\*\* indicate statistical significance at the 10, 5 and 1 per cent levels, respectively.

R<sup>2</sup> is within for fixed effects, overall for random.

Country fixed effects and random effects utilised performing a GLS model

Pooled OLS uses Driscoll and Kraay robust standard errors.

Source: Penn World Tables 9.0 (PWT), World Income Inequality Database (WIID) 3.4, and World Bank Databank

Table A2.1

Independent Variables	Gini (OECD)	Gini (Non-OECD)	Palma (OECD)	Palma (Non-OECD)
Income	0.071*	-0.025	0.585	-0.461**
Inequality	(0.041)	(0.026)	(0.509)	(0.215)
FDI	0.019**	0.075	0.014**	0.004
	(0.008)	(0.096)	(0.007)	(0.113)
Exports	-0.003	0.008	0.015	0.007
	(0.022)	(0.011)	(0.011)	(0.014)
HC	-0.274	-1.135	0.155	-1.823**
	(0.716)	(0.757)	(0.574)	(0.842)
TFP	5.057*	4.554**	0.790	6.214***
	(2.732)	(1.488)	(2.205)	(1.183)
Pop	-0.523**	-0.288	-0.030	-0.423**
	(0.230)	(0.196)	(0.330)	(0.187)
Constant	-0.413	4.107	2.005	5.462
	(2.294)	(3.267)	(2.346)	(3.076)
R <sup>2</sup>	0.04	0.05	0.02	0.08
Countries	19	79	19	75
Observations	451	778	307	558
Period	1960-2015	1960-2015	1960-2015	1960-2015

Notes: Dependent variable is annual real GDP. Standard errors are in parentheses, where \*, \*\* and \*\*\* indicate statistical significance at the 10, 5 and 1 per cent levels, respectively.

Performed using Pooled OLS model with Driscoll and Kraay robust standard errors.

Source: Penn World Tables 9.0 (PWT), World Income Inequality Database (WIID) 3.4, and World Bank Databank