The Effects of Household Investing on Wealth Inequality

An Investigation of the Mechanisms of the Financial Asset Market

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Researching household investment by applying the unique DNB Survey data results in the empirical observation that wealthier people tend to possess more financial assets. Furthermore, wealthier people do not only earn more in case they would achieve similar returns, people with more financial assets tend to achieve higher aggregate portfolio returns as well. Subsequently, the influence of the diversification level with regards to this higher aggregate return has been tested. Although the diversification channel does not seem to significantly increase the aggregate returns, it does increase the Treynor ratio of a portfolio and hence decreases its risk.

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I – INTRODUCTION

In recent years, household investments in financial assets have risen in popularity (CentERdata, 1994-2015). These increases are as large as 10% in some months (Guiso & Sodini, 2013) (Basekin, 2015). A possible reason for this sharp increase could be the recent overall shift towards individualism in the Dutch society, in terms of healthcare, education and retirement financing. These recent developments prompt an increase in the incentive to understand the financial behavior of households. Even more important is getting to understand the differences in investing behavior across different groups of people.

Finance theory assumes the individual investor to be rational. Often times, this assumption fails to hold in practice. With the introduction of behavioral finance, established economic 'laws', like the rationality assumption, are questioned and stretched. Certain aspects can be regarded as systemic irrationality, including loss aversion, hyperbolic discounting and framing (Wilkinson & Klaes, 2012). However, a portion of 'unexplainable' irrationality remains. This is exactly the irrationality that, according to finance theory, implies the inability of both individuals and professionals to outperform the market consistently, in the absence of inside information (Rosen & Gayer, 2010) (Berk & DeMarzo, 2011).

Although theory states that the individual investors are not consistently able to outperform the market, there is much more to household investments than just that statement (Berk & DeMarzo, 2011). Within the households that do invest in financial assets, many differences with respect to diversification, returns, and risks taken and so on and so forth are present. Interactions with other household-specific information, like assets or liabilities, personal debts, mortgages or possible tuition fees for the children can be of particular interest. What exactly makes the difference between a successful and an unsuccessful household investor? Part of Karl Marx' legacy elaborates on at least one of these factors.

As early as 1847, Marx documented differences in rewards due to differences in already established wealth. In short, the income rewarded for labor is usually lower than the return rewarded for providing capital. If this still holds today, this implies that people with already established wealth generate higher returns than people with lower initial levels of wealth. Hence, this would increase wealth inequality. This statement is strengthened by the findings of, among others, Barber & Odean (2001), Love (2010), Wachter & Yogo (2010) and Bogan (2013), who document that more wealthy people engage more in the investing environment.

This wealth wedge is already present and has been present for a long time, documented as early as 1996 by Stanley and Danko. That it is still present today is documented by for example Sommer (2015) and Ritholtz (2015). Although this wedge in The Netherlands is not as big as in some other countries, it is still very present and a hot news topic. The social interest in this topic is of such magnitude that the Central Office of Statistics (CBS in Dutch) allegedly presented data very creatively in order to let Holland look better in this regard (Frederik, 2013). The social discussion and interest concerning the wealth inequality became more evident than ever when the Dutch parliament invited Thomas Piketty, a renowned author in the field of wealth inequality, to discuss this matter in-depth (Schinkel, 2014). In his book, Piketty exactly describes the relations between return and wealth, and income and labor. Much like income is the reward for labor, return is the reward for providing capital. According to Piketty (2014), the return on capital is larger than the income obtained for labor. This would result in higher returns for wealthy people, making them even wealthier and increasing the wealth inequality. These findings closely relate to those of Marx (1847) and led to conducting this research.

To this date, being poor is expensive (Sanders, 2015). 'Poor people's fees' are present in many aspects of our lives. For instance, insurance costs are higher for poor people as they have a higher projected rate of default, they are not able to buy in large quantities which may have led to discounts, they might not be able to afford proper education leading to better chances on the job market, they pay higher rates on possible credit. This list goes on and on, and increases the wedge in wealth inequality. Maybe, I can extent this list by finding evidence that investments in financial assets are another determinant in a nation's wealth inequality.

The views and beliefs of Piketty sparked interest in the topic of wealth inequality and subsequently conducting this research. Very simply put, he documents some sort of positive feedback cycle of the already wealthy people becoming wealthy, due to achieving higher returns by providing more capital. In this research, I investigate if these findings also hold for Dutch household investing in financial assets, by evaluating key variables across groups with different levels of initial total wealth. I research if the people with a higher established total wealth outperform the people with less total wealth on the financial asset market, and if this is a factor in the Dutch wealth inequality. If this turns out to be the case, the effects of the recent shift towards individualism in The Netherlands can have disastrous consequences for the underprivileged part of society. Therefore, the main research question is:

How does the Dutch shift towards individualism affect the wealth inequality, through the mechanisms of the financial asset market?

The focus in this research in on establishing whether the theories of Piketty are applicable to The Netherlands and hence if I can observe this positive feedback loop of the wealthy becoming even more wealthier. If this is the case, the recent shift towards individualism which pressures more and more households in participating on the financial asset market, amplifies the consequences of the differences in outcomes from financial asset investment. Therefore, it would be an underlying determinant of the increasing wealth inequality in The Netherlands.

This study finds a positive relation between total wealth and financial wealth, implying that by definition the wealthier people achieve a higher absolute profit from the stock market, given equal returns. Hence, Piketty's theory is observable in The Netherlands as well. To add to this effect, wealthier people seem to achieve higher returns than the less wealthy people, only aggravating this effect and increasing the wealth inequality even further. Lastly, I research if the diversification channel might explain the differences in returns. Wealthier people do diversify better, however, this does not lead to higher returns. It does lead to a higher Treynor ratio, which implies lower risk for the same amount of return, but this does not contribute towards the nation's wealth inequality.

This research is structured as follows: Section II contains the literature review in which existing literature is summarized and analyzed in-depth in order to form the hypothesis for this research. Section III covers the data and its derivation used in this research, along with summary statistics. Subsequently, Section IV outlines the applied methodology, of which the results are shown, explained and discussed in Section V. Section V also contains a summary, conclusion and recommendations for further research.

II – LITERATURE REVIEW

A. Introduction to and Definition of Wealth Inequality

The presence and hence the economic interest in economic inequality dates back many decades, even centuries. Marx (1847) was one of the first economists to document the existence, origin and lingering effects wealth inequality might have. Since Marx, lots of economists and researches have tried their hands on the subject, even though some never got beyond the point of speculating. For instance, Kuznets (1955) admits that his paper consist of around 95% speculation. However, this does indicate the relevance of and the interest in inequality. Lots of different and sometimes even farfetched researches regarding inequality have been conducted, e.g. the research of Kawachi et al. (1997), which tries to establish a relation between inequality and the mortality rate of countries, as increasing economic inequality supposedly relates to a reduction in social cohesion (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997).

As described earlier, this research is inspired by the views and beliefs of Piketty (2014). In his book, Piketty conducts a groundbreaking research in this field by possessing a unique dataset from over twenty countries. The French economist touches upon theories from Karl Marx. Marx (1847) predicted income and wealth inequalities to grow concernedly large, due to reasons of social stratification. Marxist theory assumes two economically relevant structures: the substructure and the superstructure (Marx, 1847). Very simply put, the substructure consist of the ruling class, or bourgeoisie, owning the production, factory, machinery etc. and the working class putting all the effort and work into using the ruling class' facilities to produce, in return for wage or income (Marx, 1847). The superstructure consist of all ideas, philosophies and cultural aspects of society (Marx, 1847). Following the ideas of the German philosopher, Piketty endorses the possible difficulties that could arise given the division of labor as explained by Marx. Much like wage or income is the result for labor, return is the result for providing capital. In old times, this meant that the bourgeoisie who provided the capital to the proletariat could expect a higher compensation for their effort than the working class would receive for theirs. Simply because the ruling class provided the capital and the working class provided the (manual) labor, the former got a higher compensation out of this. Piketty extended this view to current economical environments, in which the division in ruling and working class has faded to some extent. However, still there are people providing labor and people providing capital. An increasingly prominent situation in which this problem is present, is household investing in financial assets. Extending the view and beliefs of Marx, Piketty is compelled to stating that the return people can achieve by providing capital (i.e. investing) is higher than the compensation people can achieve by providing labor (i.e. working). Simply changing from providing labor to capital might not be possible

due to obvious reasons, like capital constraints, ignorance or nescience. Within the group of people who do engage in household investing, many differences remain. A potential problem discussed by Piketty (2014) is that the already wealthier people are likely to have more financial assets and hence increase their wealth faster than the less wealthy people with less financial assets, given that they obtain the same returns. On top of that, the wealthier people probably have the funds to hire financial experts or consultants to make even better investment decisions. As the wealth inequality would already expand by the first identified problem, this one would increase the speed of that expansion even more. This research focusses on these two problems and investigates whether and to what extent this problem is observable in The Netherlands.

There are many ways to calculate or define wealth. The definition of total wealth in this research is similar to that of van Rooij, Lusardi and Alessie (2012); Wealth is the sum of checking and savings accounts, employer-sponsored saving plans, cash value of life insurance, home equity, additional real estate, and financial assets minus total debt (van Rooij, Lusardi, & Alessie, 2012).

Before deepening on the previous literature on wealth inequality, what exactly is wealth inequality and how is it defined? The most common way to calculate a measure for wealth inequality is the GINI coefficient. This GINI coefficient is calculated on the basis of the Lorenz-curve, which shows the cumulative percentage of the population on the x-axis and their cumulative wealth on the y-axis. Hypothetically, a population or nation with perfect wealth equality would be represented by a 45° line through the origin. However, as inequality grows, this line tends to show a more convex figure, indicating that the first people on the x-axis are below average wealth and the top percentage people are above average wealth. Wealth inequality in the represented population rises with surface area enclosed by this Lorenz-curve and the 45° line. This surface area is called the GINI coefficient, where 0 describes a perfect wealth equality and 1 describes perfect wealth inequality (Gini, 1912). Mathematically, the surface area of the enclosed domain is calculated with Brown's formula (The World Bank, 2015):

$$G = \left| 1 - \sum_{k=0}^{n-1} (X_{k+1} - X_k)(Y_{k+1} + Y_k) \right| \qquad (1)$$

Where;

G	=	*The GINI-coefficient*
X	=	*The cumulative proportion of the population*
Y	=	*The cumulative proportion of income*

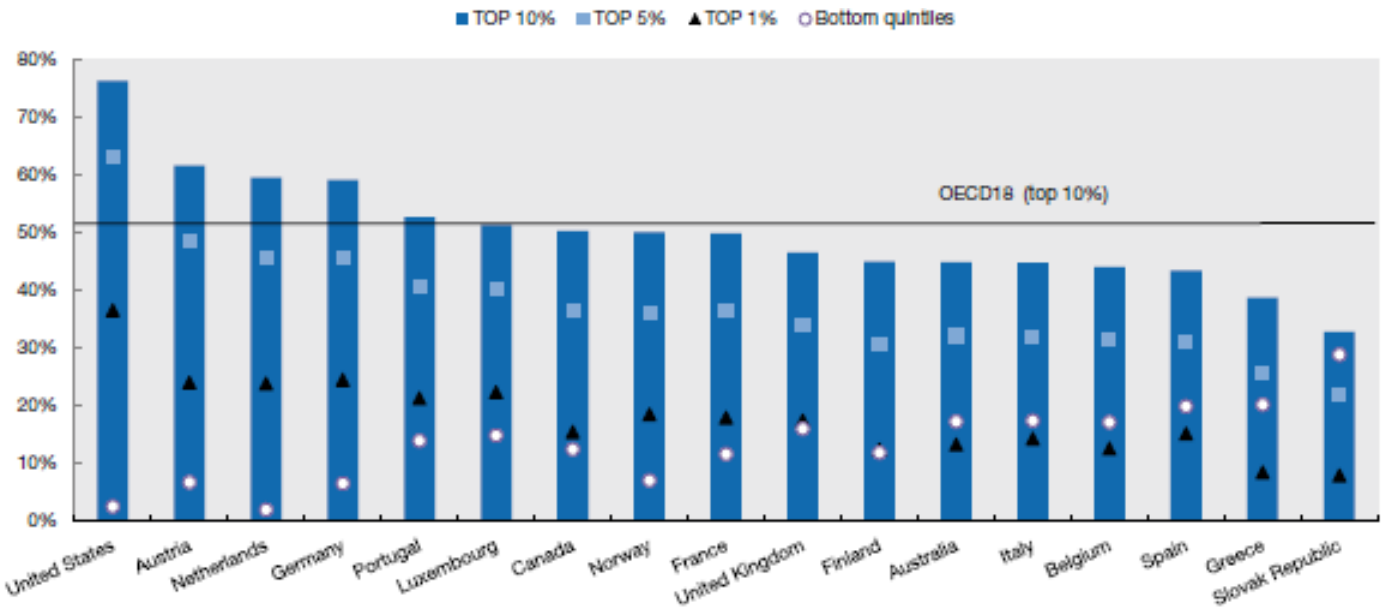

Figure 2.1: This figure from the OECD library represents the wealth inequality in different countries across Europe, and the United States. The blue bar represents how much of the total wealth in a country is owned by the top 10%. The blue square narrows this down to what is owned by the top 5% and the black triangle represents the total wealth of the top 1%. The bottom quintiles are represented by the white dot. This figure underlines the magnitude of the wealth inequality across Europe and shows that The Netherlands is among the most unequal countries.

The economic and social interest of wealth inequality is further underlined by Keister (2000). Her book identifies exactly the main problem in conducting research to wealth inequality; the lack of datasets. In this book, the author uses survey data, just like I do, and tries to recognize patterns and uses simulation modeling to explore questions regarding wealth inequality (Keister, 2000). Although the author only simulates possible outcomes and does not pay too much attention to specific household investing and its influences on the wealth inequality, it does touch upon the implications wealth inequality might have. Followed by this book, an article by Keister and Moller (2000) describes exactly the same problem; consequences of wealth inequality can only be addressed properly after acquiring adequate data (Keister & Moller, Wealth Inequality in the United States, 2000). They do, however, recognize the problem of wealth inequality but lack statements about its exact implication in this paper.

Castañeda et al. (2003) describe, in accordance with Nobel Prize winner Fleming (1955), that the only difference between the poor and the rich is that they have been subjected to a different set of circumstances, or an unbroken run of luck (Fleming, 1955) (Castañeda, Giménez, & Ríos-Rull, 2003). Although I personally consider luck to be a factor to be taken into account, the nature of this research is to establish a possible positive feedback cycle for the already rich people. This means that instead being considered rich or wealthy is a result of merely an unbroken chain of luck, being rich or wealthy might be a self-fulfilling prophecy; i.e. wealthy people becoming ever wealthier. However, it is interesting to see other thought-processes and mindsets prior to conducting the research.

B. Micro-Economic Determinants of Wealth Inequality

In order to test for true effects deriving from differences in wealth, relevant control variables have to be taken into account. Previous research has found many variables which affect investment behavior, which may in the end be determinants for wealth inequality.

One of the most widely researched influence is gender. Gender differences in investment behavior has been the starting point for many researches. As early as 1994, Lundeberg, Fox and Punccohar found men to be more confident than women, even though they make decisions on the basis of the same information. Overconfidence is more pronounced in tasks that lack direct feedback or are highly unpredictable (Ben-David, Graham, & Harvey, 2013). These characteristics are both applicable to the financial assets market and thus to investment behavior. The fact that this difference between men and women is also present in the financial asset market is further supported by Barber and Odean (2001). In their research they test many personal traits, like gender, marital status, the amount of children and age, on their influence on many different investment portfolio related variables, like the beta, return and volatility. They find a strong positive coefficient on portfolio volatility if they use a gender dummy for men, but no significant coefficient on return. This indicates that although a man might be more confident, he is not better at achieving returns. Furthermore, as discussed later, Barber and Odean (2001) find negative relations for having children and being married as well.

Age can also be influential to one's investment decisions. As supported by Ben-David, Graham and Harvey (2013), age can reduce an agent's miscalibration. Miscalibration is the systematic underestimation of the range of potential outcomes, i.e. underestimating volatility and hence risk (Ben-David, Graham, & Harvey, 2013). In their paper, they find that age has a positive effect on this miscalibration, meaning that is lessens as someone matures. This would imply that older, more experienced people, are able to make better investment decision due to their ability to better estimate potential risks.

Marital status, or whether an agent has a partner, might influence investment behavior, and therefore the investment portfolio as well. Many previous research has been devoted to the influence marriage or partnership might have on the investment decisions. Most likely, the volatility of a (married) couple converges to an average, as a man tends to prefer more risk than a woman. If partnered together, some sort of mean arises. This effect is also supported by the research conducted by Love (2010) and Wachter and Yogo (2010). Both these researches show a decrease in risk taken by (married) couples as opposed to that of a single man, and an increase if compared to a single woman.

However, the total risk taken by a (married) couple seems to be higher than the average of that of the man and the woman, possibly due to having a higher income combined (Love, 2010). In case an investment portfolio allows for more risk, it is also capable of delivering better returns (Markowitz, 1952). Variables that can account for differences in return have to be taken into account in this research. Therefore, marital status or partnership is an important control variable in testing effects on investment portfolios.

As Love (2010) finds, married people seem to have a higher risk tolerance due to having more wealth or income at their disposal. As wealth is the focal point of this research, income is used as a control variable. The notion that income does indeed influence investment behavior is supported by many previous researchers, including Barber and Odean (2001), Campbell (2006), Goetzmann and Kumar (2008) and Wachter and Yogo (2010). Having a higher income allows for taking more risk, which can in turn result in achieving higher returns (Markowitz, 1952). Therefore, it is also important to control for income if testing for the raw effects of already established wealth. The most common explanation as to why people with a higher income take more risk is simply that they can deal with the possibility of losing money and still have enough left to meet their financial obligations. This same explanation might hold for more wealthy people. By using income as a control variables, is becomes possible to test this raw effect of having more wealth.

Another important control variable is having kids or not. One can imagine that having to take care of children might lower the incentives to take excessive risk and might make for more conservative investment choices. Raising children requires time and devotion, but comes with financial costs as well. Parents might want to save money for their kids, have an extra mouth to feed and might invest in good education. Keister (2003) researches these effects on the basis of family-size. She finds that having more kids, thus having a larger family, results in taking less risk as the parents need to take into account the costs of childcare and schooling. Love (2010) further supports the significance of this negative relation. Also in the previously mentioned research of Barber and Odean (2001), a negative relation has been found between having children and risk taken and volatility of the investment portfolio.

Lastly, owning a house which is either paid off or not can make a huge difference in the funds available for investing in financial assets. One could imagine that having the burden to spend a significant amount of income on housing or mortgage can make agents more reluctant to invest in the stock market. On the contrary, having a house with a high value reflects being wealthier, which may account for a rise in stock market participation or achieved returns. These effects make for the inclusion of the worth of the agents house and whether they have a mortgage in the regression analyses.

On a different note, susceptibility to common investment fallacies might be more prominent among the less wealthy investors. Barberis and Thaler (2003) find evidence of five major fallacies that make individual investors inferior to institutional investors. The less wealthy investor might be influenced by these fallacies more, due to the inability to hire financial experts or the lack of luxury to devote their time and effort to analyzing the financial markets. Whether these financial experts really enhance the investment decision remains a debated topic (Banerjee, 2014). These frequent fallacies are excessive trading, the disposition and attention effect, and naïve and insufficient diversification. Barber and Odean (2000) further support that excessive trading lowers returns due to transaction costs and the lack of skill to achieve higher returns to make up for these transaction costs. This effect can be attributed to the illusion of knowledge; people's confidence in outcomes based on information they possess rises much faster than the actual accuracy (Wilkinson & Klaes, 2012). This results in more trading and lower returns. The disposition effect implies that people tend to sell well-performing stocks and keep losing stocks. Behavioral finance attributes this effect to an irrational belief in mean reversion or mental accounting whereby people are keen on taking gains, even though in the long run the gains could have been larger (Kahneman & Tversky, 1979). The attention effect is the empirical observation that people simply buy stocks that grabbed their attention, by for example coverage in the media (Fang, Peress, & Zheng, 2014). Wrongful, either naïve or insufficient, diversification implies that people think about the diversification decision too lightly. They invest naïvely by simply dividing 1/n over the possible options (n), without considering these options carefully, or diversify locally, as supported by Braun, Liang and Weisbenner (2007). The problem in diversifying locally is that your life is already correlated with local firms and companies, implying overexposure to idiosyncratic risk (Barberis & Thaler, 2003). Furthermore, insufficient diversification might imply not diversifying in enough possible options, e.g. holding just one kind of stock (Barberis & Thaler, 2003). Although it seems intuitive and supported by many researches that factors like these can amplify the differences in wealth, evidence on the contrary exists as well. Bodnaruk and Simonov (2014) for example find no significant effect of financial literacy on investment decisions.

C. Macro-Economic Determinants of Wealth Inequality

Although this research is focused on one single country, The Netherlands, and does not compare multiple countries to one another, it might still be worthwhile to learn the influence of macro-economic variables on wealth inequality.

An important study in this field is performed by Lee, Kim and Cin (2013). They research the effects different macro-economic variables have on the inequality in Korea. They find that an increase in the share of the elderly population, foreign direct investments or the share of import are associated with a higher level of inequality. Increases in the share of students, local (own country) investment or government spending seem to lower the level of inequality. The effect of the unemployment rate is ambiguous as interactions with variables as government spending and import result in opposite effects. Odedokun and Round (2004) find similar results as found by Lee, Kim and Cin (2013) with their research, conducted in African countries. On top of that, they find that the inequality levels are negatively related to the governmental subsidies and inflation level. In accordance with the very basis of this paper, the views and beliefs of Piketty, they find a huge positive relation with the original endowment (Odedokun & Round, 2004). This means that having a skewed endowment (high GINI-coefficient) to begin with only further increases the wealth inequality in a country.

D. Consequences of Wealth Inequality

Now that wealth and wealth inequality has been defined, and some of its determinants on both a micro- and macro-economic level has been discussed, it is important to understand what the negative impacts of a larger wealth inequality really are for a nation.

According to Kawachi and Kennedy (1997), the first problem in rising economic inequality is the loss in social cohesion. People experience an increasing feeling of ''us versus them". Macabre effects of this loss in social cohesion might be an increase in that nation's mortality rate (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997). Kawachi and Kennedy (1997) find that more economically related effects are the loss of trust in the government, dispersity in political issues, loss of long term economic growth, increases in crime rates and worse public health.

Although some researchers, like Lazear and Rosen (1981), find that wealth inequality has a positive effect on a nation's growth on the short term, Thorbecke and Charumilind (2002) find a negative impact on the long term economic growth. They try to explain this stagnating growth by stating that a larger wealth inequality implies more poverty, which is associated with higher crime rates

and poor public health (Thorbecke & Charumilind, 2002). Furthermore, Agarsen (2016) finds that a higher wealth inequality leads to a disproportionate division of political power for the wealthier people as opposed to the less wealthy. This would lead to a decline in economic growth as well (Agarsen, 2016).

The positive and economically significant relation between inequality and crime rates is endorsed by many researchers, like Stolzenberg, Eitle and D'Alessio (2006). This would be a direct results of the loss of social cohesion, making the poorer members of society more prone to incriminating behavior. Also because of the difficulties in obtaining funds legally, the poorer people's incentive to commit crimes rises as they would like to keep up with their desired consumption. Even though crimes are punishable, for some members of society crime still seems the better option (Stolzenberg, Eitle, & D'Alessio, 2006).

The decrease in public health associated with a larger wealth inequality most likely derives from the accessibility to healthier foods, as these are usually more expensive than toxic fast foods (Ver Ploeg, 2009). This results in a higher obesity rate, which in turn results in disproportionate occurrences of health issues among the less wealthy people and decreases in overall public health (Ver Ploeg, 2009) (CDC, 2016).

Finally, in countries with more wealth inequality, people are likely to be deterred from better schooling due to high tuition fees (Thorbecke & Charumilind, 2002). This would imply that individuals who are capable of earning a higher degree are prohibited from doing so due to monetary constraints. As the wealth inequality in a country increases, the potential constrained population increases, at the expense of the nation's education level (Thorbecke & Charumilind, 2002).

E. Hypothesis Formation

In this research, the main intention is to find evidence that I can observe the view and beliefs of Piketty in The Netherlands as well. According to Piketty (2014), one of the main reasons that we observe an ever-growing wealth inequality is due to the fact that the more wealthy people participate more actively in the stock market and therefore hold more financial assets. As explained earlier, the return on financial assets is most likely higher than the income acquired for labor. Therefore, by definition, people who invest more in financial assets, hence the already wealthy people, achieve a higher cumulative return and further increase the wealth inequality. Very simply put, if two persons invest an equal proportion of their wealth in financial assets and achieve an equal return, the person

with a higher original wealth gains more in absolute terms, increasing the wealth inequality. This is the main theory as explained by Piketty (2014), which I apply to The Netherlands. Therefore, the first hypothesis is:

Piketty's theory on stock market participation is visible in The Netherlands.

On top of this, the already wealthy people might have more resources to make better investment decisions. This can possibly be explained by hiring consultants, financial experts or simply having the luxury of being able to devote more time to analyze the financial market. If the already established wealthier people indeed make better investment decisions, they might be able to achieve a higher return. If this is true, this increases the wealth inequality even further. This leads to the second hypothesis:

Wealthier people achieve higher returns.

In line with this second hypothesis, probably the more wealthy people are better investors than the less wealthy people. Barberis and Thaler (2003) find evidence that individual investors have certain shortcomings as opposed to institutional investors. It might me the case that the less wealthy people are more susceptible to these fallacies than the wealthier people, and hence make worse investment decisions. Because of limitations to the data from the DNB Survey, I cannot test for excessive trading as households report their survey answers yearly. The disposition and attention effect are present across all kinds of people and do not disappear with financial knowledge coming from consultants or in-depth market analysis. Naïve and insufficient diversification remain and are hence used to account for possible differences between the wealthier and less wealthy people. As shown by von Gaudecker (2013), the diversification decision is one of the most important to make in household investing and influences the outcomes drastically. Therefore, the third hypothesis is:

Better diversification is a factor for wealthier people achieving higher returns.

III – DATA

A. Description of Data Sources

The data for this research originates from two main sources. The first and most important source is the DNB Household Survey (DHS). This is a survey, yearly conducted by CentERdata from 1994 until 2015 and publicly available on their website after requesting access with a sound and valid reason. Its goal is to map economic and psychological aspects which might influence household investment behavior, aiding in multiple research interests. In order to gather participants, randomly selected households were called with the question to participate in this survey, making participation completely voluntary. In the end, approximately 2,000 households participated in this survey. These household were asked to fill in an extensive list of questions through the internet. If participants did not have a connection to the internet nor a computer at their disposal, CentERdata provided these for them. The participants could participate whenever they desired. These circumstances ensure a higher validity in the answers.

In order to get a complete understanding of the portfolios and their characteristics, additional data on the individual stocks the respondent invested in is a necessity. The database I regard as most valid and complete for this information is Datastream.

To start the data gathering with, the ISIN code for each individual company participants of the DHS survey had stocks in, were found in Datastream. As this research only covers the effect of financial wealth on total wealth and hence wealth inequality, people without stocks or investments were excluded from the research. Subsequently, the return indices, the MSCI Europe Index and the EURIBOR Index were downloaded in order to be able to calculate the exact returns and beta for all stocks. I also downloaded the stock prices of all companies present in the output of the survey. This in order to calculate the proportion of a certain stock in the total portfolio. Important to note might be that the combined weights of all stocks is not equal to 100% for all observations. This is due to the fact that some respondents did not answer all questions completely on the survey. There are some instances where respondents filled in the amount or percentage in a certain stock only, but did not report which stock this was. However, the returns and beta are adjusted for this.

In this research, both crisis years and non-crisis years are incorporated in the sample. Regarding the non-crisis years, 2011 and 2012 are deemed most appropriate due to the accessibility and completeness of this data. Concerning the crisis years, I intended to use 2008 and 2009. However, due to unclear reasons, very few people reported their financial assets completely and correctly, or financial asset ownership in 2008 was very low. Because of the lack of a significant amount of

observations in 2008, there is only one crisis year left in this research; 2009. In favor of this research' validity, 2009 has a lot of observations and a high reporting quality.

B. Data Specifications

As many different definitions or interpretations of the used variables exist, I elaborate on the derivation of the key variables briefly. The key variables regarding the reported holdings in financial assets are the returns, volatility, beta and Treynor ratio.

Return: The total return index has been downloaded from Datastream. The choice for the total return index is made consciously as this variable processes paid dividends correctly. This index is calculated by Datastream with the following formula:

$$RI_t = RI_{t-1} * \frac{PI_t}{PI_{t-1}} * \left(1 + \frac{DY}{100 * n}\right) \quad (2)$$

Where;

RI = *Return Index*

PI = *Price Index*

DY = *Dividend Yield*

n = *Number of trading days (260)*

Subsequently, the cumulative monthly returns over the year have been corrected for the Euribor rate:

$$R_t = \sum_{i=12}^{i} (1 + RI_i + EURIBOR_i) \quad (3)$$

Volatility: The volatility in returns of a specific share is calculated on the basis of the total return index, as mentioned before. The volatility of the share is calculated with data over the relevant 12 months by using the formula for standard deviation:

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2} \quad (4)$$

Where;

σ = Volatility

N = Number of observations

x = Observed value

μ = Mean of all values

Beta: The beta represents how closely a share or portfolio relates to the market, and is also used in the calculation of the Treynor Ratio. The beta resembles the degree to which the individual stock moves with the market. Therefore, a beta larger (smaller) than 1 means that the stock moves stronger (weaker) than the market does. This definition implies that the calculation of the beta boils down to measuring the slope coefficient, regressed on the relevant index; the MSCI Europe.

$$\beta = \frac{Cov(x, y)}{Var(y)} \quad (5)$$

Where;

x = the stock's daily change

y = the index' daily change

Now that the return, volatility and beta calculation for individual stocks have been explained, it is important to know how this translates to aggregate portfolio data. In the DHS survey, people were not required to fill this what percentage of your total portfolio a stock accounts for. However, they were asked to report how many shares of a certain stock they own. In order to get to the percentage of the total portfolio, the number of shares they reported is multiplied with the closing price of that stock of that year.[1] Subsequently, dividing the monetary value of a certain stock by the total invested value returns the proportion of an individual stock to the portfolio.

[1] The respondents were not asked when they bought or sold certain stocks within the year. Therefore, I assume all transactions to be done at the end of year.

In the end, the weighted sum of the individual stock data is the aggregated portfolio data. This means taking the weighted sum of the return, volatility and beta:

$$WA_{i,j,k} = \sum_{i=10}^{i} (p * x_{i,j,k}) \quad (6)$$

Where;

$WA_{i,j,k}$ = *The weighted average of volatility, return or the beta*

p = *The proportion of a stock in the portfolio*

$x_{i,j,k}$ = *The value of the volatility, return or beta*

An important note for this aggregated data is that if not 100% of a respondents portfolio is known, possibly due to reporting errors, the aggregated beta and return are standardized as if the known portfolio is the entire portfolio. This could also possibly happen because respondents had room to enter data for their first ten stocks only. If they own more than ten stocks, they were asked to report information about the ten stocks they invested in the most. If, for instance, I only have data on 90% of the portfolio and the return is 9%, it is adjusted to a $90\%/9\% = 10\%$ total return. However, if less than 50% of the portfolio is known, generalizing this small portion to the entire portfolio is dangerous, and hence deleted.

Although the main dependent variable in this research is the aggregate portfolio return, a robustness check might enhance the explanatory power of this research and may help reinforce possible relations or conclusions. This robustness check is done on the basis of the quality of the portfolio. What determines the quality of a portfolio? I do not think that purely looking at returns is the best way to go regarding quality, as a higher return does not need to be strictly better. Possibly, the household investor with a slightly higher return had a ton more risk involved in his portfolio? Subsequently, the household investor with the lowest risk might have had a vastly smaller return than a household investor with a slightly higher risk. Therefore, I believe that quality of a portfolio is a trade-off between risk and return, and should be measured by a ratio. However, simply using a ratio of return over volatility causes serious problems in case the return is negative, because then a higher volatility results in a less negative outcome and is therefore associated with better quality. To solve this problem, the Treynor ratio suits perfectly, as it measures risk-adjusted portfolio performance, by calculating the return surplus per unit of market risk (IFRS Financial Reporting, 2015). For the exact calculation of the Treynor ratio, the risk-free rates need to be used. For this, 10-year Dutch government

bonds are used, resulting in a risk-free rate of 3.9%, 3.3% and 2.2% for the years 2009, 2011 and 2012 respectively (Datastream, 2015).

$$Quality\ of\ Portfolio_p = Treynor\ Ratio_p = TR_p = \frac{(Return_p - R_f)}{\beta_p} \quad (7)$$

Lastly, I can work directly with many straightforward survey answers. Some of these variables are simple answers to survey questions, like age, sex or the number of kids. However, some are more detailed, for instance, the respondent's income, savings, value of the mortgage, value of their car etc. The two most important variables are the financial wealth and the total wealth of a respondent. The financial wealth is calculated as the sum of the monetary value at year's closing of all held stocks. Total wealth is, as described earlier, the sum of checking and savings accounts, employer-sponsored saving plans, cash value of life insurance, home equity, additional real estate, and financial assets minus total debt (van Rooij, Lusardi, & Alessie, 2012). The natural logarithms are used for financial Wealth, total Wealth, income and worth house, this in order to normalize the distribution and acquire more valid regression output.

C. Summary Statistics

Plotting and summarizing data helps to understand the dataset and can identify possible bottlenecks. Therefore, table 3.1 provides summary statistics on the key variables for both periods.

	2009	2009*	2011-2012
Return (%)	9.24%	-1.99%	2.73%
Volatility (%)	8.606%	8.091%	8.064%
Beta	0.462	0.405	0.877
Treynor Ratio	-0.116	-0.334	-0.001
Observations (N)	190	150	200

Table 3.1: This table summarizes the key variables for both periods. For reasons explained previously, some observations from 2009 have been deleted. The cleansed data for 2009 is indicated by 2009.*

Something that becomes evident immediately is the huge average return in 2009. Upon further inspection, this abnormally large return is caused by a certain amount of households who invested 100% of their portfolio in either DSM or Philips, shares that rose with 31.8% and 71.9% respectively over 2009. By merely being lucky, these investors did skew the results in such a disastrous way that

they were removed from the sample. This resulted in an average return one would typically expect during a crisis period. Further summarizing statistics are shown below in table 3.1.

For the rest and for the core of this research, the observations are divided into four quartiles, based on total wealth. Quartile 1 (Q1) denotes the most wealthy 25% of the sample, while Quartile 4 (Q4) denotes the least wealthy quarter. In order to acquire a broader first insight in the data, the return, volatility, beta and Treynor ratio has been calculated for each of the quartiles across both period and the total sample. An independent t-test shows the significance of differences between Q1 and Q4. In table 3.2 the results from this preliminary analysis are shown.

		p-value	Quartiles based on Total Wealth			
		(Q1>Q4)	Q1	Q2	Q3	Q4
2009	Return (%)	0.142	-0.25%	-1.34%	-2.31%	-4.03%
	Volatility (%)	0.319	7.699%	8.583%	7.883%	8.205%
	Beta	0.430	0.391	0.393	0.433	0.402
	Treynor Ratio	0.225	-0.300	-0.317	-0.338	-0.380
	Observations (N)		38	37	37	38
2011-2012	Return (%)	0.102	5.50%	3.69%	2.84%	-1.10%
	Volatility (%)	0.294	7.756%	8.264%	8.165%	8.069%
	Beta	0.235	0.879	0.901	0.891	0.839
	Treynor Ratio	0.101	0.038	0.012	0.001	-0.055
	Observations (N)		50	50	50	50
Total Sample	Return (%)	0.075	2.64%	1.93%	0.12%	-1.85%
	Volatility (%)	0.260	7.696%	8.436%	8.103%	8.071%
	Beta	0.368	0.638	0.715	0.727	0.620
	Treynor Ratio	0.135	-0.131	-0.104	-0.135	-0.204
	Observations (N)		88	87	87	88

Table 3.2: This table shows a complete overview of the key variables across the quartiles based on total wealth.

Some striking observations can be made from this table. First of all, it seems that the achieved returns seem to decrease with the quartiles. This indicates towards the more wealthy people achieving higher returns than the less wealthy and thus increasing the wealth inequality even further. This observation is persistent across all time periods. Secondly, the betas of the investment portfolios do not seem to differ significantly over the quartiles. However, they are huge differences in betas over time. This is easily explained by the influence of the financial crisis. Because of the unpredictability of the market portfolio in crisis times and people's desire to keep volatility relatively low, indicated by seemingly constant volatility over time, people are unable to continue copying the markets portfolio without increasing their risk. They have to deviate from the market portfolio more, lowering their beta in return. This effect is persistent for all quartiles, as volatility and beta behave the same way across them and do not show significant differences.

Another observations that stands out from this table is with regards to the p-values. Even though the numbers in the table show clear, and economically large, differences across the different quartiles, the p-values do not indicate statistical significance. Two possible explanations can account for this outcome; the low amount of observations and the high variance within the quartiles. The low amount of observations is a direct result of the selection criteria applied on the DNB Survey data. These cannot be altered without compromising the research validity and hence have to be dealt with. The high variance within the quartiles can possibly be explained by the numerous control variables which are taken into account at a later stage.

In order to determine if Piketty's view and beliefs are visible in The Netherlands as well, the first test to be done is testing if the more wealthy people also invest more in the financial asset market. Does a higher total wealth imply a higher financial wealth? This is also one of the main hypothesis of this research. In order to get a first insight in the answer to this question, table 3.3 represents the financial wealth across the different quartiles on the basis of total wealth.

		p-value (Q1>Q4)	Quartiles based on Total Wealth Q1	Q2	Q3	Q4
2009	Financial Wealth	0.001	64240	35569	18156	9304
	Observations (N)		38	37	37	38
2011-2012	Financial Wealth	0.002	44052	15596	10978	8960
	Observations (N)		50	50	50	50
Total Sample	Financial Wealth	0.000	57976	24135	10060	9494
	Observations (N)		88	87	87	88

Table 3.3: This table shows that financial wealth (in Euro €) does increase significantly with total wealth, indicating preliminary evidence of Piketty's view and beliefs being present in The Netherlands.

This table clearly indicates that financial wealth rises with total wealth. People in Q1 do own significantly more financial assets than people from Q4, or basically any other quartile. These differences are both statistically as well as economically significant. Furthermore, this table shows that the gap in financial wealth is the largest between Q1 and Q2, in line with figure 2.1, indicating that financial wealth is concentrated in the top percentages of wealthy people. This indicates first evidence in favor of Piketty's theory. However, in order to make clear conclusions about this, I have to perform in-depth analysis which are further elaborated upon in the methodology section.

IV – METHODOLOGY

The hypotheses discussed in section II, and the preliminary testing in the summary statistics on the basis of independent samples t-tests need further explanation with regards to the applied methodology. The t-tests used to establish potential statistically significant differences between Q1 and Q4 are performed in accordance with a t-test as described by (Moore, McCabe, Alwan, Craig, & Duckworth, 2011):

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_{\bar{x}_1 - \bar{x}_2}} \tag{8}$$

Furthermore, it is necessary to discuss the methodology applied on the hypotheses separately and in-depth. Therefore, I repeat the hypotheses one by one and elaborate on the specific methodology and regressions per hypothesis. The first hypothesis to be elaborated upon is the Stock Market Participation (SMP) hypothesis, which argues that Piketty's theory that the wealthier people have a larger financial wealth is to be seen in The Netherlands as well:

Piketty's theory on stock market participation is visible in The Netherlands.

This hypothesis is tested on the basis of a regression analysis where financial wealth is the dependent variable (Y) and total wealth, together with control variables (C), is the independent variable (X):

$$\begin{aligned} &\boldsymbol{ln(Financial\ Wealth_i)} \\ &\quad = \boldsymbol{\alpha + \beta_1 * ln(Total\ Wealth_i) + \beta_2 * Gender_i + \beta_3 * Partner_i + \beta_4 * Kids_i} \\ &\quad + \boldsymbol{\beta_5 * Age_i + \beta_6 * ln(Income_i) + \beta_7 * Mortgage_i} \\ &\quad + \boldsymbol{\beta_8 * ln(Worth\ House_i) + \varepsilon} \end{aligned} \tag{1}$$

Where;

Financial Wealth	=	*Total value of investment/asset portfolio*
Total Wealth	=	*Total wealth calculated as van Rooij, Lusardi and Alessie (2012)*
Gender	=	*Dummy variable; 1 for men, 0 for women*
Partner	=	*Dummy variable; 1 for partners, 0 for singles*
Kids	=	*The number of kids*

Age = *The age of an agent*

Income = *The income as reported*

Mortgage = *Dummy variable; 1 for having a mortgage, 0 otherwise*

Worth House = *The worth of the house as reported*

This regression aims to establish a positive relation between total wealth and financial wealth, and is performed for 2009, 2011-2012 and for the total sample. Is this relation does exist, this suggests that I can observe Piketty's view and beliefs in The Netherlands as well, which might be a first determinant of the wealth inequality. Together with the first preliminary evidence deriving from the t-tests performed in the section II, potential confirming evidence would support the notion that there is indeed some sort of positive feedback loop of the already wealthier people becoming even wealthier, as discussed in the literature review.

The second hypothesis is more focused on the secondary effects that may arise from being wealthier. As explained in the literature review, wealthier people are more capable of hiring financial experts or consultants. Furthermore, they might have the resources and the time to devote their attention to analyzing the financial markets in-depth. These factors might potentially contribute to achieve higher returns. If this is the case, the possible positive feedback loop which may be present in The Netherlands might be even stronger. The second hypothesis is therefore called the Aggravated Positive Feedback Loop (APF) hypothesis:

Wealthier people achieve higher returns.

Like the first hypothesis, this second hypothesis is researched on the basis of regression analysis. The dependent (Y) variable is the return and the independent variable (X) is financial wealth, along with other control variables (C):

$$\begin{aligned} \boldsymbol{Return_i} &= \boldsymbol{\alpha} + \boldsymbol{\beta_1} * \boldsymbol{ln}(\boldsymbol{Financial\ Wealth_i}) + \boldsymbol{\beta_2} * \boldsymbol{Gender_i} + \boldsymbol{\beta_3} * \boldsymbol{Partner_i} \\ &+ \boldsymbol{\beta_4} * \boldsymbol{Kids_i} + \boldsymbol{\beta_5} * \boldsymbol{Age_i} + \boldsymbol{\beta_6} * \boldsymbol{ln}(\boldsymbol{Income_i}) + \boldsymbol{\beta_7} * \boldsymbol{Mortgage_i} \\ &+ \boldsymbol{\beta_8} * \boldsymbol{ln}(\boldsymbol{Worth\ House_i}) + \boldsymbol{\varepsilon} \end{aligned} \quad (2)$$

Where;

Return = *The aggregated portfolio return*

The definitions of the other variables are similar to those explained in the first hypothesis.

Although the preliminary testing in the summary statistics points towards evidence for this hypothesis, regression analysis is necessary to validly test for significant relations. This regression is performed for 2009, 2011-2012 and for the total sample as well. A robustness check for this hypothesis is performed by using the Treynor ratio as dependent variable (Y) to evaluate if possible effects remain. Potentially confirming this APF hypothesis would lead to even more grounds for concern as the wealth inequality might grow drastically.

The third hypothesis tests whether diversification is a channel through which higher returns are achieved. As explained earlier, there are two potential mistakes in the diversification decision; naïve and insufficient investing. The first one boils down to simply diversifying 1/n over all possible options (n), or investing too naïvely in terms of investing primarily locally. The second diversification mistake relates to the number of different stocks held: the diversification level. The third hypothesis is therefore called the Better Diversification (BD) hypothesis:

Better diversification is a factor for wealthier people achieving higher returns.

The first step in testing this hypothesis is testing whether wealthier people did indeed diversify better, both in terms of naïve and insufficient investing. Naïve investing is tested on the percentage of local investment. By taking t-tests on the percentage of financial assets invested locally across the different quartiles, differences in naïve investing are recognized. Insufficient investing is tested by means of a regression, where the diversification level is the dependent variable (Y) and financial wealth is the independent variable (X), along with the same control variables (C):

$$\begin{aligned} \boldsymbol{Diversification\ Level_i} &= \boldsymbol{\alpha} + \boldsymbol{\beta_1} * \boldsymbol{ln(Financial\ Wealth_i)} + \boldsymbol{\beta_2} * \boldsymbol{Gender_i} + \boldsymbol{\beta_3} * \boldsymbol{Partner_i} \\ &+ \boldsymbol{\beta_4} * \boldsymbol{Kids_i} + \boldsymbol{\beta_5} * \boldsymbol{Age_i} + \boldsymbol{\beta_6} * \boldsymbol{ln(Income_i)} + \boldsymbol{\beta_7} * \boldsymbol{Mortgage_i} \\ &+ \boldsymbol{\beta_8} * \boldsymbol{ln(Worth\ House_i)} + \boldsymbol{\varepsilon} \end{aligned} \quad (3)$$

Where;

Diversification Level = The amount of different financial assets held by an agent

The definitions of the other variables are similar to those explained in the previous hypotheses.

If a relation between financial wealth and the diversification level can be established, it is necessary to research if better diversification does lead to better returns. This is tested by means of a regression in which the return is the dependent variable (Y), the diversification level is the independent variable (X) and several control variables (C) are included:

$$\begin{aligned} \boldsymbol{Return_i} &= \boldsymbol{\alpha} + \boldsymbol{\beta_1} * \boldsymbol{Diversification\ Level_i} + \boldsymbol{\beta_2} * \boldsymbol{Gender_i} + \boldsymbol{\beta_3} * \boldsymbol{Partner_i} \\ &+ \boldsymbol{\beta_4} * \boldsymbol{Kids_i} + \boldsymbol{\beta_5} * \boldsymbol{Age_i} + \boldsymbol{\beta_6} * \boldsymbol{ln(Income_i)} + \boldsymbol{\beta_7} * \boldsymbol{Mortgage_i} \\ &+ \boldsymbol{\beta_8} * \boldsymbol{ln(Worth\ House_i)} + \boldsymbol{\varepsilon} \end{aligned} \quad (\mathbf{4})$$

Where;

The definitions of the variables are similar to those explained in the previous hypotheses.

A robustness check is performed by replacing return by the Treynor ratio to evaluate whether possible effects remain. If this regression analysis indeed suggests that the diversification level has a positive influence on the return, this supports the notion that having a higher wealth results in a higher return due to being better diversified. If this is the case, the diversification channel is one that aggravates the possible positive feedback loop even more.

V – RESULTS

A. Main Results

The first hypothesis investigates whether one of the basic principles of Piketty is also observable in The Netherlands; wealthier people investing more in financial assets than less wealthy people. This would increase the wealth inequality if they achieve at least the same return as the less wealthy people who invested a smaller absolute amount in the financial asset market.

Piketty's theory on stock market participation is visible in The Netherlands.

As becomes evident from table 5.1, a higher total wealth implies a higher financial wealth. As to be seen from this table, the coefficients of total wealth are positive across all time periods. Furthermore, the dummy variables with regards to the quartiles based on total wealth indicate that the lower quartiles hold less financial assets. All three coefficients for total wealth are highly significant, both statistically and economically. Also, the dummy variable coefficients show a high level of statistical and, in particular, economic significance.

The strongest effects are observed in the crisis period, 2009. This seems intuitive as the most constrained people cannot afford to lose money on their investments in tough times. Furthermore, men seem to be participating more on the stock market. This is most evident in the regressions over 2011-2012 and the total sample. Also age seems to positively influence one's stock market participation, both statistically and economically significantly. As expected, people with a higher income do participate more in the stock market, on average. A very strong coefficient is observed for the dummy variable of mortgage, which simply indicates whether a household has a mortgage or not. Especially in the crisis period, people with mortgages were reluctant to enter the stock market, most likely due to financial obligations to this mortgage.

Altogether, I can conclude that the evidence from table 5.1 strongly supports my first hypothesis; people with a higher total wealth do have a higher financial wealth. Therefore, the first hypothesis cannot be rejected. This implies if a wealthier agent, otherwise similar to a less wealthy agent, achieves the same return as this less wealthy agent, the wealth inequality in The Netherlands grows due to differences in absolute invested financial assets.

Table 5.1: This table represents the output of regression (1) in Model 1 and a regression in which the continuous variable Total Wealth has been replaced by the quartile dummies is represented by Model 2. Both these models are regressed on both time periods, as well as on the total sample. As to be seen in the table, Q1 is omitted in Model 2, due to collinearity with the other quartile dummies. In a cell, the upper value is the regression coefficient, the bottom value represents the coefficient's p-value. The dependent variable in all regression whose output is shown in this table is Financial Wealth.

	Total Sample		**2009**		**2011-2012**	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
ln(Total Wealth)	.225 0.000		.250 0.008		.206 0.000	
Q1		Omitted		Omitted		Omitted
Q2		-1.255 0.010		-1.222 0.226		-.743 0.046
Q3		-1.535 0.005		-2.305 0.053		-1.025 0.014
Q4		-2.301 0.001		-4.125 0.008		-1.508 0.002
Gender	.708 0.094	.517 0.231	-.225 0.802	-.419 0.643	.949 0.003	.930 0.006
Partner	-.385 0.364	-.417 0.338	.361 0.693	.414 0.655	-.635 0.036	-.793 0.014
Kids	.192 0.334	.067 0.742	.149 0.708	.071 0.860	.300 0.045	.206 0.195
Age	.047 0.001	.038 0.009	.055 0.053	.045 0.120	.045 0.000	.038 0.002
ln(Income)	.053 0.094	.064 0.048	.148 0.019	.145 0.025	-.033 0.189	-.011 0.675
Mortgage	-.597 0.154	-.222 0.623	-2.020 0.029	-1.561 0.119	.275 0.349	.513 0.120
ln(Worth House)	.031 0.428	-.007 0.890	.072 0.380	-.053 0.636	-.008 0.759	-.028 0.457
Constant	1.944 0.075	6.574 0.000	.395 0.864	6.650 0.013	3.232 0.000	6.925 0.000
Observations (N)	349	349	149	149	200	200
r-squared (R^2)	0,161	0,138	0,175	0,174	0,300	0,219

To extent the empirical observations of the first hypothesis, the second hypothesis is focused on the relation between financial wealth and returns. As stated in the conclusion of the first hypothesis, if a wealthier and a less wealthy agent both achieve the same return, the wealth inequality grows due to the wealthier agent earning a higher absolute amount of return. To truly understand the severity of this situation, it is important to know how returns relate to financial wealth. Exactly this is what I try to capture with the second hypothesis:

Wealthier people achieve higher returns.

The relation between financial wealth and returns is represented in table 5.2. After not rejecting the first hypothesis, it is striking to see the effect financial wealth has on the aggregate portfolio returns. Although the coefficients for financial wealth are of moderate magnitude, they are statistically highly significant and pose empirical evidence that more financial wealth results in higher returns. As became evident from regression (1), total wealth is a strong predictor for financial wealth. Now, I observe financial wealth to significantly affect returns and am hence inclined to not reject the second hypothesis.

Judging from this regression output, partners perform worse than singles. Some empirical observations that attract attention are the coefficients for Kids and Age. I observe both to be positive, although with low significance. However, this poses some evidence that household with more children or a higher age achieve higher returns. This is possibly due to cautiousness and the unwillingness to take risks which can result in either big wins or losses. With regards to income, I observe a coefficient which does not significantly differ from zero for any given model in any given time frame. Despite income raising the likelihood of participating on the stock market, it does not notably influence the achieved returns. The same goes for the mortgage dummy, even though having a mortgage or not severely influenced the stock market participation for a household, it barely influences the eventual realized return.

The conclusion for this hypothesis is not as clear as for the first hypothesis. I can imagine some ambiguity to arise when making conclusions on the basis of the regression output from table 5.2, as the coefficients for financial wealth are not as economically significant as they are statistically. Nevertheless, the regression does provide empirical evidence on financial wealth having a positive effect on the aggregate portfolio return. This is consistent with the second hypothesis. Therefore, I cannot reject the second hypothesis; wealthier people do achieve higher returns.

Table 5.2: This table represents the output of regression (2) in Model 1 and the output of the robustness check, where the Treynor ratio is used as dependent variable instead of the aggregate portfolio return, in Model 2. Both models are applied to both time periods and the total sample as well.

	Total Sample		**2009**		**2011-2012**	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
ln(Financial Wealth)	.011 0.003	.030 0.000	.008 0.010	.021 0.016	.017 0.087	.025 0.069
Gender	-.014 0.636	.000 0.999	.014 0.667	.076 0.421	-.056 0.231	-.080 0.224
Partner	-.036 0.212	-.096 0.094	-.032 0.352	-.137 0.161	-.030 0.492	-.050 0.422
Kids	.015 0.279	.033 0.213	.023 0.125	.078 0.064	.006 0.773	.001 0.975
Age	.001 0.209	.001 0.567	.002 0.148	.002 0.516	.001 0.453	.002 0.434
ln(Income)	-.001 0.546	.003 0.515	.001 0.671	.004 0.515	-.005 0.192	-.006 0.236
Mortgage	-.000 0.982	-.003 0.954	.010 0.770	-.013 0.899	-.008 0.860	-.006 0.914
ln(Worth House)	.004 0.152	.009 0.070	.002 0.403	.009 0.274	.004 0.299	.005 0.354
Constant	-.142 0.047	-.491 0.001	-.198 0.016	-.692 0.003	-.125 0.287	-.220 0.181
Observations (N)	349	349	149	149	200	200
r-squared (R^2)	0,054	0,09	0,102	0,103	0,047	0,050

The third hypothesis researches if the increase in returns for wealthier people is caused by being better diversified:

Better diversification is a factor for wealthier people achieving higher returns.

Table 5.3 represents intuitive numbers regarding differences in investment diversification and shows no evidence of wealthier people diversifying less naïvely. The percentage of locally invested stock is actually higher in the higher quartiles, which indicates that no benefits from stock picking can arise. However, the diversification level does significantly differ across the quartiles, Q1's diversification level is nearly 50% higher than that of Q4. This can result in significant diversification benefits.

	p-value	Quartiles based on Total Wealth			
	(Q1>Q4)	Q1	Q2	Q3	Q4
Locally Invested (%)	0,271	59,9%	64,3%	55,6%	56,3%
Diversification Level	0,003	3,1	3,0	3,0	2,1
Observations (N)		88	87	87	88

Table 5.3: This table shows the differences in locally invested stocks and the overall diversification level across the quartiles. On first sight, there do not seem to be any significant differences in the percentage of locally invested stocks across the quartiles. The diversification level does differ significantly, especially Q4 diversifies significantly less than the other quartiles.

Before I can test for significant differences in benefits resulting from better diversification, I need to establish sure differences in diversification. Therefore, table 5.4 represents the output from regression (3). This table shows highly significant coefficients for financial wealth, indicating that if financial wealth rises, the diversification level rises with it. Besides showing high statistical significance, these coefficients show a huge economic significance as well. Other notable coefficients are those of Kids and Age. One would expect people with kids to be more cautious in their investment choices. However, kids seem to negatively influence the diversification level. This can easily be explained by time constraints. Having to take care of children comes at the cost of time, which can thus no longer be devoted to making time-consuming diversification decisions. Age seems to positively influence the diversification level. As discussed before, older people tend to make better investment decisions, this observation supports that statement.

Table 5.4: This table shows the output from regression (3). The effect of financial wealth is regressed on the dependent variable: diversification level. This is done for 2009, 2011-2012 and the total sample as well.

	Total Sample	2009	2011-2012
ln(Financial Wealth)	.267	.154	.676
	0.000	0.000	0.000
Gender	.401	-.022	.335
	0.236	0.931	0.551
Partner	-.005	.004	.393
	0.989	0.988	0.463
Kids	-.314	.001	-.691
	0.047	0.932	0.009
Age	.017	.024	-.004
	0.146	0.004	0.825
ln(Income)	.002	-.006	.019
	0.936	0.745	0.655
Mortgage	.133	-.085	-.114
	0.692	0.750	0.824
ln(Worth House)	.033	.029	.027
	0.263	0.165	0.575
Constant	-.855	-.480	-2,863
	0.306	0.437	0.043
Observations (N)	349	149	200
r-squared (R^2)	0,185	0,224	0,363

Now that has been established that the diversification level seems to be positively influenced by wealth, I evaluate the effect of the diversification level on the achieved returns and, as a robustness check, on the Treynor ratio. Table 5.5 shows the output from this regression. The coefficients for the diversification level show huge differences over time. First of all, judging from the coefficients for diversification level over the total sample, diversification level does not seem to influence the achieved return significantly. However, it does influence the Treynor positively. This relation is both statistically and economically significant. In this case, the diversification level does not alter the returns significantly, but does alter the Treynor ratio.

Table 5.5: This table represents the output from regression (4) in Model 1. Model 2 is the robustness check in which the dependent variable is the Treynor ratio, instead of the aggregate portfolio return. Both these models are applied to 2009, 2011-2012 and the total sample as well.

	Total Sample		2009		2011-2012	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Diversification Level	.002	.023	.041	.156	-.005	-.006
	0.665	0.009	0.000	0.000	0.416	0.428
Gender	-.009	.005	.014	.081	-.034	-.047
	0.769	0.935	0.658	0.342	0.465	0.467
Partner	-.040	-.106	-.031	-.139	-.043	-.068
	0.173	0.071	0.344	0.116	0.331	0.270
Kids	.016	.042	.022	.077	.007	.003
	0.248	0.123	0.117	0.044	0.740	0.927
Age	.002	.002	.001	-.002	.002	.003
	0.084	0.324	0.529	0.500	0.164	0.146
ln(Income)	-.001	.004	.002	.005	-.005	-.006
	0.750	0.331	0.500	0.410	0.171	0.211
Mortgage	-.008	-.024	.010	.006	-.004	-.002
	0.776	0.679	0.770	0.943	0.919	0.977
ln(Worth House)	.005	.011	.001	.004	.005	.007
	0.068	0.031	0.592	0.614	0.202	0.241
Constant	-.103	-.381	-.174	-.624	-.044	-.100
	0.148	0.007	0.026	0.003	0.687	0.513
Observations (N)	349	349	149	149	200	200
r-squared (R^2)	0,030	0,060	0,173	0,269	0,036	0,036

This means that although the return itself does not change, the diversification level does positively influence the investment decision as the same returns can now be achieved by taking less risk. The Treynor ratio is a measure of how many units of return are achieved for a number of units of risk. Therefore, the same amount of return can now be achieved with less units of risk. This is an improvement of the investment portfolio. Secondly, the effects in 2009 are even stronger. I observe significant coefficients for the diversification level on both the aggregate portfolio returns and the Treynor ratio. Lastly, in 2011-2012, the coefficients for diversification level on both the returns and the Treynor ratio are insignificant, statistically as well as economically. No evidence of an effect of diversification level on the achieved returns or portfolio's Treynor ratio is found.

In summary, the observations from table 5.5 lead to the conclusion that the diversification level does significantly influence the Treynor ratio of a portfolio for the better. However, no unambiguous evidence has been found for an effect on the aggregate portfolio return. The positive effect on the Treynor ratio is an improvement for the investment portfolio, as the same returns can be achieved with a lower accompanied risk. Together with the observations from table 5.4, showing a positive effect of financial wealth on the diversification level, a positive effect of the diversification level on the Treynor ratio indicates that wealthier people hold a better investment portfolio, due to better diversification.

However, no significant effect on returns have been found. Therefore, the only improvement in the investment portfolios of wealthier people is less exposure to risk while achieving the same returns. As there is no evidence that people increase their risk to original levels in order to achieve higher returns, I cannot state that the observed effect influences the wealth inequality in The Netherlands. The third hypothesis is thus rejected; better diversification does not alter returns significantly. It does alter the Treynor ratio, but people are not willing to increase their risk again to increasing returns, and hence the wealth inequality is not affected by this effect.

B. Summary

With the research of the first hypothesis I find evidence that people with more total wealth also possess more financial wealth, in accordance with Piketty. Table 5.1 shows positive coefficient for total wealth and increasingly negative coefficients for lower quartiles. A direct implication of this observation is that the wealthier people increase their wealth faster than the less wealthy people, even if they achieve the same aggregate portfolio returns. This is detrimental to the wealth inequality in The Netherlands, as this only increases the differences between the rich and the poor.

The second hypothesis researches if this effect of the wealthier people's wealth increasing faster, is amplified by them achieving higher returns. Table 5.2 clearly shows positive significant coefficients for financial wealth on the aggregate portfolio return. This implies that wealthier people increase their wealth even more, relative to the less wealthy, than was supposed under the first hypothesis. Not only does the wealth inequality rise due to differences in financial wealth, but also due to differences in achieved returns. This might increase the wealth inequality at an alarming rate.

The third hypothesis researches if these differences in return between the wealthier and the less wealthy people are due to differences in the diversification decision. The first necessity to research this is to make sure that wealthier people do indeed diversify better. Table 5.4 showed evidence for

this statement. The positive significant coefficients for financial wealth indicate that people with higher financial wealth have a higher diversification level. The second necessity is to investigate whether this higher diversification level also results in higher aggregate portfolio returns. Table 5.5 shows no evidence of this notion; returns are not significantly affected by the diversification level. However, the Treynor ratio is significantly affected by this diversification level, lowering the risk of an investment portfolio. Nevertheless, this lower risk does not influence the achieved returns. Therefore, I conclude that the diversification channel does not explain the differences in returns between the wealthier and the less wealthy people. Hence, it is not a factor in the growing wealth inequality in the Netherlands.

C. Conclusion

After summarizing the main findings of the hypothesis, I can answer the main research question:

How does the Dutch shift towards individualism affect the wealth inequality, through the mechanisms of the financial asset market?

With regards to the first hypothesis I can confidently state that household investment in financial assets is more prominently present in households with a higher total wealth. This applies to testing with total wealth as a continuous variable, and to testing with quartile dummies as well. The implication of this observation is that the wealth inequality in The Netherlands grows, as the wealthier people's wealth increases more than less wealthy people's wealth in case they achieve similar returns. On top of that, they do not achieve similar returns, as evidence from the second hypothesis shows. People with more financial assets, hence wealthier people, achieve higher returns than people with less financial assets. This implies that the rate at which the wealth inequality grows, by the explanation of the first hypothesis, increases due to these differences in achieved return. This only aggravates the effect found under the first hypothesis and increases the wealth inequality at an alarming rate. Lastly, I research if the differences in returns were to be explained by the diversification channel. This did not seem to be the case, as the diversification level only decreases the exposure to risk, but did not increase the aggregate portfolio returns.

The recent developments of the individualization of The Netherlands only further amplify the abovementioned effects. For example, defined contribution pension payments instead of a defined benefit, the renewed loan system for college students and the individualization of the health care sector, all push the average Dutch household towards investing themselves. As shown in this research,

there are differences in outcome, i.e. return or Treynor ratio, across the different quartiles based on total wealth. Even though the examples I just listed are good or services that should be equally available to all members of society, the mechanisms of the financial asset market make for an unequal final outcome. The recent overall shift towards individualism in The Netherlands forces people to invest, which subjects them to unequal results across different classes of wealth, aggravating the implications of wealth inequality into many aspects of the average citizen's life.

D. Shortcomings and Recommendations

To improve the contribution of this research to existing literature it is appropriate to discuss some of its shortcomings and recommendations for further research. First of all, this research is based on a survey. All survey research is subject to reporting errors, and so is this one. Secondly, this research tries to capture a determinant of the wealth inequality; financial wealth. However, there are many more determinants of a nation's wealth inequality and therefore this research only represent one piece of the much larger puzzle. In order to get a full understanding of the causes and determinants on a nation's wealth inequality, one should not focus on financial wealth only. People's housing, cars, boats, art etc. is all part of the big picture. It would be interesting to see this all being incorporated into other researches. Furthermore, the DNB Household Survey is conducted for Dutch citizens only. Effects similar to those found in this study might not exist in other countries, or with possible different magnitudes. A cross country study of these effects and linkage to the countries respective macro-economic variable might also be an interesting topic.

Now that has been established that people with a higher total wealth are likely to possess a higher financial wealth as well, and that people with a higher financial wealth achieve higher returns, it might be valuable to investigate other channels that can explain this effect. I researched the effect of the diversification. Although it did affect the investment portfolio for the better, no evidence for an effect on returns have been found. A recommendation for further research would be evaluating and researching other channels' effects, e.g. the effect of trading frequency, the disposition or attention effect and its effects on the achieved return.

VI – BIBLIOGRAPHY

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