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HOUSEHOLD PORTFOLIOS:
THE ROLE OF FISCAL POLICY, PEER BEHAVIOUR, AND FINANCIAL LITERACY

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Abstract

This thesis is a collection of three distinct essays that study the impact of fiscal policy, peer behaviour and financial literacy on household portfolio choices.

Chapter 1 analyses the effects of fiscal incentives to homeowners on the decision to acquire main residence rather than renting it. Although many of the world's wealthy countries provide such incentives, their impact on housing tenure choice is unclear. Using difference-in-differences approach, this chapter estimates the effect of mortgage interest deduction on homeownership in the United States. The identification relies on the large changes in income tax rates and standard deduction. The largest of these changes increased income tax rate by as much as 23.9% and decreased standard deduction by 7.2% between 2002 and 2004. The baseline estimates suggest that increase in income tax rate in a state that allows mortgage interest deduction is associated to 3 percentage points increase in homeownership relative to states that didn't change their fiscal policy and to 5 percentage points - relative to states that do not allow mortgage interest deduction but had a comparable increase in tax rates. Increase in the proportion of itemizers through lower standard deductions also leads to higher homeownership rates in the treated states. The results are robust to a range of alternative specifications.

Chapter 2 studies the role of peers' behaviour on investment choices. In particular, this essay analyses the influence of immigrant investment behaviour on stock market participation of natives. To identify the peer effect this study exploits the fact that roughly half of Luxembourg residents are foreign born and that immigrant groups are heterogeneous in terms of their financial attitudes. The reflection problem is addressed by instrumenting immigrant stock ownership rates with the participation rates in their countries of origin. Contextual and correlated effects are separated from the endogenous peer effect by controlling for neighbourhood-specific characteristics and individual risk preferences and financial knowledge. The results show that peers' investment attitudes have sizeable effect on households' portfolio composition. Furthermore, this effect operates through both social learning, transmitted through more financially literate individuals, and social utility channels.

Finally, chapter 3 seeks to understand how differences in financial literacy between women and men are related to the differences in their financial wealth. By using Dutch Central Bank Household Survey, this study shows that women are, on average, less knowledgeable about basic financial concepts and that households whose financial decisions are taken by women tend to have less financial wealth. The results of the decomposition of the gender wealth differential suggest that 30% to 40% of the explained difference in women's and men's financial wealth can be attributed to differences in their financial literacy and that this portion increases along the wealth distribution.

The results of this thesis contribute to designing evidence-based policy interventions. On the one hand, they show that households portfolio choices are sensitive to fiscal incentives. On the other, they uncover the importance of financial literacy for long-term financial wealth accumulation and the presence of social multiplier of financial knowledge, which has implications for the implementation of financial education programmes.

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Introduction

It is nowadays an acknowledged fact that households' financial decisions have a significant impact on financial and real estate markets, as well as on the overall economy. By the end of 2015, households in the United States held more than $100 trillion of assets, among which $71 trillion in financial assets, and had $15 trillion of outstanding liabilities, most of which due to home mortgages.[1] To compare, on the same period, nonfinancial corporate business had total assets amounting to $40 trillion and overall liabilities equal to $17 trillion, while the United States and the global GDP were $18 trillion and $73 trillion, respectively.[2] Given the "market size" of the finances of households, the importance of building understanding on how households manage their portfolios goes without saying.

To study how households choose to allocate their existing assets and to finance new asset purchases, the scholars of household finance adopted two main approaches. On the one hand, they analyzed models predicting optimal financial behavior. On the other, empirical studies focused on the actual one. The main conclusion of this literature was that households' observed behavior does not coincide with that predicted by the models. Thus, it became central to explain such discrepancies and to provide recommendations on how to design policies aimed to help households in making the right financial choices.

One of the puzzles revealed by the data was the limited participation of households in financial markets, and in particular in risky assets. Among the main explanations provided to this pattern were elevated information costs of such investments and incentives created by taxation system to invest in certain asset classes.[3] If these arguments are true, then policies affecting households' financial sophistication and fiscal advantages associated to specific types of assets have the potential to influence households' asset allocation, thus having wide-ranging impact on their balance sheets and the economy as a whole.

This thesis contributes to the empirical literature in the field of Household Finance by building on these arguments. In particular, it studies how tax rules and financial knowledge, including that transmitted through one's peers, shape households portfolios.

To contribute to the strand of research about how tax rules affect households portfolio composition, the first chapter of this work, *Implications of fiscal policy for housing tenure decisions*, focuses on studying the effects of fiscal incentives to purchase housing - the asset class of outstanding importance for most of the households. In particular, it seeks to understand whether the provision of the United States, as well as of many other countries, tax code to deduct interests paid on the mortgage from taxable income creates an incentive to own the residence instead of renting it. Although this way of

[1] *Source*: Federal Reserve Statistical Release. Z.1 Financial Accounts of the United States. Flow of funds, Balance Sheets, and Integrated Macroeconomic Accounts. Release Second quarter 2016. Table B.101 *Balance Sheet of Households and Nonprofit Organizations*. Figures include assets and liabilities of non profit organizations such domestic hedge funds, private equity funds, and personal trusts.

[2] *Source*: World Bank. Available at http://data.worldbank.org/indicator/NY.GDP.MKTP.CD

[3] For the summary, see Guiso et al. (2002) and Guiso and Sodini (2013).

supporting homeownership is widely used, there has been no clear understanding so far on its implications for households' tenure decision. There are two main sources of controversy over the mortgage interest deduction (MID) policy. First, due to the progressivity of the tax system, tax deductions mostly benefit those who have higher incomes, more expensive houses and bigger loans, that is those households who are supposedly less in need of financial support. This means that generous subsidies to homeowners, which goal is to increase homeownership rates, might have limited influence on actual tenure decisions since these richer beneficiaries would be likely to own a house even in the absence of any incentives. Second, MID might have unintended general equilibrium effects by creating incentives to reallocate resources from taxable financial wealth to tax advantageous real estate and by generating distortions on real estate markets. In particular, by encouraging the purchase of larger houses and the take up of bigger loans, tax deductions might drive housing prices and mortgage interest rates up, thus having the perverse effect of discouraging homeownership. This chapter, therefore, aims to establish whether in the United States the mortgage interest deductibility ultimately manages to reach its goal of supporting homeownership despite the insensitivity to costs of owning of some beneficiaries and the potential distortions arising from general equilibrium effects. To answer this question, the research design exploits the fact that American states are free to set and revise their state income taxes, including those directly impacting the potential benefits from mortgage interest deduction. In particular, the empirical strategy builds on across- and within-state variation in individual marginal income tax rates, which affect the amount of subsidy, and in standard deduction level, which has an impact on the proportion of itemising taxpayers. By relying on the major changes in fiscal policies across the states before the crisis and an identification strategy based on difference-in-differences approach, the study shows that there was a positive development in homeownership rates in states that provided more generous benefits for homeowners relative to states that didn't change their tax rules over the same period. Thus, this chapter concludes that despite possible adverse general equilibrium effects, the mortgage interest deduction in the US seems to have positive effects on overall homeownership rates.

The second chapter proceeds by uncovering the topic on how peers' financial decisions might affect one's own financial behavior. In particular, it studies whether learning about peers' investment choice to participate in risky assets increases the likelihood of a household itself to participate in such markets. There are numerous reasons outlined in the literature for why this might happen and which, using the terminology of Bursztyn et al. (2014), can be aggregated in two main groups: *social learning* and *social utility*. The first refers to the fact that acquisition of potentially costly information about financial investments by learning about investment opportunities, directly from financially sophisticated peers or indirectly through their choices, could decrease information costs of entry into the financial markets and facilitate participation. The second refers to the fact that there might be some utility associated to behaving similarly to others, the so-called *social utility*, which could further enhance financial market participation. However, only a limited number of studies to date have tried to disentangle the two channels, and their conclusions are mixed. The chapter *Peer effects in stock market participation: Evidence from immigration* contributes to this body of knowledge by studying whether there exist peer effects in the decision to invest in risky assets and what are the channels driving them. To answer these questions, this research exploits the variation in the population composition of Luxembourg municipalities and in the investment attitudes of its residents. In particular, it studies whether native-born Luxembourgish tend to invest similarly to their foreign peers. In this context, the identification of the peer effect is possible for three reasons. First, roughly half of the Luxembourg population is foreign born, and thus the likelihood of a native being exposed to foreigners

and getting familiar with their financial behavior is high. Second, immigrants from different countries have different financial attitudes, which are to some extent attributable to their cultural inheritance. Third, municipalities are heterogeneous in their immigrant population composition and thus, there is enough variation in foreigners' stock market participation rates. For these reasons, it is possible to use an instrumental variable strategy to identify the peer effect of immigrant financial decisions on the investment choices of natives. In particular, this work uses lagged stock market participation in the country of origin of immigrants as an instrument for immigrant stock market participation in Luxembourg. To understand whether the peer effects are driven by *social utility* or *social learning*, channels that could account for *social learning* are shut down and the remaining effect is attributed to *social utility*. To account for *social learning*, such variables as financial literacy, one's employment in financial sector, as well as the proportion of neighbors employed in financial sector are included in the regression specification. The results show that there is positive and significant effect of peers'□□ stock market participation on one's own participation decisions, meaning that the more of one's foreign peers invest in stock market the more is a native likely to invest in stocks herself. Moreover, we find that both *social utility* and *social learning* channels matter in the transmission of these peer effects. In line with the previous literature (e.g., Bursztyn et al., 2014), we also find that the higher is the proportion of financially sophisticated peers, the more likely one is to invest in stocks. This finding can be indicative, however, not only of a strong presence of *social learning*, but also of the supply effect from those working in the financial industry through social interactions and potential promotion of mutual funds products. The results are important since they provide empirical evidence that the financial behavior has potential spillovers, and therefore financial education has arguably positive externalities. However, they also show that, since *social utility* matters too, there is some herding behavior associated to stock market participation, which might amplify adverse effects of asset sales in times of crisis.

The third chapter *Gender Differences in Wealth and the Role of Financial Literacy* seeks to uncover the relationship between financial literacy and wealth inequality. In particular, it studies how differences in financial knowledge between women and men contribute to the differences in their accumulated financial wealth. To set the stage for the analysis, the chapter starts off by observing that women, on average, are less financially literate than men and, in the same time, have less financial wealth. To quantify the impact of the differential financial knowledge on the gender wealth gap, the difference in financial wealth between women and men is decomposed both at the means and across the financial wealth distribution following Blinder-Oaxaca (Blinder, 1973; Oaxaca, 1973) and re-centered influence function regressions (Firpo et al., 2009) approaches. The results show that differences in financial literacy between women and men account for between 30% and 40% of the explained difference in financial wealth and its importance increases along the wealth distribution. Unsurprisingly, the difference in the knowledge about the most complex and the most relevant in our framework concept for financial wealth accumulation, namely risk and portfolio diversification, plays the most important role in explaining the wealth differential. Moreover, this is also the concept for which the difference in knowledge between women and men is the largest. If proven causally, the results of this chapter have profound implications for the need of wide-spread financial education. In line with the results of Calvet et al. (2007, 2009a,b) that better educated investors commit less financial mistakes, this chapter finds that more financially sophisticated households are able to accumulate more financial wealth. This leads to a conclusion that financial education is crucial to tackle wealth inequality since it has a potential to provide those at the bottom of the wealth distribution with tools to deal with day-to-day financial decisions and to reach greater economic well-being.

The thesis proceeds as follows. Three main chapters provide detailed summaries of previous related research, discuss methodological approach and present the results of the empirical analysis. The final chapter concludes by summarizing the key findings of the thesis and discusses policy implications and avenues for future research.

Chapter 1

Implications of Fiscal Policy for Housing Tenure Decisions

1.1 Introduction

Many of the world's wealthy countries provide fiscal incentives to homeowners. However, the impact of such tax breaks on housing tenure decision is unclear. Many existing policies, aimed at promoting house purchases and widely used among taxpayers, have proved to be both expensive[1] and not targeted, thus creating controversy about their overall effect. This paper aims to shed light on the effectiveness of such fiscal incentives by providing empirical evidences on their impact on housing tenure decisions. Specifically, this work focuses on the effect of mortgage interest deduction (MID) on home-ownership in the United States.

To build understanding on how housing tenure decision is affected by fiscal policy is important for several reasons. Firstly, housing wealth is arguably one of the most basic needs for many families in developed countries. It is the main asset, while the associated mortgage is the main liability for many households. Housing determines families' economic well being by affecting their consumption (Sierminska and Takhtamanova, 2012; Li and Yao, 2007; Bostic et al., 2009), and serving as a mean of saving (Yao and Zhang, 2005) and a collateral (Cooper, 2013). It has also been shown that owning a house contributes to the psychological well being by providing families with a sense of security (McCarthy et al., 2001) and enhancing life satisfaction (Rohe et al., 2013). Despite the importance of the investment in housing wealth, there is no consensus on how homeownership should be supported. Both design and intensity of fiscal incentives available to homeowners vary substantially among countries. Moreover, existing empirical evidences and theoretical predictions of whether housing related tax breaks have any effect on homeownership, and if yes, what is their impact, are mixed. The aim of the proposed study, thus, is to address this issue by identifying the effect of the MID on the decision to own a house.

To answer this question, the panel survey data from PSID for the period 2001 to 2011 is used. To identify the effect of MID on the home ownership, this paper analyses two channels through which MID affects user cost of housing: first, changes in personal state income tax rates; second, changes in the standard deduction allowed at the state level. Variation in these fiscal policy parameters allows for the identification of the causal effect of MID on home ownership for several reasons. Firstly, in presence of MID, higher marginal tax rates lead to higher tax savings from housing, other things been equal. Thus, since mortgage interest payments are deducted from taxable income, the higher is the marginal tax rate household faces, the higher are its tax savings and the lower is the user cost of housing. Secondly, lower standard deduction increases a fraction of households that qualify for this program. This is because MID is an itemized deduction and, thus, can be filed for only in case overall amount of itemised deductions exceeds the standard deduction. Therefore, increase in the amount of standard deduction at the state level implies that less homeowners could qualify for mortgage interest deduction, and vice versa, the lower is the standard deduction, the higher is the proportion of itemisers. Finally, each state is free to decide whether to impose state income tax and allow for mortgage interest deduction. Both state-level standard deductions and personal income tax rates are set independently by each state and were revised several times during the analysed period. Although the time of announcement varies from state to state, Internal Revenue Service announces tax rates, tax brackets and standard deduction in the provision normally published in the end of the year preceding the fiscal year in question. Given very short announcement period, this fact creates a quasi-experimental set up allowing for difference-in-differences estimation strategy. Therefore this study identifies the effect of

[1] According to *The Economist*, in 2013 tax revenues forfeited because of mortgage interest deductibility amounted 0.6% of GDP (The Economist, 2015).

MID on housing tenure decision by exploiting variation in state marginal tax rates and standard deduction.

The identification of the effect of MID on home-ownership proposed in this paper relies on large changes in fiscal policy. The largest of these changes led to an increase in income tax rate by as much as 23,9% and to a decrease in the standard deduction by 7,2% between 2002 and 2004.

The estimates suggest that increases in income tax rates in a state that allows mortgage interest deduction is associated to a 3 percentage point increase in home-ownership relative to states that didn't change their fiscal policy. Furthermore, in states where more households were able to qualify for MID because of the lower standard deduction, home-ownership increased by 4 percentage points relative to control states.

Thus, this study suggests that MID has a positive effect on home-ownership decisions and that increase in fiscal incentives to homeowners resulting in greater tax savings related to housing have positive impact on housing ownership decision. The results are robust to a range of alternative specifications and have wide ranging policy implications.

This paper proceeds as follows. Section 1.2 reviews the US law related to mortgage interest deduction and summarises main previous research findings. Section 3.2 discusses theoretical framework and strategy for estimating the effect of mortgage interest deduction on homeownership decision. Section 3.3 discusses data and sample selection. Results are discussed in the Section 3.4 and robustness analysis in Section 1.6. Section 3.5 concludes.

1.2 U.S. Fiscal Policy and Homeownership Incentives

Currently, when a household decides to finance the purchase of its first or second residence with the mortgage, it can benefit from fiscal incentives by reducing its taxable income by the amount of paid interests. This deduction applies to the interests paid on the first and/or second mortgages used for buying, building or improving the house and to any other home equity debt. The interest payments that can be deducted are those paid on the first $1 million of a total mortgage debt and the first $100,000 of home equity debt (or $500,000 and $50,000 respectively if married and filed separately). [2] Any household can file for mortgage interest deduction within the set limits as long as its total amount of itemised deductions exceeds the level set by the standard deduction. [3]

The use of mortgage interest deduction is widespread among the US taxpayers, although the amount claimed vary from state to state. For example, in California mortgage interest payments claimed per filer are the highest among the US states [4]. In the year 2000 this amount was $ 13, 247 and grew up to $ 15,756 over the decade. It peaked around 2006-2008 reaching $ 19k of mortgage interests paid per claimant, which translates into $ 4,750 of tax savings for an individual in a 25% tax bracket. Although in the state with the lowest mortgage interests claimed per filer, namely in Oklahoma, its amount is roughly half of that in California, it was still ranging around as high as $7,000 between 2000 and 2010. The general tendency across all the states was that mortgage interests paid per filer reached maximum levels between 2006 and 2008 and decreased afterwards possibly due to the fact that some household moved to the rental dwelling. Proportion of filers who claimed mortgage interest deduction, however, remained quite constant overtime, ranging from around 37% in the state with the highest incidence, namely Maryland, to 15% in West Virginia and North Dakota as of the year 2010.

[2] Federal limits are set by IRS Publication 936.

[3] Otherwise household can file for the standard deduction.

[4] Further details can be found in Appendix.

According to the US tax law, households can potentially benefit from mortgage interest deduction (MID) filing for both federal and state tax purposes. Although federal rules apply to all the of taxpayers in the US, states have a great degree of autonomy when deciding on their fiscal policy and not all of them allow MID for state income taxation purposes. In particular, households can deduct mortgage interest payments in 32 states out of 51 (including District of Columbia). Out of remaining 19 states which do not allow MID, 12 states impose income tax while 7 states have no income tax levied. The intensity of taxation also varies greatly among the US states. District of Columbia and Rhode Island, for example, are the states that were charging the highest average tax rates, of more than 7%, in the beginning of 2000's while in Pennsylvania the flat rate was as low as 2,8% during the same period. Next, not only income tax rates vary greatly across states and within state across time, but also standard deduction allowed at state level is different for many states. Some of the states closely follow federal rules in setting standard deduction, which means indexing its level by inflation. Others, however, follow their own policy track in setting this amount. The highest level of standard deduction, for example, is allowed by the state of New York where it didn't change for single or separately filing individuals during the 2000's. Finally, most of the states adjust their fiscal policy frequently and, thus, many of them modified at least some of the parameters associated to income taxation during the observed period by varying tax rates, or tax brackets, or both.
Hence, the US tax code in part that is related to individual income taxation is a complex system which changes frequently over time and varies largely across states. This fact creates an insightful set up for analysing effects of fiscal policy, and in particular, of mortgage interest deduction, on housing tenure decisions.

1.2.1 Controversy about mortgage interest deduction

The original aim of mortgage interest deduction (MID) is to promote homeownership and to support housing demand but there is no agreement on the effectiveness of its design to reach this goal. On the one hand, this policy is widely accessible and used, and provides generous tax deductions. In the US, more than 25% of tax filers and more than 48% of homeowners claimed MID in 2011 with the average refund of $1,906 per claimant (see Keightley, 2014). The fact that not all of the homeowners can benefit from the mortgage interest deduction is because of the eligibility criteria: to benefit from MID total amount of itemised deduction must exceed standard deduction level. On the other hand, MID is frequently blamed for targeting families who are less in need of a support. The controversy about the implementation of the policy that supports housing demand in the form of tax deduction is twofold. First, as documented in Morris and Wang (2012), MID has an undesired redistributive effect due to the progressivity of tax system. In particular, since the refund obtained increases with income, because of the fact that taxation is progressive, wealthier households are those who benefit the most from the policy. Secondly, the refund increases with the mortgage taken out and, thus, with the value of the house purchased. The consequence of these two features of the fiscal incentive design is illustrated in Poterba and Sinai (2008): the average tax savings from mortgage interest deduction were almost $ 5,500 for the wealthiest taxpayers, while less the $100 for those in the bottom of the income distribution as of the year 2004. Hence, given the fact that tax refund increases with income and with the value of the house, that income profile, in its turn, increases with age, and that MID does not address the down payment requirement, this policy does not provide a substantial support to young families planning to become first time home-owners, while offers significant benefits to the families that would purchase a house without any subsidy. These facts create ambiguity about the

overall effect of such a policy.

1.2.2 Previous Research

The relation between the US tax code and homeownership rates is a vivid argument of both popular and academic discussions. Most non-academic literature emphasises ineffectiveness of preferential taxation of homeowners to reach its original goal to support homeownership due to the fact that it does not address downpayment and favours mostly the wealthiest households (e.g., Keightley, 2014). However, there is no such a consensus among scholars.

Indeed, conclusions of the academic literature that studies the impact of taxation on the evolution of homeownership rates are mixed. Moreover, there are only few attempts to analyse empirical evidences, despite the existence of extensive and well developed theoretical works. A body of research that establishes the link between mortgage-related tax breaks and housing tenure decisions was originated in seminal works of Rosen (1979) and Rosen and Rosen (1980). They find that differences in the relative prices of renting and owning the residence determines the choice between the two and that higher net price of housing services generated by an owner-occupied dwelling may discourage homeownership. Federal tax system, according to these works, drives this difference by subsidizing owner-occupied housing and, therefore, have important impacts on the percentage of home owning households. Rosen and Rosen (1980) further investigate the effect of the provisions of the federal personal income tax and explain nearly a quarter of the growth in the proportion of homeowners in the post-World War II period by the tax system's favourable treatment of owner-occupied housing.

Researchers have examined several channels through which preferential housing taxation affects tenure choice. Dìaz and Luengo-Prado (2008) analysed the life cycle model of housing demand and showed that both the fact that owner-occupied housing services are not taxed and that mortgage interest payments are deductible have a substantial effect on the difference between user cost of housing and its rental price. They further noticed that the effect of the former is greater and that the main determinant of this spread is income tax rate. Study by Poterba (1984) investigates the effect of favourable taxation on the user cost of homeownership in presence of rising inflation. Author finds that persistent high inflation rates along with tax deductibility of mortgage interest payments make homeownership more attractive and may, therefore, explain housing investment. The reason for this is that inflation both increases the homeowner's interest charges, by pushing up nominal interest rates, and leads to larger nominal capital gains on houses. However, nominal mortgage interest payments are tax deductible and the capital gains from house appreciation are untaxed. Therefore, increase in the rate of expected inflation along with such a taxation raises tax subsidy to owner occupation and, thus, reduces user cost of housing and favours ownership. Gervais (2002) studies wedge between return on housing capital and that on business capital by employing dynamic general equilibrium life-cycle model. He finds that this spread is generated by the failure to tax imputed rents and is amplified by mortgage interest deductibility. He finds two effects of the elimination of the latter: first, it would increase the user cost, and therefore, if house prices were to remain unchanged, would depress homeownership; second, individuals would delay decision to buy a house which, in its turn, would increase the rental housing stock at the expense of owner-occupied housing.

The benefits from tax savings related to housing are not equally distributed among taxpayers, however. Poterba (1992) finds that more than half of tax savings from mortgage interest deduction were concentrated among less than 10 percent of the wealthiest tax payers after tax reforms in the 1980's. He

also argues, that these reforms made rental real estate investment less attractive by effectively reducing housing-related tax incentives for all income groups. In fact, provisions of the reforms decreased marginal tax rates and increased standard deductions. Reductions in marginal tax rates lowered the value of tax-exempt imputed income for homeowners, which mostly affected high-income individuals. The result of the latter was ceasing by a large portion of tax payers, mostly low- and middle-income one's, itemising prior to the reform to itemize after. This finding is confirmed by Hilber and Turner (2014) who show that, although MID increases homeownership, it does so only for higher-income individuals in relatively unregulated housing markets. Finally, Poterba and Sinai (2008) find that distribution of tax savings from mortgage interest deduction varies not only with income, but also with age and that they are the highest among young, high-income individuals that own expensive houses and have high marginal tax rates. They also find that removing mortgage interest deduction or taxing imputed rental income on owner-occupied housing will raise the average user cost, if no changes in loan-to-value ratios occur. This strand of literature concludes, therefore, that one part of the rapid development of homeownership rates in the second half of 1900's can be attributed to tax breaks home owners enjoy in the US.

However, there is a rich body of research that presents evidences in favour of the opposite view. In particular, this literature emphasises the distortionary or no effect of existing tax system on homeownership. On the one hand, Sommer and Sullivan (2014) find negative effect of fiscal incentives on homeownership rates. Specifically, they use dynamic model of housing tenure choice to analyse the effect of the tax subsidies related to housing on equilibrium house prices and homeownership. Authors find that evoking existing tax breaks, including mortgage interest deduction, would lead house prices to decline and would, therefore increase homeownership.

On the other hand, there are several studies, that find no link between tax incentives and the tenure decision. Among such is Glaeser and Shapiro (2002) who claim that home mortgage interest deduction is a poor instrument for encouraging homeownership because it is targeted at the wealthy, who are most always homeowners. To support their argument, authors use variation in inflation and standard deduction. Using time series tests, they show that, despite the fact that ownership subsidies changed significantly between 1956 and 2002 due to fluctuations in inflation rates, homeownership rate has stayed essentially constant over the second half of 1900's. They also find no evidence of effectiveness of mortgage interest deduction as a policy promoting homeownership by testing whether changes in the degree of itemisation, that varies with the level of standard deduction, affected levels of homeownership. Next, Chambers et al. (2009b) study effects of the progressivity of income taxation on homeownership in the framework of an overlapping generations model. They find that its reduction may mitigate asymmetries created by the preferential tax treatment of homeowners by decreasing equilibrium interest rate and rental price and, therefore, increasing homeownership. More progressive income taxation, instead, makes the mortgage interest deduction more valuable and, thus, introduces an incentive to purchase larger homes, but leads to a decrease in the total number of homeowners. Elimination of mortgage deduction, however, has small overall effect on homeownership. This is confirmed in Hanson (2012), who finds that MID creates an incentive to buy a larger house but does not have any effect at the extensive margin. Finally, Gervais and Pandey (2008) claim that eliminating mortgage interest deduction would have little impact on the user cost because households would modify their loan-to-value ratios in response. They conclude that preferential taxation of owner-occupied housing creates only distortions in the housing market and benefits households that most probably are already owners.

Several works provide explanations of the recent growth of the homeownership alternative to tax sys-

tem favouring ownership. Chambers et al. (2009a), for example, examine the role of such factors as mortgage innovations and demographic characteristics in the boom of homeownership in the late 90's-early 2000's. They find that mortgage innovation largely contributed to this increase whereas demographics is found to be less important. Further, they attribute at least half of the increase in homeownership after 1940 to the introduction of the conventional fixed rate mortgage. In their other study Chambers et al. (2009c) explore another channel of the housing tenure decision making. In particular, they study the impact of alternative mortgage structure on the housing finance decision and find it to have important implications for both tenure choice and the size of the home consumed. They further show that preferred mortgage structure depends on age and income and that loan products with low initial payments maybe an alternative to mortgages with no downpayment. They also emphasise the role of inflation which reduces the real value of the mortgage payments and the outstanding loan.
Thus, this strand of literature concludes, that housing tax provision, if anything, generates asymmetries on housing markets and does not improve homeownership rates. This view contradicts to the findings of the research which explains recent increase of homeownership rates by preferential tax treatment of owner-occupied housing. Therefore, given the controversy of the conclusions and the fact that the literature addressing this question is mostly represented by theoretical research while very few studies attempted empirical analysis, more work is needed in order to establish the effect of tax savings available to homeowners, and in particular that of the mortgage interest deduction, on housing tenure decision. [5]

1.3 Methodology

1.3.1 Theoretical Framework

The focus of this study is the analysis of the effects of the fiscal policy on housing tenure decision. This decision potentially depends on a range of socio-demographic and economic household characteristics, as well as on the relative cost of buying the house as opposed to renting it. Broadly speaking, household will decide to switch from renting the house to owning it once rental payments exceed the user cost of ownership.
There are several mechanisms through which the user cost of owner-occupied housing might be altered. The most influential works that present formal analysis of such channels are Glaeser and Shapiro (2002) and Poterba (1992). Following their definition, the user cost of owner-occupied dwelling, UC, is given by the ratio of imputed rental value to house price, RH/P_hH, where R is an imputed rental price for a unit of housing, P_h is a capital price per unit of housing and H is the quantity of housing. [6]

[5] Among other studies that analyse relation between taxation and homeownership are Hines (2013), Aaron (1970) and Dougherty and Order (1982). There are also several other studies that analyse the demand for housing. However, they do not emphasise the role of taxation in a tenure decision. Among these works are Bajari et al. (2013) that estimate a dynamic model of demand for housing, introducing down-payment constraints and non convex costs of adjustment to housing shock as key frictions. They find that because of this frictions households don't adjust housing stock frequently. Negative home price shocks allow renting households to upgrade earlier in the life-cycle. But if these shocks occur along with negative income shocks, then housing demand becomes lower for young and middle aged households. Further, these kinds of shocks do not lead to a change in housing stock for older households, as they have already reached their optimal home size. Attanasio et al. (2012) model individual demand for housing over the life cycle and show that higher house prices lead households to downsize rather than to stop being owners and that individuals delay purchasing their first home when incomes are low or uncertain.

[6] The user cost of homeowner is defined differently in Dìaz and Luengo-Prado (2008). They describe ex post user cost is a present value of the sum of maintenance costs and property taxes (net of deductions), current and appropriately discounted

If homeownership were taxed for its real economic profits, then net-of-tax income from owning a home worth $P_h H$ with imputed rental value RH for an owner with a marginal tax rate τ, would be

$$(1-\tau)[RH-(i+\tau_p+d-\pi)P_h H] \tag{1.1}$$

In this expression, i denotes nominal interest rate which measures the owner's interest payments and/or forgone equity cost. π is inflation rate or, in other words, owner's nominal capital gain. For the sake of simplicity of the exposition, it is assumed that house prices appreciate at the overall inflation rate.[7] τ is marginal income tax rate and τ_p is deductible property tax rate. d is the total maintenance and depreciation cost which is assumed to be the same for renters and owners (differently from Glaeser and Shapiro (2002), who assume it to be different in order to emphasise agency costs involved in renting).

In equilibrium, the net income from homeownership is zero (by zero profit condition), therefore, the free-market user cost of housing equals to a sum of the costs associated to ownership (cost of the outstanding mortgage, opportunity cost, property taxes, depreciation and maintenance costs) minus expected capital gain:

$$UC * P_h = (i+\tau_p+d-\pi)P_h = R \tag{1.2}$$

However, the preferential taxation of homeowners permitted by the US tax code, introduces a distortion in the user cost. Under the US taw law, the cost of homeownership depends on whether the owner itemises its deductions, marginal tax rate he faces and the nominal interest rate he pays.

If a household itemises its deductions independently of a housing tenure status, then it has enough allowable expenditures (e.g., medical expenses or charitable contributions) to exceed the threshold set by the standard deduction . If such a household were a homeowner, then its per unit cost of housing would be :

$$UC' * P_h = [\theta i(1-\tau)+(1-\theta)i(1-\tau)+\tau_p(1-\tau)+d-\pi]P_h = R-\tau(i+\tau_p)P_h \tag{1.3}$$

where θ is the fraction of the house that is financed with the owners' capital and $1-\theta$ can be viewed as a loan-to-value ratio.

When, on the contrary, a homeowner never has enough expenditures to itemise, his per unit cost of housing is:

$$UC'' * P_h = [\theta i(1-\tau)+(1-\theta)i+\tau_p+d-\pi]P_h = R-\tau\theta i P_h \tag{1.4}$$

Nonitemizers cannot claim mortgage-interest deductions and their after-tax cost of borrowing is simply i. However, the equity they invest in the house could have earned $(1-\tau)i$ had it been invested elsewhere. As further noted by Glaeser and Shapiro (2002), per unit cost of housing for nonitemizers

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future transaction costs, the forgone return to home equity, and the cost of the mortgage (net of possible deductions) minus capital gains. The main difference between the rental price and user cost is that rental income from housing is taxable while services from owner-occupied housing are not. This fact is reflected in the rental price. Further, user cost may vary with mortgage loan-to-value ratios because of the tax deductibility of mortgage interest payments. In particular, under assumptions that house prices are constant and there are no buying costs, the user cost of homeowner i is given by $uc^i = (1-\tau_y)r^f + \frac{(1-\tau_y)(M^i(\hat{r}^m-\hat{r}^d)+\Gamma^i)}{\hat{r}^d+\delta^h+\hat{\tau}_h} r^f$. M^i is the mortgage loan-to-value ratio for household i. Γ^i are selling costs, $\hat{r}^m$ the after tax mortgage interest rate ($\hat{r}^m = (1-\tau_m\tau_y)r^m$) , $\hat{r}^d$ after tax return on deposits ($\hat{r}^d = (1-\tau_y)r^d$), r^f is the after-tax rental price of one unit of housing stock which structure is assumed using asset pricing theory and which is equal to $r^f = \frac{q-\frac{1}{1+\hat{r}^d}q(1-\delta^h-\hat{\tau}_h)}{1-\tau_y}$, where q is the constant house prices. Houses depreciate at the rate δ^h. Income tax is denoted by τ_y, deduction percentage by τ_m, proportional effective local property tax on housing is $\hat{\tau_h} = (1-\tau_y)\tau_h$ and it is fully deductible from income taxes. Imputed housing rents for homeowners are tax free.

[7] This assumption can be relaxed and does not affect the conclusions of the theoretical specification presented in this section.

is increasing with debt-financing. Therefore, nonitemizers as opposed to itemisers face tax-created incentives to put everything ($\theta = 1$) into their home because the capital gains in that asset are not taxed. Furthermore, if $\theta = 0$, meaning that homeowner uses all-debt financing, such a nonitemizer receives no subsidy. Therefore, home mortgage provides an incentive for owners who don't itemize to invest more in housing.

Finally, if a household claims standard deduction, D, in the absence of privately-owned residence, but its mortgage interest payments would have been high enough to allow it to itemise deductions were it a house owner, then this household would file for itemised deduction only if owned a residence and standard deduction would become an opportunity cost. In his case the user cost of housing is:

$$UC''' * P_h = [\theta i(1-\tau) + (1-\theta)i(1-\tau) + \tau_p(1-\tau) + d - \pi]P_h + \tau\frac{D}{H} = R - \tau(i+\tau_p)P_h + \tau\frac{D}{H} \quad (1.5)$$

Given this form of the unit cost of housing, the benefit from owning (as opposed to renting) can be derived. It is given by the difference between the free market cost of renting and the cost of owning. If individual itemizes when he is both an owner and a renter, his benefits from owning a house of fixed size per dollar spent on housing are (see Appendix 1.8.2.1 for the derivation of the user cost of housing in terms of real interest rate)

$$\tau(\bar{i} + \pi + \tau_p) \quad (1.6)$$

where $\bar{i}$ is the real interest rate.

If individual does not itemize in either case, then the incentive to own relative to the cost of housing is

$$\tau\theta(\bar{i} + \pi) \quad (1.7)$$

Finally, if individual itemises only when he owns and claims the standard deduction in the other case, then his cost total cost of renting is $RH - \tau D$, while his user cost of housing is affected only by the amount he itemises. [8] Therefore, his incentive to own per dollar spent on housing equals to:

$$\tau(\bar{i} + \pi + \tau_p) - \tau\frac{D}{P_h H} \quad (1.8)$$

To summarise, tax code creates subsidies to homeowners by allowing them to deduct their mortgage interest payments from the taxable income. These incentives increase with marginal tax rate[9], interest payments and are higher for households who itemize their deductions. Among nonitemizers, the

[8] To see why standard deduction affects user cost only in the case when individual claims itemised deduction if he is an owner and standard deduction otherwise, consider all three cases. First, if individual claims itemised deduction if he is both owner and renter, then he has enough deductible expenses not related to housing. These other deductions, therefore, do not depend on the price of the house and costs and gains associated to it. Thus, the amount of itemised deduction which is not related to housing and will stay the same independently of ownership status will not affect expression for benefits of owning relative to renting (it is deductible in both cases, and, thus, appears both on the left hand side and the right hand side of the expression in the same quantity) and, hence, can be omitted. Second, if individual does not itemize in neither case, then he claims standard deduction independently of tenure choice. Therefore, both his potential rent (right hand side) and user cost of housing (left hand side) are decreased by the amount of standard deduction, which does not depend on ownership, and, can be omitted as well. If, however, individual claims standard deduction only when he is a renter but itemises when he is an owner, then the only expenses he can itemize are those related to housing. Therefore such an individual faces the tradeoff: in case he stays a renter, his rent is decreased by standard deduction; if, however, he owns, then he can claim itemised deduction, loosing his right to claim standard deduction. Thus, standard deduction affects renting cost, and, therefore, changes the user cost and enters in the final expression for the benefits of owning relative to renting.

[9] This is the case for all the individuals. For households who itemize only when owns, benefits of owning relative to renting increases in τ only if $\bar{i} + \pi + \tau_p > \frac{D}{P_h H}$, meaning that itemised expenses exceed standard deduction. Note that it will always be the case, since we assumed that individual itemises when he owns. Therefore, his benefits are always positive and increase with marginal tax rate.

incentive to own increases only for those buyers who pay for a significant fraction of their own homes. For households who itemise only when they own the residence, the higher is the level of standard deduction, the lower is the benefit of owning relative to renting. Thus, increase in standard deduction increases the user cost of owning, and thus, may reduce homeownership. Hence, it can be concluded, that incentives provided by the tax system reduce the user cost of ownership and induce both to own homes and to consume more housing. These incentives are higher for those who itemize and for individuals who face higher tax rates. These clear theoretical predictions can be tested empirically, and, thus, will guide our identification strategy.

1.3.2 Empirical Framework

1.3.2.1 Identification Strategy

As follows from the previous discussion, the difference between the imputed rent and the user cost of owner-occupied housing is generated by fiscal incentives available to homeowners and depends not only on market's and owner's characteristics, but also on a range of fiscal policy parameters. The baseline rule to understand the dollar amount of the tax savings due to mortgage interest deduction depends on whether individual is eligible for such deductions, the tax bracket he is in, and on the amount of interests paid on the mortgage. Broadly speaking, if a household is in 25% tax bracket, can itemise and mortgage interest payments are fully deductible, then it can save 250 US$ for every 1,000 US$ of mortgage interest.
In order to identify the effect of mortgage interest deduction on homeownership, several sources of exogenous policy variation could potentially be used. The main channels through which fiscal policy may alter dollar amount of tax incentives to own a house, thus, affecting the housing tenure decision are the following:

- **Change in the total limit of the mortgage and home equity eligible for the deduction.** In the theoretical framework adopted in this study, it is implicitly assumed that mortgage interest payments are fully deductible (see Appendix 1.8.3 for an extension of the definition of the user cost). Dìaz and Luengo-Prado (2008) modify this assumption and study how the extent to which mortgage interests can be deducted may alter the gap between rental payments and user cost of owning. Authors show that despite the fact that when mortgage interest payments are not fully deductible or cannot be deducted at all, mortgages become more expensive, this channel does not lead to major changes in the relative price of owning the house . The reason for this is that households respond to the changes in the limits up to which they can deduct by revising their debt holdings. Hence, when the mortgage interest payments deductibility limits decrease, the debt holdings decrease as well while rental price remains unchanged. Thus, the user cost rises only slightly. From the empirical point of view, in the US, there are large across state differences in the overall adoption of mortgage interest deduction: some states allow deductibility, whereas others do not; but there has been no time variation in this policy over the last few decades. The amount of the mortgage and home equity on which interest payments can be deducted applies to all the taxpayers and were changed last time in the 1980's.

- **Change in marginal tax rate**. This channel naturally follows from the theoretical framework in spirit of Glaeser and Shapiro (2002) and Poterba (1992) proposed in this study. As can be seen from Equations 1.6 and 1.7, the benefit from owning the house, rather than renting it, is increas-

ing in income tax rate. One study that points out the importance of the marginal tax rate to the relative cost of owning the house is presented in Feldstein (1995). He summarised the important role of income tax rates in driving the difference between relative prices of deductible and non-deductible consumption in general. He noticed that decrease in marginal tax rates causes a reduction in deductible expenditures by decreasing the relative price of ordinary consumption relative to the price of tax-favored consumption. One example of such a consumption, considered by Feldstein (1995), is mortgage payments. Furthermore, according to Dìaz and Luengo-Prado (2008), this channel is the main driver of the wedge between user cost and rental payments. According to their model, when income tax decreases, the rental price decreases while the user cost increases. Thus, the difference between the two is reduced. However, the opposite occurs when the tax rate increases: the higher is the tax rate, the lower is the user cost and, therefore, the higher is the difference between user cost and rental price. Therefore, their study confirms that the difference between the two increases with marginal tax rate. To illustrate this point, consider the example made in the beginning of this section. If marginal tax rate increased from 25% to 30%, then dollar amount of tax savings would increase by 50 US$ for every 1,000 US$ of mortgage interest (the decrease in tax rate would work in a similar fashion).

- **Change in the standard deduction**. Mortgage interest deduction is an itemised deduction. Therefore, only those households whose total amount of itemised deductions exceeds the limit set by the standard deduction will benefit from this incentive. Coming back to the previous example, if the total amount of the itemised deduction is 1,000 US$, while the limit set by the standard deduction is 900 US$, then the household will file for the mortgage interest deduction. However, if the standard deduction were raised up to 1,100 US$, the household would not claim mortgage interest deduction. Therefore, as noticed in Poterba (1992) and Glaeser and Shapiro (2002), the use of homeowner deduction would increase if standard deduction were decreased because homeowners would be more likely to itemise their tax deductions. Poterba (1992) further develops this point by noticing that the Tax Reform Act of 1986 raised the standard deduction in the US which resulted in a decline of the number of taxpayers itemising their tax deductions. He further shows, that for low- and middle-income taxpayers, for whom marginal tax rates were not changed significantly by the tax reforms of 1980's, the switch from being an itemiser to claiming the standard deduction was the largest effect of the tax reform on homeownership costs. He shows that the discrepancy between the actual and true economic user cost of homeownership is smaller if a given household does not itemize than if it does. This can be seen from Equation 1.8, which shows that the benefit of owning the house rather than renting it decreases with the level set by the standard deduction, and from Equations 1.6 and 1.7, which demonstrate the tax savings are higher for owners that itemize than for those that don't. Finally, Glaeser and Shapiro (2002) state that, if the tax subsidy is at all important, then homeownership would fall when standard deduction were increased. Therefore, changes in the standard deduction cause changes in the degree of itemisation, thus potentially leading to changes in the homeownership.

To summarise, there are three main channels through which fiscal policy may affect tax savings related to housing, thus, affecting the incentive to become a homeowner. These channels are the degree of mortgage interest payments deductibility, marginal tax rate and standard deduction.

The straightforward way to study the causal relation between MID and homeownership would be to exploit the variation in the amount of mortgage interests eligible for the deduction which would provide an immediate insight into the effects of this policy. This approach faces several challenges for

an identification, however. Firstly, major changes in the regulation of mortgage interest deduction that revised limits of the eligible interest payments, such as, for example, those introduced by the Tax Reform Act of 1986, affected all the population. This variation, although potentially represents an interesting research design, cannot help in the identification of the causal effect of MID on homeownership. This is because such a massive reform affected all the tax payers and there is no counterfactual group in order to identify the effect of this policy reform. Moreover, using only time variation on the federal level, as has been done in the previous studies, may confound the results since there is no proper control group. On the other hand, thanks to the autonomy granted to the states in managing their own fiscal policy, there is a large across-state variation in the adoption of the policy: there is a number of states that allow for the mortgage interest deduction while others do not. However, during the observed period for which data is available, there were no states, to the best of our knowledge, that implemented or eliminated the policy to allow for a within state variation[10] and simple across-state comparison of outcomes will provide biased estimates of the results if fiscal policy in general and MID in particular are correlated with unobservable states characteristics. Finally, following theoretical contributions, the degree of mortgage interest payments deductibility is found to have no significant effects on housing tenure choice because households tend mitigate it by changing their loan-to-value ratios.

In order to overcome these challenges in the identification, this study proposes a unique empirical strategy. In particular, I exploit both across and within state variation in the intensity of fiscal incentives to homeownership in a difference-in-differences framework. The sources of this variation are changes in state marginal income tax rates and in state standard deduction.

Such an identification strategy is possible for several reasons. Firstly, different states changed income tax rates and standard deduction at different times, while other states didn't have any changes in fiscal policy related to housing market during the analysed period Secondly, not only the timing of the reforms was different among the states, but also marginal tax rates were changed by different amounts for various income groups Next, there were no changes in the total limits of the mortgage and home equity eligible for MID on neither the federal nor the state level between 2000 and 2011. Finally, both marginal tax rates and the level of standard deduction are found, in the theoretical literature, to have potentially major effects on the wedge between the user cost and rental payments if tax subsidies have any effect on the tenure decision - a finding that can be tested with the proposed research design. Therefore, to identify the effect of mortgage interest deduction on the decision to own the residence this study will use exogenous policy variations in marginal tax rates and standard deduction.

1.3.2.2 Modelling housing tenure decision

Housing tenure choice depends on the user cost of housing and on a range of household inputs (e.g., income, employment, number of children, marital status) and general economic conditions (e.g., inflation, unemployment rate, GDP per capita). In this section, individual housing tenure decision is modelled, accounting for the possibility of the effect of the changes in the user cost of housing occurred in states that experienced changes in fiscal policy through channels described in the previous section

[10]The exception is Rhode Island which abolished itemised deductions in the fiscal year 2011. However, this study uses PSID waves up to 2011, which contains data on income regarding year 2010, and, therefore, cannot be used to estimate the effect of the changes in fiscal policy implemented in 2011. The 2013 PSID release has become available in June 2015 and, therefore, can be used in the future studies, provided enough observations residing in Rhode Island, to ensure the power of the experiment.

(these states are later referred to as *treated states*).
Let Y_{ist} being an indicator for a household that owns its residence as opposed to renting it.[11] Then, the housing tenure choice equation with individual fixed effects can be written as follows: [12]

$$Y_{ist} = \beta_0 + \beta_t + \alpha_i + \beta_1' X_{is} + \beta_2' W_{ist} + \sum_g \tau_g FiscalPolicy_{ist} + \beta_3' S_{st} + \epsilon_{ist} \tag{1.9}$$

In this equation, X_{is} is a vector of observable time invariant characteristics (e.g., gender and college degree) and α_i reflect unobserved permanent attributes for households i (i.e., a household fixed effect).[13] W_{ist} is a vector of socio-economic and demographic variables that change over time and includes an inverse hyperbolic sine transformation of income[14], age of the household head, number of family members and number of children. In the empirical analysis, there are also included dummies for whether household head is married, self-employed, unemployed and retired. Next, β_0 is a constant and β_t is a time dummy which captures time variation common across individuals. S_{st} is a vector of state-specific controls, among which are house price index, log transformations of real GDP and real GDP per capita, and unemployment rates. ϵ_{ist} denote any time-varying unobserved shocks to the household. Finally, $FiscalPolicy_{ist}$ is identity if household i was a resident in a state that changed fiscal incentives for homeowners at time t by varying either marginal income tax rate or standard deduction :

$$FiscalPolicy_{ist} = \begin{cases} 1 \text{ if individual i receives treatment in period t,} \\ 0 \text{ otherwise} \end{cases}$$

τ_g is, therefore, the coefficient of interest that identifies the effect of tax subsidies for homeownership on the tenure decision and is estimated by using fixed-effects estimator.[15] Subscript g accounts for ex-

[11] Although it is arguably of interest to study the transition probabilities between tenure statues, i.e. between being a homeowner or a renter, this paper focuses on the analysis of the determinants of the probability of being a homeowner by modelling homeownership status. There are several reasons for that. Firstly, this approach makes the results comparable to the previous studies. Second, it might be of direct interest to policy makers to build more understanding on the determinants of homeownership rates. Finally, the paper uses the available data as both pooled cross-section and panel data. Thus, analysis that includes individual fixed effects should provide some insight on the transition between the tenure statuses as it uses the within-household variation.

[12] Given that the dependent variable is binary, along with the OLS model I also estimated logit model for the specification without individual fixed effects. The results are reported in tables 1.K and 1.L and confirm that the effect of MID estimated by OLS and Logit is similar. For the specification with individual fixed effects, however, I only estimate OLS models. This is because estimation of the specification that includes the full set of fixed-effects and interaction terms involves computational difficulties in clustering the standard errors and computing marginal effects for the logit fixed-effect model (Dal Borgo, 2016). For more details see, for example, Ai and Norton (2003) and Brambor et al. (2006).

[13] In specifying the model, I explicitly include both observable (X_{is}) and unobservable (α_i) time invariant variables. However, in the empirical analysis, I estimate either pooled cross-section model, including only a vector of X_{is}, or a fixed-effect model accounting for households' unobservable characteristics, from where variables X_{is} are omitted.

[14] Inverse hyperbolic sine transformation of income is used in its log form: IHS $I = ln(I + \sqrt{(1 + I^2)})$. This transformation is used in order to adjust for skewness but to cover also zero amounts, which are approximately 19% of all observations: the measure of income only includes labour, business and farm income of the head of a household. Out of observations whose income is zero 56% are retired, 20% are permanently disabled, 9% occupied as "housewife" by keeping the house, 8% are unemployed, 2% are students, 5% are reportedly working (half of them as "self-employed"), the rest accounts for "other occupation". For more details on IHS transformation see, for example, Burbidge et al. (1988), Carroll et al. (2003), and Pence (2006).

[15] For the main specification, the variable of interest $FiscalPolicy_{ist}$ is defined following the notation of Cameron and Trivedi (2005) for difference-in-differences estimator for the panel data models with individual fixed effects. I keep their notation to highlight the difference from the pooled cross-section. In the empirical analysis, however, the following specification without individual fixed effects is also estimated by pooled cross-section: $Y_{ist} = \beta_0 + \beta_t + \beta_s Treated_{gs} + \sum_g \delta_g (Treated_{gs} \text{ x } Post_t) + \beta_1 X_{is} + \beta_2 W_{ist} + \beta_3 S_{st} + \epsilon_{ist}$. In this specification, $Treated_{gs}$ is a dummy for treated states and the effect of interest is given by the interaction term $Treated_{gs}$ x $Post_t$, which defines treated states in the post-treatment period. To ease the reading of the paper and the interpretation of the results, in the regression outcomes tables I denote the variable of interest using naming convention of the pooled cross section notation (i.e., $Treated_{gs}$ x $Post_t$) as it is widely adopted in works using difference-in-differences approach.

pected heterogeneous effects between states that have similar changes in fiscal policy but differ in the adoption of allowed deductions. In particular, there are two groups of states, from this point of view: those that allow to deduct interest payments and those that do not. Since in states that experienced increase in income tax rates and that allow for such a deduction, this policy change will increase tax savings for homeowners but in states that do not allow for the deduction - it will not, these two groups of states are included in the regression separately.

During the observed period, states didn't change income tax rates by the same amount. On the contrary, they changed tax rates by different amounts for different income groups at different times. This fact creates additional variation in fiscal policy and, therefore, provides an opportunity to gain a deeper insight into the effect of taxation on ownership choice. In order to estimate this effect, the following model of tenure choice is specified:

$$Y_{ist} = \beta_0 + \beta_t + \alpha_i + \beta_1' X_{is} + \beta_2' W_{ist} + \gamma MarginalTaxRate_{ist} + \beta_3' S_{st} + \epsilon_{ist} \tag{1.10}$$

Taking first differences of Equation 1.10, to eliminate the unobserved individual fixed effect α_i, yields:

$$\Delta Y_{ist} = d_t + \beta_2' \Delta W_{ist} + \gamma \Delta MarginalTaxRate_{ist} + \beta_3' \Delta S_{st} + \Delta\epsilon_{ist} \tag{1.11}$$

In this specification, d_t reflects the fact that model allows for time dummies and time-invariant characteristics X_{is} does not appear in the equation since they affect only the level of homeownership but not its growth.

Following Card and Krueger (1994), variable ΔMarginal Tax Rate$_{ist}$ is defined to be a difference in tax rates individual is subject to if resides in the treated state and zero otherwise.

$$\Delta\text{Marginal Tax Rate}_{ist} = \begin{cases} \Delta\text{Marginal Tax Rate}_{ist}\text{, if individual lives in treated state } s \text{ at time } t \\ 0 \text{ otherwise} \end{cases} \tag{1.12}$$

Given this specification, coefficient γ captures effect of any change in the marginal tax rate experienced by household i in a given period t on the change of its tenure. This change, however, may reflect not only variation induced by policy changes, but also that individual might have changed states or could have had dramatic changes in his income and, therefore, changed the tax bracket he was in. To disentangle the effect of the policy induced variation from these other reasons, I explicitly control for both by keeping sample of individuals who didn't move across states and who didn't have big changes in their income, and thus did not change the tax bracket. [16]

Models given by Equations 1.9 and 1.10 serve as baseline specifications. Estimation of these models allows to obtain estimates for the effect of changes in income tax rates and in standard deduction, which affect tax savings from housing, on the housing tenure choice in difference-in-differences framework.

1.3.2.3 Defining the time frame

The analysis concentrates on the years 2000 to 2010. Almost every year one of the states implemented some changes in standard deduction or in the income tax rates. However, in order to assess

[16] I also estimate a model where I keep individuals who changed tax bracket and I control for this by introducing an interaction term. Specifically, I estimate the following model in first differences: $\Delta Y_{ist} = d_t + \gamma_0 * \Delta MarginalTaxRate_{ist} + \gamma_1 \Delta MarginalTaxRate_{ist} * ChangedBracket_{ist} + \gamma_2 ChangedBracket_{ist} + d_1' \Delta W_{ist} + d_2' \Delta S_{st} + \Delta\epsilon_{ist}$. In this model, $ChangedBracket_{ist}$ is unity if individual i changed the tax bracket at time t, and it is zero otherwise. The results are robust to this specification.

the impact of the changes in fiscal policy on the house tenure decision, the best period to analyse is the window between the year 2002 and the year 2004. There are several reasons for this choice. Firstly, it is safely far away from the crisis occurred in the year 2008 which was directly related to the housing and mortgage markets. Secondly, there are observations available two periods before year 2004, and thus, the behaviour of homeownership rates can be observed before the treatment year which is essential to analyse the common pre-trend assumption. Finally, PSID data is biennial and, thus, it is only possible to compare two non-consecutive years. Hence, changes in fiscal policy occurred in the year 2004 relative to the year 2002 are the most suitable in order to identify the effect of MID and constitute the core of the empirical analysis. However, in the robustness analysis, the effects of fiscal policy is estimated using different time windows (e.g., covering all years from 2000 to 2010). The results show to be robust to such specifications.

1.3.2.4 The choice of the control group to identify the effect of MID

This study aims to identify the effect of the mortgage interest deduction on housing tenure decision using difference-in-differences strategy. In order to do so, changes in homeownership rates in the treated states before and after tax reform are compared to those in the control group. This section discusses how states composing the control group were chosen.

In order to build a control group, only those states where there were no changes in fiscal policy are considered. Among such states, there are both states that allow to deduct mortgage interest payments from taxable income for state income tax purposes (Alabama, Georgia, Mississippi, Virginia,) and those that don't (Alaska, Illinois, Indiana, Florida, Nevada, New Hampshire, South Dakota, Tennessee, Texas, Washington, West Virginia and Wyoming). Furthermore, we also include separately in the regression states that had only minor and, thus insignificant for housing tenure decisions, changes in fiscal policy. If changes in homeownership are indeed driven by fiscal policy, there should be not changes in homeownership rates in these states relative to the control group.

1.3.2.5 Using changes in state income tax rates to estimate the effect of mortgage interest deduction on homeownership

In order to identify the effect of fiscal incentives on the housing tenure decision, the first channel of exogenous policy variation used in this study is variation in income tax rates. As discussed in Section 3.2.1 and Section 1.3.2.1, if tax savings generated by the possibility to deduct mortgage interest payments from taxable income have any effect on homeownership, then comparable increase in marginal income tax rates should lead to higher ownership rates in states that allow for such deductions than in the states that do not.

Indeed, any change in marginal income tax leads to a dollar change in the amount of tax savings if mortgage interest deduction is permitted. Given the chosen year of treatment, namely 2004, there are several states that changed their income tax rates at least for some income brackets. However, this research focuses on the changes occurred in New York and Pennsylvania. There are several reasons for why these two states are the best cases in order to analyze the effect of MID. Firstly, both New York and Pennsylvania increased their income tax rates (as opposed to decreasing them), which is the most revealing direction of the change in this fiscal policy parameter for the purpose of this study. The

reason for this is the fact that decrease in income tax rates for a given level of income is not always the result of the changes of the rates *per se*. Indeed, this change is oftentimes generated by the increase in the dollar value of the tax bracket due to the indexation by the inflation and thus, is a gradual year-to-year change. Most of the time it occurs in the states that closely follow federal scheme in designing their state fiscal policies. On the contrary, increase in income tax rates is always the result of either a rise in tax rates or a decrease in tax brackets' thresholds and, therefore, goes in the opposite direction to the general tendency of the states to decrease income tax rates for a given level of income. Thus, this study will focus on implications of the increase of income tax rates, leaving their decrease aside as it does not represent an interesting case to examine. Such states as Hawaii, New Mexico, Maryland, Massachusetts, Michigan and New Jersey are, therefore, excluded from the analysis. [17]

Other five states that changed income tax rates in the year 2004 comparing to the year 2002 are New York, Nebraska, Oklahoma, Connecticut and Pennsylvania. Although all of them increased their income tax rates, the largest changes took place in New York, Pennsylvania and Connecticut. Furthermore, only in New York and Pennsylvania this reform touched all the tax payers, while in Connecticut there were no changes in income taxation for the households whose income was under 10,000 US$.

Next, only in New York and Pennsylvania there is a sufficient number of respondents in every PSID release, while number of observations for Connecticut never exceeded 50 heads of the households in any given year.

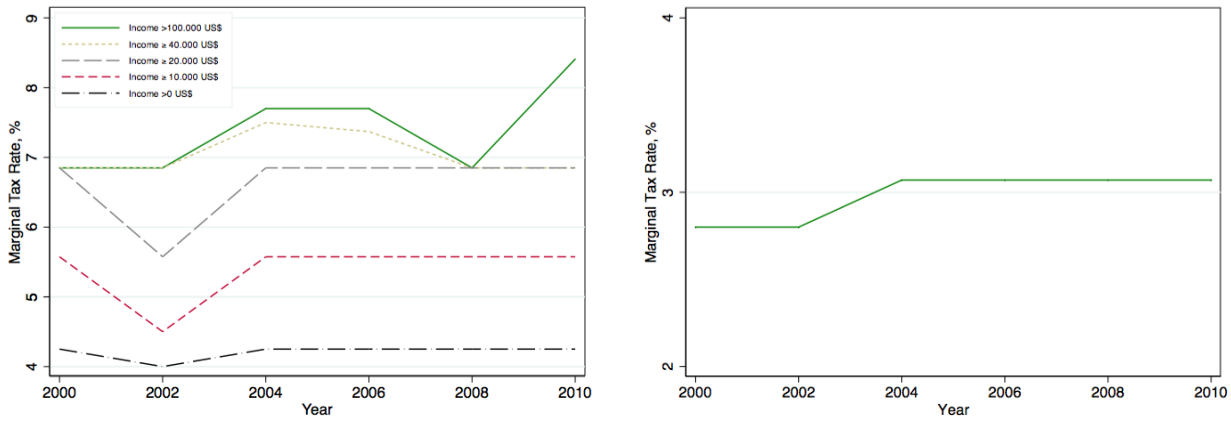
Finally, but importantly, neither New York nor Pennsylvania, to the best of our knowledge, changed any other policy parameter regarding housing market over the observed period, including standard deduction for single or separately filing couples (see Appendix for more details)[18]. For these reasons, in order to evaluate the effect of income taxation on the decision to purchase a house, this study will consider changes in marginal tax rates in states New York and Pennsylvania.

In order to study the effect of MID on housing tenure decision through the variation of income tax rates the following strategy is adopted. Firstly, the difference in the effects of increase in income tax rates in New York and Pennsylvania will be tested. The main difference between these two states is the fact that New York allows to deduct mortgage interest payments from taxable income for state income taxation purposes while Pennsylvania does not. Therefore, if MID has any implications for homeownership, then negative effect of increase in income taxes should be bigger in Pennsylvania than in New York, where it would be at least partly mitigated by increased tax savings. Although negative effect of increased tax rates on the decision to own, if there is no possibility to deduct interest payments, follows from the fact that higher taxes decrease disposable income, the degree to which this negative effect can be diminished by the presence of MID remains ambiguous. Indeed, the estimated effect of this tax reform in New York maybe be positive (if positive effect of MID is stronger than negative effect of increased income tax rates), zero (if two effects are nearly the same and, therefore, cancel out), or even negative (if effect of MID is smaller than direct effect of income taxation). In any of these cases, however, if MID has any effect on homeownership, it should be observed that in Pennsylvania drop in homeownership is bigger than in New York. In principle, this prediction could be tested directly by comparing Pennsylvania and New York. However, to make the evidence sharper and to secure the power of the test, it is chosen to compare both New York and Pennsylvania to a group of control states which didn't change any policy parameter in the observed period. Such a comparison would allow to disentangle the effects in Pennsylvania and in New York, thus, permitting to make more robust conclusions.

[17] Changes in income tax rates over time by income group are summarised in Appendix.

[18] There are no data available on property taxes, however, which is one of the major limitations of this study.

Next, variation of income tax rates in New York allows to estimate their effect directly. This is because in New York income tax rates were increased by different amounts across income groups. As can been seen Figure 1.1 Panel A , marginal tax rates changed from varying between 4% and 6,9% in 2002 to being between 4,3% and 7,7% in 2004. The biggest changes occurred for low and middle-income households. For those who earn between $10.000 and $ 20.000 income tax rate were increased from 4,5 % to 5,6% by 24%, and for those who earn between $20.000 and $ 40.000 - from 5,6 % to 6,9% by 23%. Given this variation, it is possible to estimate the exact effect of changes in marginal income tax rates on changes in homeownership by comparing outcomes in New York and in a group of control states. Note that, although income tax rates in Pennsylvania increased by as much as 9,6%, it changed equally for all the taxpayers, who are subject to flat tax schedule, as can be seen on Figure 1.1 Panel B. Moreover, Pennsylvania changed its income tax rates only once during the observed period. This fact makes it an attractive case to be studied in a difference-in-differences framework, but given the absence of the sufficient variation, complicates estimation of the effect of fiscal incentives using marginal tax rates instead of the policy dummy.



Panel A. New York

Panel B. Pennsylvania

FIGURE 1.1: Individual State Marginal Income Tax Rates

Source: Author's calculations based on Taxfoundation data

Thus, this study analyses changes in homeownership rates in New York and Pennsylvania relative to the control states which did not change fiscal policy between 2000 and 2010. It will further use variation in income tax rates in New York to estimate effect of taxation on tenure choice.

1.3.2.6 Using changes in Standard Deduction to Estimate the Effect of Mortgage Interest Deduction on Homeownership

Another source of variation that potentially affects housing tenure decision is standard deduction. As has been shown in Section 3.2.1 and Section 1.3.2.1, decrease in standard deduction both allows more households to benefit from MID and reduces user cost of owner-occupied housing, which should lead to the increase in homeownership if fiscal incentives play any role in supporting it. In order to

identify the effect of the mortgage interest deduction through the change in the level of standard deduction allowed at the state level, this study will focus on the case of Oregon. The reason for such a choice is threefold. Firstly, this state experienced the decrease in the amount of standard deduction between 2004 and 2002. Although, there are 17 states that changed standard deduction in this period, only two of them for which data is available, namely District of Columbia and Oregon, decreased it. It is more revealing to study the decrease in the standard deduction than its increase because most of the states that raised its level simply followed the federal model and indexed it by inflation. Furthermore, even if the increase in standard deduction was an unexpected policy change, higher standard deduction would mean not only that less taxpayers would file for the mortgage interest deduction, but also that nonitemizing taxpayers would receive a higher amount of the dollar refund, benefiting from the higher standard deduction allowance. This fact may potentially confound the results. Therefore, this analysis will focus on the states in which there was a decrease in the level of the standard deduction, which potentially leads to more interpretable conclusions.

Secondly, among the two states which decreased standard deduction in 2004, Oregon is the most suitable case to study for the purpose of this analysis because of the proportion of the urban population in this state. Indeed, in the District of Columbia, every resident (100% - see more details in the Appendix) is defined as belonging to the urban population and this is a unique composition among 51 US states. Therefore, there is no possible control group for this state. Instead, urban population in Oregon varied from 79% to 81% between 2000 and 2010, which is in line with the average composition among other states.

Finally, in the period of interest, there were no other changes related to the housing market in Oregon, which, therefore, allows to identify the effect of MID relying on changes in standard deduction. In the District of Columbia, instead, marginal tax rates varied greatly between 2000 and 2010, which may confound the results.

Therefore, in order to estimate the effect of MID through variation in standard deduction this study will focus on the case of Oregon, where standard deduction decreased by 7,2% between 2002 and 2004, as shown on the Figure 1.2. Using difference-in-differences research design, I will compare after-reform homeownership rates in Oregon with those in the states which didn't not change their fiscal policy. If MID has any effect, it is expected that decrease in the level of standard deduction would lead to a higher ownership rates in Oregon than in the control states.

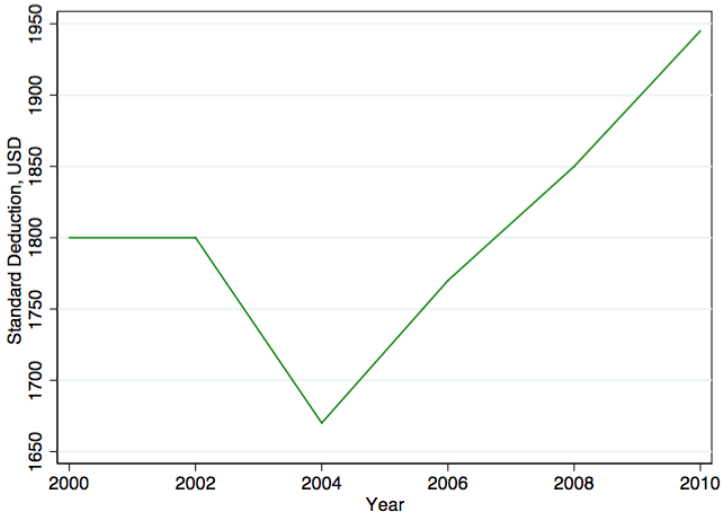


FIGURE 1.2: Standard Deduction in Oregon State

Source: Author's calculations based on Taxfoundation data

1.4 Data, Sample Definition and Descriptive Evidence

1.4.1 Individual Level Data

The main data source used in this study is Panel Study of Income Dynamics (PSID). In particular, I analyse waves for questionnaires collected biennially from the year 2001 to the year 2011. This is the best available dataset to answer the question if MID affect homeownership because it contains detailed information on household's portfolio and, in particular, on housing wealth as well as socio-economic characteristics of individuals followed overtime. This study concentrates on the period between 2001 and 2011 because data on state level explanatory variables is available only starting from the year 2000.

The original sample contains 48,887 observations on 12,799 heads of the households.

TABLE 1.1: Summary statistics for the PSID sample, panels 2001 - 2011

	All states			States with no MID			States allowing for MID			P-value difference
	N	**Mean**	**Median**	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**	
All households										
Homeownership (%)	44,863	61.8		18,371	63.0		26,492	61.0		0.000
Became an owner (%)	43,182	3.6		17,717	4.0		25,465	4.0		0.533
Became a renter (%)	43,182	2.4		17,717	2.0		25,465	3.0		0.118
Mortgage ownership (%)	44,863	43.9		18,371	45.0		26,492	43.0		0.000
Second mortgage ownership (%)	44,863	6.8		18,371	7.0		26,492	7.0		0.596
Income($)	44,863	37,249	27,000	18,371	38,630	28,000	26,492	36,292	26,955	0.000
Unemployed (%)	44,863	6.2		18,371	6.0		26,492	6.0		0.250
Retired (%)	44,863	12.1		18,371	13.0		26,492	11.0		0.000
Self-employed (%)	44,863	10.2		18,371	10.0		26,492	10.0		0.519
Male (%)	44,863	70.3		18,371	70.0		26,492	71.0		0.213
Age	44,863	45.6	44.0	18,371	46.2	45.0	26,492	45.1	44.0	0.000
Married (%)	44,863	50.9		18,371	51.0		26,492	51.0		0.637
Number of Children	44,863	0.9	0	18,371	0.8	0	26,492	0.9	0	0.007
Years of education	44,863	14.4	12.0	18,371	14.8	12.0	26,492	14.1	12.0	0.009
State-level variables										
Unemployment rate (%)	44,863	6.0	5.6	18,371	6.0	6.0	26,492	6.0	6.0	
House price index	44,863	126.6	120.2	18,371	122.7	113.8	26,492	129.4	121.1	
Real GDP (.000$)	44,863	537	382	18,371	535	493	26,492	538	255	
RealGDP per capita ($)	44,863	46,115	44,720	18,371	46,122	44,204	26,492	46,111	45,427	
Nominal Personal Income ($)	44,863	35,342	34,422	18,371	35,840	35,080	26,492	34,996	34,341	
Votes in presidential elections (% republicans)	22,105	48.8		9,071	43.0		13,034	53.0		
Urban population (%)	44,863	76.9	77.5	18,371	81.3	82.5	26,492	73.8	72.8	
Country-level variables										
15 Years Mortgage Interest Rate	44,863	5.7	5.6							
30 Years Mortgage Interest Rate	44,863	6.2	6.0							
Consumer Price Index	44,863	197.1	201.6							
Individuals who changed state										
Changed state in the sample (% in full sample)	46,266	3.0		18,933	3.0		27,333	3.0		0.502

Note: The table reports descriptive statistics for households heads in the selected PSID sample for waves 2001 through 2011. State-specific unemployment rate and Consumer price index are from Bureau of Labor Statistics. Unemployment rate is seasonally adjusted. House price index is from Freddie Mac. House price index is constructed such that December 2000 is normalised to 100. Real GDP, real GDP per capita and per capita personal income are from Bureau of Economic Analysis. Real dollar values are stated in terms of chained 2009 dollars. Votes in presidential elections are from Wikipedia. Proportion of urban population is from the State Data Centre of Iowa. Country-wide CPI is based upon a chained year 1982-1984 = 100. 15-year fixed rate mortgage interest rates is from Freddie Mac. 30-year conventional mortgage interest rates are based on Federal Reserve Economic Data. P-values are reported only for differences in variables computed from the individual-level PSID data. Differences in observations is given by the fact the (i) households observed in the panel for the first time are omitted to compute the transitions in the tenure status (variables became an owners and became a renter); (ii) presidential elections occur every 4 years, while the PSID is collected biennially; (iii) the main summary statistics are computed for the sample of those who didn't move across states, while to compute proportion of people who changed states - these households are kept in the sample.

The dependent variable analysed in this study is if household owns its main residence. It is a dummy that takes value 1 if household is the owner and zero of it is a renter. Thus, the paper focuses on the analysis of this binary outcome and studies the determinants of homeownership rates, and in particular of the role of mortgage interest deduction. However, since mortgage interest deduction affects housing tenure decision through changing the tradeoff between owning and renting the residence by decreasing the user cost of the owner, this paper does not consider those with a different housing tenure status (e.g., those living for free in their residence). Thus, if a household neither owns nor rents its residence, the observation is dropped (2612 observations corresponding to 1705 households).
Next, to address the concern that households might change state of residence due to changes in housing-related policy, I drop observations for which I observe such moves (1,403 observations). [19]

[19]The results presented in this paper are for households who never changed the state of residence. I do such a sample selection to address the concern that changes in fiscal policy might induce moving across states due to arbitrage opportunities. However, as can be seen from Table 1.1, on average there are around 3% of observations that changed state of residence

Finally, I drop observations if the respondent refused to answer about its age (9 observations). Such a sample selection leads to a total of 44,863 observations.

Following Dahl and Lochner (2012) and Eissa and Liebman (1996), housing tenure status is linked to the income tax rates of the previous year, for which annual income is measured. Therefore, the analysed information is for tax years 2000 through 2010, and this is how it will be referred to in this study.[20] Table 1.1 shows summary statistics for all households in the sample. As reported in the table, homeownership rate among all states is around 62% during the observed period and it is slightly higher in states that does not allow mortgage interest deduction than in the states that do. This fact indicates that, simple comparison of average outcomes across states would have led to the biased results on the effect of MID on homeownership. This is because, the adoption of MID policy on the state-level is probably partly driven by unobservable state characteristics.

Similarly to homeownership rates, mortgage ownership rates also differ slightly across states that allow MID and those that do not, where it is 43% and 45% respectively. Furthermore, average nominal income is considerably higher in the states that do not allow MID where it is around $ 39,000. Conditioning on homeownership, average value of the house, as reported in the survey, is $ 205,000 and it is higher in the states that do not allow MID than in those that do [21]. This, along with the fact that in no MID states house price index is lower, indicates that, on average, individuals who live there own more expensive houses. Along with more expensive houses, households in the states without MID have both higher mortgages holdings and higher home equity. Finally, a slightly higher proportion of households who live in states that allow MID experienced difficulties with mortgage payments after 2008.

Despite the differences in wealth between states that allow MID and those that do not, there is no noticeable differences in the demographic characteristics of the heads of the households, except from the fact that in states that do not allow MID, the average age of the head of the household is slightly higher, being around 46 years old , which is also reflected by the fact that there are more retired: 13% in the states that do not allow MID relative to 11% in the states that do. Finally, duration of the mortgage and interest rates are roughly the same across these two groups of states.

Thus, it can be concluded, that individuals who live in the states that do not allow mortgage interest deduction from their taxable income for the state income taxation purposes, are, on average, richer and more of them own houses relative to those that live the states that allow MID.[22]

during the observed period. In the treated states (New York, Oregon and Pennsylvania) in the period between 2002 to 2004 less than 3% of observations moved across states. In the US overall between 2002 and 2004 the proportion of movers stayed roughly the same. Thus, changes in mortgage interest deduction does not seem to affect the choice of the state of residence. Finally, it might be argued that non-movers are more prompt to acquire their residence and thus, dropping them from the sample leads to upward-biased results. To address this concern, I perform all the analysis for a full sample and the results do not change.

[20] PSID is collected biennially in the period between March and November. Information on income is referred to the previous year. Socio-demographic characteristics and, in particular, information on housing wealth is contemporaneous. Therefore, the change in the homeownership status, that is analysed, may have occurred in the year previous to the year of the survey, or in the year of the survey.

[21] For more details see Appendix: Table 1.F which shows descriptive statistics for the sample of home- and mortgage-owners.

[22] The fact that states might be different on observables justifies the choice of the identification strategy, i.e. difference-in-differences, and, in principle, does not prevent identification as long as the common trend assumption is satisfied. However, to address the issue that states that do not allow MID might be wealthier, I include individual-specific income variables in the estimated regression model, as well as such state controls as seasonally adjusted unemployment, house price index, log real GDP and log real GDP per capita, which are meant to capture such differences.

1.4.2 State Level Data

The state variables are taken from Federal Reserve Economic Data (30-year conventional mortgage interest rates), Freddie Mac (15-year fixed rate mortgage interest rates and House price index), Census Bureau (total, urban and rural population in 2010), The State Data Centre of Iowa (total, urban and rural population in 2000), Bureau of Economic Analysis (Real GDP, Real GDP per capita, per capita personal income), Bureau of Labor Statistics (unemployment rate and consumer price index), Wikipedia (results of presidential elections), PSID selected sample (state specific homeownership rate).
In order to analyse the effect of MID, variation in such state fiscal policy parameters as income tax rates and standard deduction is used. These data is taken from Tax Foundation and NBER TAXSIM calculator. Income tax rates are linked to individuals based on their income, which is grouped in five tax brackets (more details can be found in the Appendix). Standard deduction used in this study corresponds to the level set for single individuals or for married couples filing separately.
As reported in Table 1.1, house prices grew slower in the states that do not allow MID. Also, states that do not allow MID have higher proportion of urban population (81,3% relative to 73,8% in states that allow MID), but similar levels of Real GDP per capita. [23]

1.5 The effect of Fiscal Policy on Homeownership

1.5.1 Estimates of the effect of MID on housing tenure decision using variation in income tax rates

Figure 1.3 shows homeownership rates in New York, Pennsylvania and the control states. Given the difference-in-difference empirical framework, difference in the levels of the dependent variable in treatment and control groups does not prevent identification. However, the underlying assumption of this estimator is the common trends assumption, meaning that in the absence of treatment average change in outcome for the treated and control states would have been the same. As can be seen from the graph, the trend of homeownership rate in New York and in the control group before and after treatment, which occurred in 2004, is similar: it is slightly increasing in the beginning of the decade and decreases starting from year 2004 onwards. As for the Pennsylvania, the trend almost coincides with the one of the control group after 2006. However, the homeownership rate in Pennsylvania declines stronger than in the control states in the period of interest, and this decline, though much milder, started already before the treatment period. However, this study relies mainly on the changes in income tax rates in New York, whereas Pennsylvania serves to the purpose of emphasising differences in the response to increased tax between states that allow MID and those that do not. Thus, the slight divergence in the Pennsylvania homeownership trends should not affect the conclusions. The robustness of the common trend assumption is discussed more formally in section 1.6.
Table 1.2 reports averages of homeownership rates in the control states, Pennsylvania and New York in 2002 and after tax rates were increased in the treated states in 2004. The corresponding difference-in-differences coefficient shows that in New York the proportion of homeowners increased by 3.3 percentage points relative to the control states in the year after the revision of individual income tax rates.

[23] The detailed state characteristics for the years 2000 and 2010 are shown in Appendix.

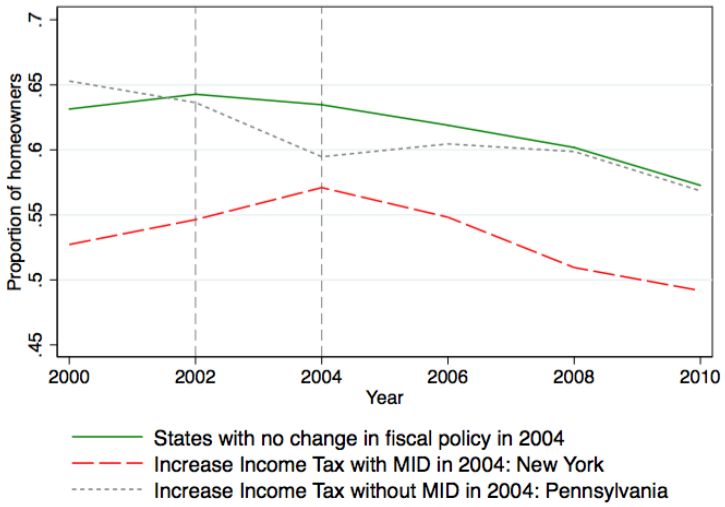


FIGURE 1.3: Homeownership rates in New York, Pennsylvania and control states

Source: Author's calculations based on PSID data.
Note: The graph shows proportion of homeowners in New York, Pennsylvania and control states. In New York and Pennsylvania there was an increase in marginal tax rates between 2004 and 2002.

TABLE 1.2: Homeownership rates before and after the increase in income tax rates in New York and Pennsylvania

	Year 2002	Year 2004	Δ 2004 vs. 2002
	(1)	(2)	(3)
New York	0.546***	0.571***	0.025***
	(0.000)	(0.000)	(0.000)
Pennsylvania	0.636***	0.595***	-0.041***
	(0.000)	(0.000)	(0.000)
Control States	0.643***	0.635***	- 0.008
	(0.015)	(0.015)	(0.007)
Change in homeownership rates, New York vs. Control States	-0.097***	-0.064***	0.033***
	(0.015)	(0.015)	(0.007)
Change in homeownership rates, Pennsylvania vs. Control States	-0.007	-0.040***	-0.034***
	(0.015)	(0.015)	(0.007)
Change in homeownership rates, New York vs. Pennsylvania	-0.090***	-0.024***	0.066***
	(0.000)	(0.000)	(0.000)

Note: Author's computations using PSID panels 2005 and 2003. Changes in homeownership rates between Pennsylvania and control states 2004 vs 2002 do not add up due to rounding. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

In Pennsylvania, on the other hand, proportion of homeowners decreased by 3.4 percentage points relative to the states that didn't change fiscal policy as a response to higher income tax rates. Therefore, the overall gap between the effects of the higher income taxes in New York and Pennsylvania is 6.6 percentage points. The reason for this differential impact on the ownership decision between the two states is the fact that New York state allows households to deduct their mortgage interest payments from taxable income for the purpose of state income taxation, while the Pennsylvania state does not allow for such a deduction. In fact, both Pennsylvania and New York had a comparable increase in income tax rates in 2004 relative to 2002, while other observable policy parameters stayed constant over this period. Therefore, the major difference between the two states is their treatment of mortgage interest deductibility at state level. This difference, thus, drives the result and is responsible for the fact that in the state in which increase in income tax rates is not associated with increase in tax savings from housing ownership, higher taxes led to a lower disposable income without affecting the user cost of housing, which had an overall negative impact on individual housing demand. In New York this negative effect of higher taxes was mitigated by increased tax savings and, therefore, lowered user cost of housing and increased ownership.

Corresponding OLS and Fixed Effect estimates of the housing tenure choice equation are reported in the Table 1.3. The coefficients of interest are interaction terms of New York and Pennsylvania indicators with a 2004 year dummy. These coefficients correspond to the difference-in-differences estimator and indicate the change in homeownership rates in treated states relative to the control group after treatment. The reference group across all the specifications are states which did not changed fiscal policy between 2002 and 2004. I further explicitly include states that had only minor changes in state marginal tax rates or in state-specific standard deductions (Other States). If changes in homeownership rates in New York and Pennsylvania are indeed driven by fiscal policy, there should be no effect in states that had only minor adjustments. Finally, households residing in Oregon are excluded from the sample.

Column 1 in Table 1.3 shows the estimates that corresponds to the tabulation results presented in the Table 1.2. Columns 2 and 3 show estimates from the regression with controls for individual and state level covariates. As can be seen, the signs of the coefficients of interest are preserved, although in both specifications the positive effect is bigger in magnitude while the negative effect is dwarfed. Columns 4 through 6 of Table 1.3 report the main results from the fixed effect model. In this case, identification comes only from the individuals who changed their homeownership status. The baseline specification (column 4) includes only difference-in-differences terms. The results show that in a state where tax change was associated to higher mortgage deductions (New York), the homeownership rate increased by 2.5 percentage points relative to control states. On the contrary, in a state where income tax rate increased but the mortgage interest deduction is not provided by the state tax law (Pennsylvania), the rate of homeowners declined by 2.1 percentage points relative to states with no fiscal policy changes during the observed period. Column 5 reports the results for the specification which includes time-varying individual socio-demographic and economic controls. The point estimates remain both significant and similar in magnitude. Finally, column 6 reports estimates for the model with state-level controls. In this specification, the positive effect of MID is considerably higher and indicates that higher fiscal subsidies to homeowners led to the relative increase in homeownership by 4.5 percentage points. On the other hand, higher tax rates in Pennsylvania did not have a negative effect on the rate of homeowners according to this specification. Overall, the results show that even accounting for individual fixed effect, the effect of being in New York, where subsidies to homeowners were increased,

TABLE 1.3: OLS Regressions: increase in income tax in New York and Pennsylvania in 2004 vs 2002

	Pooled Cross-Section			Fixed-effects		
	(1)	(2)	(3)	(4)	(5)	(6)
NewYork #Year 2004	0.033***	0.039***	0.049***	0.025***	0.027***	0.045***
	(0.007)	(0.006)	(0.008)	(0.006)	(0.006)	(0.011)
Pennsylvania #Year2004	-0.034***	-0.021***	-0.016**	-0.021***	-0.019***	-0.006
	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)	(0.009)
New York	-0.096***	-0.162***	-0.091***			
	(0.015)	(0.013)	(0.012)			
Pennsylvania	-0.006	-0.005	0.014			
	(0.015)	(0.013)	(0.010)			
Year 2004	-0.008	-0.009	0.010	0.021***	0.019***	0.002
	(0.007)	(0.006)	(0.009)	(0.006)	(0.006)	(0.013)
IHS Income		0.021***	0.022***		-0.001	-0.001
		(0.002)	(0.002)		(0.001)	(0.001)
Age		0.010***	0.010***			
		(0.000)	(0.000)			
Nr. Family Members		0.040***	0.043***		0.023***	0.024***
		(0.006)	(0.005)		(0.007)	(0.007)
Nr. Children		-0.032***	-0.034***		-0.001	-0.002
		(0.007)	(0.007)		(0.010)	(0.010)
Male		0.029**	0.033**			
		(0.014)	(0.013)			
Married		0.267***	0.259***		0.176***	0.176***
		(0.013)	(0.012)		(0.033)	(0.033)
College		0.065***	0.069***			
		(0.014)	(0.014)			
Self-employed		0.034***	0.032***		0.026	0.026
		(0.011)	(0.012)		(0.018)	(0.018)
Unemployed		-0.106***	-0.104***		0.004	0.005
		(0.021)	(0.021)		(0.020)	(0.020)
Retired		0.100***	0.100***		-0.017	-0.017
		(0.019)	(0.020)		(0.016)	(0.016)
Other States	0.012	-0.005	0.002			
	(0.026)	(0.025)	(0.013)			
Other States #Year 2004	-0.000	-0.005	0.001	-0.003	-0.002	-0.000
	(0.009)	(0.008)	(0.010)	(0.008)	(0.008)	(0.009)
DV Mean Control Group	0.639	0.639	0.639	0.639	0.639	0.639
P-value New York 2004=Pennsylvania 2004	0.000	0.000	0.000	0.000	0.000	0.000
Observations	14,172	14,172	14,172	14,172	14,172	14,172
R-squared	0.002	0.275	0.284	0.005	0.027	0.028
Individual Fixed Effects				YES	YES	YES
State-level controls			YES			YES
F-statistic of test on joint significance of state-level controls			18.340			2.425
P-value			0.000			0.061

Note: The dependent variable is an indicator that a household owns its residence and it takes value zero if a household is a renter. The table shows the result of estimating OLS models using: models (1)-(3) - pooled cross-section; models (4)-(6) - panel regressions. Individual level data is from PSID waves 2003- 2005. Control group are states that never changed fiscal policy between 2000 and 2010. Other states are those, that had minor changes in fiscal policy in any given year between 2000 and 2010. Observations for Oregon are excluded from the regression. Individual controls include inverse hyperbolic sine transformation of income, age of the head of the household, number of children and number of family members residing together, indicators for head of the household being male, married, having at least 12 years of education (college), being self-employed, unemployed or retired. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 1.4: OLS Regressions of homeownership: increase in income tax rates in New York State in 2004 vs 2002

	Fixed Effects		
	(1)	(2)	(3)
Marginal Tax Rate in New York	4.641***	4.652***	6.614***
	(0.458)	(0.453)	(0.876)
Marginal Tax Rate in Other States	1.170	0.921	1.300
	(1.446)	(1.043)	(0.797)
Year 2004	0.013***	0.013***	0.008
	(0.004)	(0.005)	(0.011)
IHS Income		-0.001	-0.001
		(0.003)	(0.003)
Nr. Family Members		0.019**	0.019**
		(0.008)	(0.008)
Nr. Children		0.002	0.002
		(0.010)	(0.010)
Married		0.212***	0.211***
		(0.034)	(0.034)
Self-employed		0.018	0.018
		(0.021)	(0.021)
Unemployed	0.013	0.014	
		(0.024)	(0.024)
Retired		-0.038*	-0.039*
		(0.020)	(0.020)
Mean Control Group	0.639	0.639	0.639
Average change in MTR in New York, pp	0.75	0.75	0.75
Observations	11,831	11,831	11,831
R-squared	0.004	0.032	0.034
Individual Fixed Effects	YES	YES	YES
State-level controls			YES

Note: The dependent variable is an indicator that a household owns its residence and it takes value zero if a household is a renter. The table shows the result of estimating individual fixed effects models. Individual level data is from PSID waves 2003- 2005. Control group are states that never changed fiscal policy between 2000 and 2010. Other states are those, that had minor changes in fiscal policy in any given year between 2000 and 2010. Observations for Oregon and Pennsylvania are excluded from the regression. Individual controls include inverse hyperbolic sine transformation of income, number of children and number of family members residing together, indicators for head of the household being married, self-employed, unemployed or retired. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

relative to the control states, has a positive effect on the housing tenure decision, thus, confirming the finding that MID seems to induce homeownership.

Table 1.4 shows the results of the estimation of the effect of increase in marginal tax rates on housing tenure decision using variation in income tax rates in New York.[24] Such a variation might be induced, however, not only by exogenous policy changes we are ultimately interested in, but also by big changes in individual's income, which led to changes in income tax brackets. [25]. To address this concern, I drop all the individuals who changed their tax bracket between 2004 and 2002 (1743 observation). [26] The results show that average increase in income tax rates in New York by 0.75 percentage points, ob-

[24] I use only fixed effects model because coefficient on marginal tax rates in a pooled cross-section specification would simply reflect the fact that high-income individuals, who also face higher marginal tax rates, are more likely to be homeowners.

[25] Another case of endogenous variation in income tax rate might have been a situation when an individual changed states of residence between waves. In our case it is not a problem, however, since we do all the analysis for a subgroup of non-movers

[26] I also do the analysis for a full sample explicitly controlling for changes in the tax bracket and the results do not change.

served in the sample, explains approximately 3.5 percentage points increase in the homeownership rate in New York relative to the control states. This magnitude is very close to the one found in the regression with the policy dummy and, thus, confirms positive effect of MID on homeownership. As expected, states that experienced only minor changes in fiscal policy across the years, have not reacted on changes in income tax rates. [27]

The results of the analysis of the increase in income tax rates, therefore, seem to indicate that lower user cost of housing due to higher tax savings from mortgage interest deduction, is associated to around 3.5 percentage points increase in ownership rate in New York relative to the control states.

1.5.2 Estimates of the effect of MID on housing tenure decision using variation in standard deduction

Figure 1.4 plots homeownership rates in Oregon and control states. As can be seen, between 2002 and 2004 there was a sharp increase in proportion of homeowners in Oregon.The differences in homeownership rates between control states and Oregon in 2002 and 2004 are further characterised in Table 1.5. As can be seen from the table, the increase in the proportion of itemising households triggered by the decrease in standard deduction led to the increase in homeownership by 8.8 percentage points in Oregon relative to the states that didn't have any changes in fiscal policy. Corresponding regression results are shown in the Table 1.6. Columns 1 through 3 show the results of OLS estimation using pooled cross-section regression, columns 4-6 report the results of the individual fixed effects regression. As can be seen, controlling for individual and state level characteristics decreases the magnitude of the difference-in-differences estimate to 0.054 and 0.066. By taking into account individual fixed effect, the estimated effect suggests that in Oregon after decrease of standard deduction homeownership increased relative to the control states by around 4 percentage points. Therefore, it can be concluded that decrease in the standard deduction in Oregon in between 2002 and 2004 led to increase in homeownership relative to the control states by allowing more people to itemise, thus benefitting from mortgage interest deduction and reducing the user cost of housing. This result suggests that possibility to itemise mortgage interest payments might induce households to acquire their residence.

1.5.3 Interpreting the results

In the previous sections there were discussed the results of the estimation of the effect of mortgage interest deduction on housing tenure decision. In particular, in order to identify this effect, variation in income tax rates and in the level of standard deduction in the states where the largest changes in fiscal policy occurred was used. If MID has any effect on the homeownership, then in Pennsylvania, where it is not allowed to decrease taxable income by the amount of mortgage interests paid, the increase in income tax rates should have a stronger negative impact on the individual housing demand than in New York state, where this negative effect would be at least partly compensated by the increase in tax savings. On the other hand, in Oregon, where there was a decrease in the level of standard deduction

[27] Residents of both Oregon and Pennsylvania are excluded from the sample. The effect of changes in marginal tax rates cannot be estimated explicitly for the control group, as, by definition, there has been no variation in fiscal policy in control states.

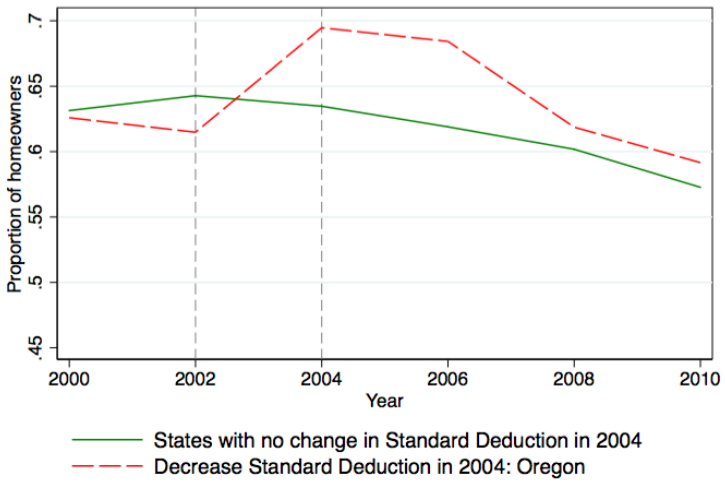


FIGURE 1.4: Homeownership rates in Oregon

Source: Author's calculations based on PSID data.
Note: The graph shows proportion of homeowners in Oregon and control states. In Oregon there was a decrease in standard deduction between 2004 and 2002.

TABLE 1.5: Homeownership rates before and after the decrease in standard deduction in Oregon

	Year 2002	Year 2004	Δ 2004 vs. 2002
	(1)	(2)	(3)
Oregon	0.615***	0.695***	0.08***
	(0.000)	(0.000)	(0.000)
Control States	0.643***	0.635***	- 0.008
	(0.015)	(0.015)	(0.007)
Change in homeownership rates,	-0.028*	0.06***	0.088***
Oregon vs. Control States, pp	(0.015)	(0.015)	(0.007)

Note: Author's computations using PSID panels 2005 and 2003. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 1.6: OLS Regressions of homeownership: decrease in standard deduction in Oregon in 2004 vs 2002

	Pooled Cross-Section			Fixed-effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Oregon #Year2004	0.088***	0.054***	0.066***	0.046***	0.046***	0.042***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)	(0.014)
Oregon	-0.028*	-0.058***	-0.082***			
	(0.015)	(0.013)	(0.019)			
year_dummy3	-0.008	-0.009	0.010	0.021***	0.019***	0.002
	(0.007)	(0.006)	(0.009)	(0.006)	(0.006)	(0.013)
IHS Income		0.021***	0.021***		0.000	0.000
		(0.002)	(0.002)		(0.001)	(0.001)
Age		0.010***	0.010***			
		(0.000)	(0.000)			
Nr. Family Members		0.039***	0.043***		0.027***	0.027***
		(0.006)	(0.005)		(0.008)	(0.008)
Nr. Children		-0.032***	-0.034***		-0.003	-0.004
		(0.007)	(0.007)		(0.010)	(0.010)
Male		0.028*	0.033**			
		(0.014)	(0.014)			
Married		0.269***	0.260***		0.155***	0.155***
		(0.013)	(0.012)		(0.030)	(0.030)
College		0.066***	0.071***			
		(0.015)	(0.015)			
Self-employed		0.029**	0.027**		0.029	0.028
		(0.011)	(0.011)		(0.019)	(0.019)
Unemployed		-0.107***	-0.106***		-0.002	-0.001
		(0.022)	(0.022)		(0.020)	(0.020)
Retired		0.101***	0.101***		-0.013	-0.014
		(0.021)	(0.022)		(0.016)	(0.016)
Other States	0.012	-0.005	0.002			
	(0.026)	(0.025)	(0.013)			
Other States #Year2004	-0.000	-0.005	0.001	-0.003	-0.002	-0.000
	(0.009)	(0.008)	(0.010)	(0.008)	(0.008)	(0.009)
DV Mean Control Group	0.639	0.639	0.639	0.639	0.639	0.639
Observations	13,224	13,224	13,224	13,224	13,224	13,224
R-squared	0.000	0.274	0.284	0.006	0.026	0.027
Individual Fixed Effects				YES	YES	YES
State-level controls			YES			YES

Note: The dependent variable is a dummy, indicating a household being the owner of the residence. The table shows the result of estimating OLS models using: models (1)-(3) - pooled cross-section; models (4)-(6) - panel regressions. Individual level data is from PSID waves 2003- 2005. Control group are states that never changed fiscal policy between 2000 and 2010. Other states are those, that had minor changes in fiscal policy in any given year between 2000 and 2010. Observations for Pennsylvania and New York are excluded from the regression. Individual controls include inverse hyperbolic sine transformation of income, age of the head of the household, number of children and number of family members residing together, indicators for head of the household being male, married, having at least 12 years of education (college), being self-employed, unemployed or retired. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

which leads to the increase in the share of itemising households, such a change should be associated with an increase in homeownership rates if MID has any effect on the tenure choice. In order to identify this effect, the difference-in-differences empirical strategy is adopted.

As results show, in both cases fiscal policy changes that led to a lower user cost of housing are associated with increase in homeownership rates in the treated states relative to the control states. Moreover, in Pennsylvania, where there is no MID at the state level, increase in tax rates lead to the decrease in homeownership. This fact confirms the hypothesis that lower disposable income has a negative impact on individual housing demand through the income effect when the user cost remains unchanged. There is a range of possible channels that might lead to this result. First of all, it is possible that families who consider becoming homeowners are, indeed, quite sensitive to the relation between the user cost of housing and its rental price which is affected by mortgage interest deductions. Since the cost of renting a house is especially high in urban areas, it would require less of a change in tax savings in order to revert the inequality between the two in the areas where high fraction of households rents their residences. Thus, even a slight increase in tax savings would induce city residents to reconsider their housing tenure status, which would produce the observed effect. In this case, the results might be driven by the fact that the case of the New York state, where a large portion of the population lives in the New York City, is considered. On the other hand, the positive result of mortgage interest deduction identified through the change in income tax rates might derive from the substitution effect between the two types of the investments - real estate and financial assets. Indeed, increase in income taxation not only decreases the user cost of housing, but also decreases profits from financial operations. Therefore, if households were to reconsider their portfolio, they would reallocate the sum needed for the downpayment from the financial market to the privately-owned residence. Building understanding on the importance of this channel is of utmost relevance for policy makers and is left for the future investigation.

The findings reported in this study confirm empirical results documented in Poterba (1992) and theoretical predictions shown in Dìaz and Luengo-Prado (2008), Gervais (2002). They, however differ from those established in Glaeser and Shapiro (2002). In particular, they argue that, although tax savings generated by the possibility to deduct mortgage interest payments from the taxable income changed greatly over time, there were no such changes in homeownership rates. The difference in the results presented in this paper and those of the authors is due to the fact, that, in order to identify the effect, they used time series tests to analyse aggregate data over a long period of time, namely from 1956 to 2002, concentrating on two sources of variation in the amount of tax subsidies: changes in inflation rates and the degree of itemisation. However, their approach allows to account for less factors than it is possible with the micro data used in this study, which could potentially lead to biased results.

Despite the fact that the results found in this study are robust to a variety of specifications, as discussed in the next section, the general equilibrium effects are not analysed. In particular, it is out of scope of this analysis to investigate market mechanisms through which fiscal policy affects housing tenure decision. Thus, it is not analysed how changes in income tax rates and in the standard deduction affect market mortgage interest rates and house prices and empirical investigation of these factors is left for the future research.

1.6 Robustness Analysis

The validity of difference-in-differences estimation strategy hinges entirely on the common trend assumption. To evaluate this assumption and to study presence of anticipatory effects, I conduct formal test by including the identifier for the year 2000 - the year preceding the period of interest - and its interaction with the treated states. If common trend assumption holds the coefficient of the interaction term should not be statistically different from zero. The results show that this assumption holds for New York, Oregon and states where there were only minor changes in fiscal policy - the trend in homeownership in these states between 2000 and 2002 is the same as in control states. However, as has already been noticed, the common trend assumption in Pennsylvania seems to be violated since homeownership rate there was decreasing faster than in the control states. Thus, results of the analysis for Pennsylvania must be interpreted with caution.
Next, the baseline analysis presented in this paper has been limited to the years 2002 and 2004 between which the change in the policy occurred. Specifically, three baseline specifications were analysed. The first one looked at the effect of the increase in income tax rates by using difference-in-differences estimation strategy and comparing the outcomes in New York state to those in Pennsylvania and the control states with the help of a dummy variable for a fiscal policy change. The second specification used variation in marginal income tax rates in New York state within different income groups and compared the outcomes to the states that didn't have any changes in fiscal policy. The last approach analysed the effect of the decrease in the standard deduction in Oregon. To study the robustness of the results, I re-estimate all three specifications using all the available observations for time window between 2000 to 2010. The results hold across the years.
Therefore, it can be concluded, that the results found in the baseline analysis, in particular that both increase in income tax rates and increase in the proportion of itemisers is associated to higher homeownership through mortgage interest deduction, hold through a variety of robustness checks.

1.7 Conclusion

Understanding implications of fiscal policy on housing tenure decisions is of critical importance in order to design effective programs aimed at supporting homeownership. This paper analysed the effect of the decrease of the housing user cost on the decision to own a house. In particular, this study exploited the variation in personal income tax rates and in the standard deduction which affects user cost through mortgage interest deduction. The largest of these fiscal policy changes increased marginal tax rates by 23,9% and decreased standard deduction by 7,2% between 2002 and 2004. Using a panel of 12,504 heads of the households, allows to observe tenure decision within a household over time, and therefore, to account for unobserved household's fixed effects. The results show that housing tenure decision is sensitive to the variation in housing related tax savings and that decrease in the user cost is associated with higher probability to own a house. The results are robust to a variety of alternative specifications, including wider time windows of pre- and post- treatment periods. Therefore, it can be concluded, that, although wealthy taxpayers benefit the most from the policy, it also impacts those households who are at the margin between owning a house and renting it. Hence, this study provides an empirical evidence in favour of mortgage interest deduction as a policy supporting homeownership, leaving, however, analysis of its potentially more effective alternatives beyond the scope of this work.

1.8 Appendix

1.8.1 Estimated models for the sample restricted to time period between 2004 and 2002

1.8.1.1 Models with a dummy policy variable

Estimated baseline model, from which the effect of income taxation on homeownership is obtained, with the sample restricted to years 2004 and 2002, and New York, Pennsylvania and controlled states without individual fixed effects is:

$$homeownership_{ist} = \alpha_0 + \gamma_{NY} NewYork_{ist} + \gamma_{PA} Pennsylvania_{ist} + d2004_t + \tau_1 2004_t NewYork_{ist} + \tau_2 2004 Pennsylvania_{ist} + \epsilon_{ist} \quad (1.13)$$

Where $NewYork_{ist}$ and $Pennsylvaniaist$ are dummies indicating that individual i was the resident of New York and Pennsylvania respectively at time t. 2004_t is a dummy for year 2004. τ_1 and τ_2 are coefficients of interest reflecting the effect of been in a treated as opposed to the control state in 2004. Estimated baseline model for the same sample but including individual fixed effects is:

$$homeownership_{ist} = \alpha_0 + \alpha_i + d2004_t + \tau_1 PolicyNY_{ist} + \tau_2 PolicyPA_{ist} + \epsilon_{ist} \quad (1.14)$$

Where $PolicyNY_{ist}$ and $PolicyPA_{ist}$ indicate that individual i received treatment at time t and resided in New York or Pennsylvania respectively. This model can be written in first differences as:

$$\Delta homeownerhip_{is} = d + \tau_1 \Delta PolicyNY_{is} + \tau_2 \Delta PolicyPA_{is} + \Delta\epsilon_{is} \quad (1.15)$$

This is equivalent to :

$$\Delta homeownerhip_{is} = d + \tau_1 NewYork_{is} + \tau_2 Pennsylvania_{is} + \Delta\epsilon_{is} \quad (1.16)$$

Estimated model for the tenure choice that uses variation in standard deduction with the sample restricted to years 2004 and 2002, Oregon and controlled states without individual fixed effects is:

$$homeownership_{ist} = \alpha_0 + \gamma_{OR} Oregon_{ist} + d2004_t + \tau_1 2004_t Oregon_{ist} + \epsilon_{ist} \quad (1.17)$$

Where $Oregon_{ist}$ is a dummy equal to unity if individual i resides in Oregon at time t.
The corresponding model which includes individual fixed effects is:

$$homeownership_{ist} = \alpha_0 + \alpha_i + d2004_t + \tau PolicyOR_{ist} + \epsilon_{ist} \quad (1.18)$$

Where $PolicyOR_{ist}$ indicates that individual i received treatment at time t.
In first difference the corresponding model can be written as:

$$\Delta homeownerhip_{is} = d + \tau \Delta PolicyOR_{is} + \Delta\epsilon_{is} \quad (1.19)$$

This is equivalent to :

$$\Delta homeownerhip_{is} = d + \tau Oregon_{is} + \Delta\epsilon_{is} \quad (1.20)$$

These models can be estimated either using first difference approach or individual fixed effects. With only two period two procedures give equivalent coefficients' estimates. In this paper these models are estimated using fixed effect estimator and correcting standard error for serial correlation by clustering.

1.8.1.2 Models with a continuous policy variable

Assume only two periods 2002 and 2004. In order to estimate the effect of mortgage interest deduction on homeownership , the following model in first differences is considered:

$$\begin{aligned}\Delta homeownership_{is} =& d + \gamma \Delta \text{ MarginalTaxRate}_{is} + \gamma_1 \Delta \text{ MarginalTaxRate}_{is} * \text{ Changed Bracket}_i + \\ &+ \Delta X_{is} + \Delta S_s + \Delta \epsilon_{is}\end{aligned} \tag{1.21}$$

Variable ΔMarginal Tax Rate$_{is}$ is defined to be difference in tax rates individual is subject to if resides in New York and zero otherwise.

$$\Delta\text{Marginal Tax Rate}_{is} = \begin{cases} \Delta\text{Marginal Tax Rate}_{is} \text{ if individual lives in New York state at time t} \\ 0 \text{ otherwise} \end{cases} \tag{1.22}$$

Next, it is controlled for the fact the individual might have changed his marginal tax rate not because of the policy, but because of the sharp changes in his income. In the sample, the reason for such a sharp change is, most often, sharp drop in income. This is taken into account by the dummy Changed Bracket$_i$, which as defined as follows:

$$\text{Changed Bracket}_i = \begin{cases} 1 \text{ if} \Delta \text{ Bracket}_i \neq 0 \text{ meaning that individual changed the tax bracket at time t} \\ 0 \text{ otherwise} \end{cases} \tag{1.23}$$

1.8.2 Theoretical Framework

1.8.2.1 Derivation of the user cost of housing

For an individual who itemises always independently of his housing tenure status, the user cost of housing is:

$$\begin{aligned} UC' = \theta i(1-\tau) + (1-\theta)i(1-\tau) + \tau_p(1-\tau) - \pi + d = \\ = (\bar{i} + \tau_p)(1-\tau) + d - \tau\pi = \\ = \frac{R}{P_h} - \tau(i + \tau_p) = \\ = UC - \tau(\bar{i} + \pi + \tau_p) \end{aligned} \tag{1.24}$$

where $\bar{i}$ denotes real interest rate.
If owner does not itemize, his per unit cost of housing is

$$\begin{aligned} UC'' = \theta i(1-\tau) + (1-\theta)i + \tau_p + d - \pi = \\ = \bar{i} + \tau_p + d - \tau\theta(\bar{i} + \pi) = \\ = \frac{R}{P_h} - \tau\theta i = \\ = UC - \tau\theta(\bar{i} + \pi) \end{aligned} \tag{1.25}$$

1.8.3 Extension of the theoretical specification for the case when mortgage interest payments are not fully deductible

For owners who always itemize, the user cost of housing services is given by:

$$\begin{aligned} R' = [(1-\theta)i(1-\tau) + \theta i(1-\tau)] + \tau_p(1-\tau) - \pi + d = \\ [i + \tau_p - \pi + d] - \tau(i + \tau_p) = \\ R - \tau(i + \tau_p) \end{aligned} \tag{1.26}$$

Now, consider the case, when mortgage interest rates are deductible only up to a portion τ_m. Then,

$$\begin{aligned} R'_{\tau_m} = [(1-\theta)i(1-\tau_m\tau) + \theta i(1-\tau)] + \tau_p(1-\tau) - \pi + d = \\ R - \tau(\theta i + \tau_p) - (1-\theta)i\tau_m\tau \end{aligned} \tag{1.27}$$

Note, that when $\tau_m = 1$, meaning that mortgage interest rates are fully deductible, we are back in the first case. Therefore, benefit of owning the house as opposed to renting it increases with τ_m.

1.8.4 Robustness Analysis

This section discusses in details the robustness analysis.
The main results presented in this paper build on three baseline specifications. The first one estimates at the effect of the increase in income tax rates by using difference-in-differences estimation strategy and comparing the outcomes in New York state to those in Pennsylvania and the control states with the help of a dummy variable for a fiscal policy change. The second specification used variation in marginal income tax rates in New York state within different income groups and compared the outcomes to the states that didn't have any changes in fiscal policy. The last approach analysed the effect of the decrease in the standard deduction in Oregon. In all of these baseline specifications the analysis was limited to the years 2002 and 2004, between which the change in the policy occurred. To investigate the robustness of the findings I extend the the analysis to the time window between 2000 to 2010. Firstly, I analyse the effect of the increase in marginal tax rates in New York and Pennsylvania using all the available years. To do so, I define a policy dummy to be unity if marginal tax rates for a given tax bracket were higher after 2004 than in the observed period before then. In Pennsylvania it concerns households in all the tax brackets. In New York, however, only households whose income exceeded 40,000 USD had higher income tax in the period after 2004. Since high-income households are more

sensitive to policy changes such a specification probably overestimates the effect of MID. Also, I drop observations for year 2008, because in New York in 2008 marginal tax rates were back to the level of the year 2000. The results presented in the Table 1.G show that both in Pennsylvania and in New York the results over the period 2000 to 2010 are comparable to those found using only changes occurred between years 2002 and 2004.

Next, I analyse the effect of MID using changes in marginal tax rates during all the period 2000 and 2010. To do so, I estimate separately the effect of the increase in marginal tax rates in New York by defining an interaction term between marginal tax rates faced by households and whether it increased with respect to the previous year for a given tax bracket. The results are shown in the Table 1.H. As predicted by the theory, increase in marginal tax rates in New York has a positive effect on homeownership relative to any other change in tax rates in New York. Moreover, changes in other states - those that experienced only slight changed in fiscal policy, does not seem to affect homeownership relative to control states. These robustness checks, thus, confirm the result that changes in income tax rates in New York are associated with higher homeownership rates in New York relative to the control states.

As for Oregon, I conduct the analysis for the time window 2000 through 2010. As shown in the Table 1.B, standard deduction is lower in 2006 and in 2004 than any other observed year. Therefore, I define a policy dummy to be unity for years 2004 and 2006 for the residents of Oregon. As reported in Table 1.I, the magnitude of the coefficient is close to those found in the baseline specification and estimates are significant across all the specifications.

Therefore, it can be concluded, that the results found in the baseline specification, in particular that both increase in income tax rates and increase in the proportion of itemisers is associated to higher homeownership through mortgage interest deduction, are robust to a specification with wider time window.

Finally I analyse the common-trend assumption by testing whether coefficient on the year 2000 is significant in treated states. As shown in Table 1.J the formal test is satisfied for both New York and Oregon - the main focus of this study. However, in Pennsylvania it seems that homeownership has started decreasing already before 2004.

TABLE 1.A: **Mortgage interest deduction and average tax rates by state**

State*	MID at State Level	Average Tax Rate 2000, %	Average Tax Rate 2002, %	Average Tax Rate 2004, %	Average Tax Rate 2006, %	Average Tax Rate 2008, %	Average Tax Rate 2010, %	Delta pp 2010 vs 2000
D.C.	Yes	7.9	7.3	7.3	7.2	6.2	6.2	- 1.8
Rhode Island**	Yes	7.8	7.5	7.5	7.5	7.5	7.5	- 0.3
Vermont	Yes	7.6	7.6	7.6	7.6	7.6	7.3	- 0.2
North Dakota	Yes	7.2	4.2	4.2	4.2	4.2	3.7	- 3.5
Oregon	Yes	7.0	7.0	7.0	7.0	7.0	8.6	1.6
North Carolina	Yes	6.9	7.3	7.3	7.3	7.2	6.9	-
Minnesota	Yes	6.9	6.8	6.8	6.8	6.8	6.8	- 0.2
Hawaii	Yes	6.7	6.4	6.0	6.0	6.0	7.0	0.3
Montana	Yes	6.5	6.5	6.5	4.0	4.0	4.0	- 2.5
Idaho	Yes	6.0	5.4	5.4	5.4	5.4	5.4	- 0.7
Wisconsin***	Yes	6.0	6.0	6.0	6.0	6.0	6.4	0.4
New Mexico	Yes	5.5	5.5	5.1	3.8	3.7	3.6	- 1.9
Maine	Yes	5.5	5.5	5.5	5.5	5.5	6.7	1.2
Kansas	Yes	5.4	5.4	5.4	5.4	5.4	5.4	-
New York	Yes	5.3	5.3	6.0	5.9	5.3	6.2	0.9
California	Yes	5.1	5.1	5.1	5.8	5.8	6.1	1.0
Colorado	Yes	5.0	4.6	4.6	4.6	4.6	4.6	- 0.4
Iowa	Yes	4.9	4.9	4.9	4.9	4.9	4.9	-
Delaware	Yes	4.8	4.6	4.6	4.6	4.6	4.8	- 0.0
South Carolina	Yes	4.6	4.6	4.6	4.6	4.6	4.2	- 0.4
Nebraska	Yes	4.4	4.4	4.5	4.5	4.5	4.5	0.1
Arkansas	Yes	4.1	4.1	4.1	4.1	4.1	4.1	-
Louisiana	Yes	4.0	4.0	4.0	4.0	4.0	4.0	-
Mississippi	Yes	4.0	4.0	4.0	4.0	4.0	4.0	-
Kentucky	Yes	4.0	4.0	4.0	4.3	4.3	4.3	0.3
Virginia	Yes	3.9	3.9	3.9	3.9	3.9	3.9	-
Arizona	Yes	3.9	3.9	3.9	3.9	3.5	3.5	- 0.4
Missouri	Yes	3.8	3.8	3.8	3.8	3.8	3.8	-
Alabama	Yes	3.7	3.7	3.7	3.7	3.7	3.7	-
Oklahoma	Yes	3.5	3.5	3.6	3.5	3.0	3.0	- 0.5
Georgia	Yes	3.5	3.5	3.5	3.5	3.5	3.5	-
Maryland	Yes	3.5	3.5	3.4	3.4	4.3	4.5	1.0
Tennessee****	No	6.0	6.0	6.0	6.0	6.0	6.0	-
Massachusetts	No	6.0	5.6	5.3	5.3	5.3	5.3	- 0.7
New Hampshire****	No	5.0	5.0	5.0	5.0	5.0	5.0	-
West Virginia	No	4.8	4.8	4.8	4.8	4.8	4.8	-
Utah	No	4.7	4.7	4.7	4.7	5.0	5.0	0.3
Michigan	No	4.4	4.2	4.0	3.9	4.4	4.4	- 0.1
Ohio	No	4.2	4.3	4.3	4.1	3.8	3.4	- 0.8
Connecticut	No	3.8	3.8	4.0	4.0	4.0	4.8	1.1
New Jersey	No	3.5	3.5	4.6	4.6	4.6	4.6	1.1
Indiana	No	3.4	3.4	3.4	3.4	3.4	3.4	-
Illinois	No	3.0	3.0	3.0	3.0	3.0	3.0	-
Pennsylvania	No	2.8	2.8	3.1	3.1	3.1	3.1	0.3
Alaska	No	-	-	-	-	-	-	-
Florida	No	-	-	-	-	-	-	-
Nevada	No	-	-	-	-	-	-	-
South Dakota	No	-	-	-	-	-	-	-
Texas	No	-	-	-	-	-	-	-
Washington	No	-	-	-	-	-	-	-
Wyoming	No	-	-	-	-	-	-	-

Source: Author's computations based on State income tax form, CCH State Tax Handbook; information available at www.taxfoundation.org; Morris and Wang (2012) and ITEP (2011)

* States are listed in decreasing order of average tax rate in the year 2000.

** As of the year 2011 Rhode Island eliminated the use of the itemised deductions.

*** Wisconsin provides tax credit.

**** Tennessee and New Hampshire tax only investment income.

TABLE 1.B: **Standard deduction for single or separately filing couples by state, USD**

State*	Standard Deduction 2000, US$	Standard Deduction 2002, US$	Standard Deduction 2004, US$	Standard Deduction 2006, US$	Standard Deduction 2008, US$	Standard Deduction 2010, US$
New York	7,500	7,500	7,500	7,500	7,500	7,500
Wisconsin	5,200	7,440	7,790	8,140	8,790	9,440
Idaho	4,300	4,550	4,750	5,000	5,350	5,700
Minnesota	4,300	4,550	4,750	5,000	5,350	5,450
Nebraska	4,300	4,550	4,750	4,980	5,350	5,700
New Mexico	4,300	4,550	4,750	5,000	5,150	5,700
South Carolina	4,300	4,550	4,750	5,000	5,350	5,700
Maine	4,300	4,400	4,750	5,000	5,450	5,700
Missouri	4,300	4,400	4,750	5,000	5,150	5,700
Utah	4,250	4,550	4,750	5,000	5,450	5,700
North Dakota	na	4,550	4,750	5,000	5,350	5,700
Rhode Island	na	na	4,750	5,000	5,350	5,700
Vermont	na	na	na	5,000	5,350	5,700
Arizona	3,600	3,600	4,050	4,125	5,450	4,677
Delaware	3,250	3,250	3,250	3,250	3,250	3,250
Montana	3,020	3,130	3,330	3,560	3,810	1,750
Kansas	3,000	3,000	3,000	3,000	3,000	3,000
Virginia	3,000	3,000	3,000	3,000	3,000	3,000
North Carolina	3,000	3,000	3,750	3,000	3,000	3,000
California	2,642	2,960	3,070	3,254	3,516	3,637
New Hampshire	na	na	na	na	2,400	2,400
Georgia	2,300	2,300	2,300	2,300	2,300	2,300
Mississippi	2,300	2,300	2,300	2,300	2,300	2,300
D.C.	2,000	2,000	1,000	2,000	2,500	2,000
Alabama	2,000	2,000	2,000	2,000	2,000	2,000
Arkansas	2,000	2,000	2,000	2,000	2,000	2,000
Maryland	2,000	2,000	2,000	2,000	2,000	2,000
Oklahoma	2,000	2,000	2,000	2,000	2,000	4,250
Oregon	1,800	1,800	1,670	1,770	1,850	1,945
Hawaii	1,500	1,500	1,500	1,500	1,500	2,000
Kentucky	1,500	1,700	1,830	1,910	2,050	2,190
Iowa	1,460	1,470	1,550	1,610	1,750	1,750
Alaska	-	-	-	-	-	-
Connecticut	-	-	-	-	-	-
Florida	-	-	-	-	-	-
Illinois	-	-	-	-	-	-
Indiana	-	-	-	-	-	-
Massachusetts	-	-	-	-	-	-
Michigan	-	-	-	-	-	-
Nevada	-	-	-	-	-	-
New Jersey	-	-	-	-	-	-
Ohio	-	-	-	-	-	-
Pennsylvania	-	-	-	-	-	-
South Dakota	-	-	-	-	-	-
Tennessee	-	-	-	-	-	-
Texas	-	-	-	-	-	-
Washington	-	-	-	-	-	-
West Virginia	-	-	-	-	-	-
Wyoming	-	-	-	-	-	-
Colorado	na	na	na	na	na	na
Louisiana	na	na	na	na	na	na

Source: State income tax form, CCH State Tax Handbook; Information available at www.taxfoundation.org

* States are listed in decreasing order of standard deduction in the year 2000.

TABLE 1.C: **Summary of Income Tax Rates by State**

State*	Tax Bracket, US$ **	Tax Rate 2000, %	Tax Rate 2002, %	Tax Rate 2004, %	Tax Rate 2006, %	Tax Rate 2008, %	Tax Rate 2010, %	Delta 2004 vs. 2002, %
	-	6.0	5.0	5.0	5.0	4.0	4.0	-
	10,000	8.3	7.5	7.5	7.5	6.0	6.0	-
D.C.	20,000	9.5	9.3	9.3	9.0	6.0	6.0	-
	40,000	9.5	9.3	9.3	9.0	8.5	8.5	-
	100,000	9.5	9.3	9.3	9.0	8.5	8.5	-
	-	3.9	3.8	3.8	3.8	3.8	3.8	-
	10,000	3.9	3.8	3.8	3.8	3.8	3.8	-
Rhode Island	20,000	7.3	7.0	7.0	7.0	7.0	7.0	-
	40,000	8.1	7.8	7.8	7.8	7.8	7.8	-
	100,000	9.8	9.5	9.5	9.5	9.5	9.5	-
	-	3.6	3.6	3.6	3.6	3.6	3.6	-
	10,000	3.6	3.6	3.6	3.6	3.6	3.6	-
Vermont	20,000	7.2	7.2	7.2	7.2	7.2	7.0	-
	40,000	8.5	8.5	8.5	8.5	8.5	8.3	-
	100,000	9.3	9.3	9.3	9.3	9.3	8.9	-
	-	4.4	2.1	2.1	2.1	2.1	1.8	-
	10,000	6.4	2.1	2.1	2.1	2.1	1.8	-
North Dakota	20,000	7.9	3.9	3.9	3.9	3.9	3.4	-
	40,000	11.2	4.3	4.3	4.3	4.3	3.8	-
	100,000	11.2	5.3	5.3	5.3	5.3	4.6	-
	-	7.0	7.0	7.0	7.0	7.0	7.0	-
	10,000	7.0	7.0	7.0	7.0	7.0	7.0	-
Oregon	20,000	7.0	7.0	7.0	7.0	7.0	7.0	-
	40,000	7.0	7.0	7.0	7.0	7.0	7.0	-
	100,000	7.0	7.0	7.0	7.0	7.0	10.9	-
	-	6.0	6.0	6.0	6.0	6.0	6.0	-
	10,000	7.0	7.0	7.0	7.0	7.0	7.0	-
North Carolina	20,000	7.0	7.0	7.0	7.0	7.0	7.0	-
	40,000	7.8	7.8	7.8	7.8	7.8	7.8	-
	100,000	7.8	8.3	8.3	8.3	8.0	7.8	-
	-	5.5	5.4	5.4	5.4	5.4	5.4	-
	10,000	7.2	7.1	7.1	7.1	5.4	5.4	-
Minnesota	20,000	7.2	7.1	7.1	7.1	7.1	7.1	-
	40,000	8.0	7.9	7.9	7.9	7.9	7.9	-
	100,000	8.0	7.9	7.9	7.9	7.9	7.9	-
	-	4.9	4.6	4.1	4.1	4.1	4.1	- 10.8
	10,000	7.8	7.5	7.0	7.0	7.0	7.0	- 6.0
Hawaii	20,000	8.4	8.1	7.8	7.8	7.8	7.8	- 3.7
	40,000	8.8	8.5	8.3	8.3	8.3	8.3	- 2.9
	100,000	8.8	8.5	8.3	8.3	8.3	10.0	- 2.9
	-	3.5	3.5	3.5	3.0	3.0	3.0	-
	10,000	7.0	6.5	6.5	6.5	6.5	6.5	-
Montana	20,000	9.5	8.5	8.5	6.5	6.5	6.5	-
	40,000	11.0	10.5	10.5	6.5	6.5	6.5	-
	100,000	11.0	10.5	10.5	6.5	6.5	6.5	-

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Table 1.C -- *Continued from previous page*

State*	Tax Bracket, US$ **	Tax Rate 2000, %	Tax Rate 2002, %	Tax Rate 2004, %	Tax Rate 2006, %	Tax Rate 2008, %	Tax Rate 2010, %	Delta 2004 vs. 2002, %
	-	5.7	5.0	5.0	5.0	5.0	5.0	-
	10,000	5.7	5.0	5.0	5.0	5.0	5.0	-
Idaho	20,000	8.2	7.8	7.8	7.8	7.8	7.8	-
	40,000	8.2	7.8	7.8	7.8	7.8	7.8	-
	100,000	8.2	7.8	7.8	7.8	7.8	7.8	-
	-	5.6	5.4	5.4	5.4	5.4	4.6	-
	10,000	6.8	6.5	6.5	6.5	6.5	6.2	-
Wisconsin	20,000	6.8	6.5	6.5	6.5	6.5	6.5	-
	40,000	6.8	6.5	6.5	6.5	6.5	6.5	-
	100,000	6.8	6.8	6.8	6.8	6.8	7.3	-
	-	2.5	3.2	2.5	2.5	2.5	2.5	- 23.4
	10,000	4.7	6.0	5.4	5.2	5.0	4.8	- 10.8
New Mexico	20,000	6.6	7.1	7.1	5.2	5.0	4.8	-
	40,000	8.1	8.1	7.7	5.2	5.0	4.8	- 4.3
	100,000	8.1	8.1	7.7	5.2	5.0	4.8	- 4.3
	-	4.5	4.5	4.5	4.5	4.5	6.5	-
	10,000	8.5	8.5	8.5	8.5	8.5	6.5	-
Maine	20,000	8.5	8.5	8.5	8.5	8.5	6.5	-
	40,000	8.5	8.5	8.5	8.5	8.5	6.5	-
	100,000	8.5	8.5	8.5	8.5	8.5	6.9	-
	-	3.5	3.5	3.5	3.5	3.5	3.5	-
	10,000	6.3	6.3	6.3	6.3	6.3	6.3	-
Kansas	20,000	6.5	6.5	6.5	6.5	6.5	6.5	-
	40,000	6.5	6.5	6.5	6.5	6.5	6.5	-
	100,000	6.5	6.5	6.5	6.5	6.5	6.5	-
	-	4.3	4.0	4.3	4.3	4.3	4.3	6.3
	10,000	5.6	4.5	5.6	5.6	5.6	5.6	23.9
New York	20,000	6.9	5.6	6.9	6.9	6.9	6.9	22.9
	40,000	6.9	6.9	7.5	7.4	6.9	6.9	9.5
	100,000	6.9	6.9	7.7	7.7	6.9	8.4	12.4
	-	1.5	1.5	1.5	1.5	1.5	1.8	-
	10,000	5.0	4.0	4.0	4.0	4.0	4.3	-
California	20,000	8.7	7.8	7.8	7.0	7.0	7.3	-
	40,000	8.7	7.8	7.8	9.3	9.3	9.6	-
	100,000	8.7	7.8	7.8	10.3	10.3	10.6	-
	-	5.0	4.6	4.6	4.6	4.6	4.6	-
	10,000	5.0	4.6	4.6	4.6	4.6	4.6	-
Colorado	20,000	5.0	4.6	4.6	4.6	4.6	4.6	-
	40,000	5.0	4.6	4.6	4.6	4.6	4.6	-
	100,000	5.0	4.6	4.6	4.6	4.6	4.6	-
	-	2.0	2.0	2.0	2.0	2.0	2.0	-
	10,000	6.3	6.3	6.3	6.3	6.1	6.1	-
Iowa	20,000	7.4	7.4	7.4	7.4	6.6	6.6	-
	40,000	9.0	9.0	9.0	9.0	8.5	8.5	-
	100,000	9.0	9.0	9.0	9.0	8.5	8.5	-

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Table 1.C -- *Continued from previous page*

State*	Tax Bracket, US$ **	Tax Rate 2000, %	Tax Rate 2002, %	Tax Rate 2004, %	Tax Rate 2006, %	Tax Rate 2008, %	Tax Rate 2010, %	Delta 2004 vs. 2002, %
	-	3.8	3.1	3.1	3.1	3.1	3.1	-
	10,000	5.6	4.8	4.8	4.8	4.8	4.8	-
Delaware	20,000	6.4	5.4	5.4	5.4	5.4	5.4	-
	40,000	6.4	6.0	6.0	6.0	6.0	7.0	-
	100,000	6.4	6.0	6.0	6.0	6.0	7.0	-
	-	4.1	4.1	4.1	3.6	3.6	3.0	-
	10,000	7.0	7.0	7.0	6.5	6.5	6.5	-
South Carolina	20,000	7.0	7.0	7.0	6.5	6.5	6.5	-
	40,000	7.0	7.0	7.0	6.5	6.5	6.5	-
	100,000	7.0	7.0	7.0	6.5	6.5	6.5	-
	-	3.0	3.0	3.1	3.1	3.1	3.1	2.2
	10,000	5.0	5.0	5.1	5.1	5.1	5.1	2.2
Nebraska	20,000	6.7	6.7	6.8	6.8	6.8	6.8	2.4
	40,000	6.7	6.7	6.8	6.8	6.8	6.8	2.4
	100,000	6.7	6.7	6.8	6.8	6.8	6.8	2.4
	-	2.9	2.9	2.9	2.3	2.3	2.3	-
	10,000	6.0	6.0	6.0	5.3	5.3	5.3	-
Arkansas	20,000	7.0	7.0	7.0	7.0	7.0	7.0	-
	40,000	7.0	7.0	7.0	7.0	7.0	7.0	-
	100,000	7.0	7.0	7.0	7.0	7.0	7.0	-
	-	2.0	2.0	2.0	2.0	2.0	2.0	-
	10,000	4.0	4.0	4.0	4.0	2.0	4.0	-
Louisiana	20,000	4.0	4.0	4.0	6.0	4.0	4.0	-
	40,000	6.0	6.0	6.0	6.0	6.0	6.0	-
	100,000	6.0	6.0	6.0	6.0	6.0	6.0	-
	-	3.5	3.5	3.5	3.5	3.5	3.5	-
	10,000	5.0	5.0	5.0	5.0	5.0	5.0	-
Mississippi	20,000	5.0	5.0	5.0	5.0	5.0	5.0	-
	40,000	5.0	5.0	5.0	5.0	5.0	5.0	-
	100,000	5.0	5.0	5.0	5.0	5.0	5.0	-
	-	4.0	4.0	4.0	4.0	4.0	4.0	-
	10,000	4.0	4.0	4.0	4.0	4.0	4.0	-
Kentucky	20,000	4.0	4.0	4.0	4.0	4.0	4.0	-
	40,000	4.0	4.0	4.0	6.0	6.0	6.0	-
	100,000	4.0	4.0	4.0	6.0	6.0	6.0	-
	-	3.3	3.3	3.3	3.3	3.3	3.3	-
	10,000	5.8	5.8	5.8	5.8	5.8	5.8	-
Virginia	20,000	5.8	5.8	5.8	5.8	5.8	5.8	-
	40,000	5.8	5.8	5.8	5.8	5.8	5.8	-
	100,000	5.8	5.8	5.8	5.8	5.8	5.8	-
	-	2.9	2.9	2.9	2.9	2.6	2.6	-
	10,000	3.2	3.2	3.2	3.2	2.9	2.9	-
Arizona	20,000	3.7	3.7	3.7	3.7	3.4	3.4	-
	40,000	4.7	4.7	4.7	4.7	4.2	4.2	-
	100,000	5.0	5.0	5.0	5.0	4.5	4.5	-

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Table 1.C -- *Continued from previous page*

State*	Tax Bracket, US$ **	Tax Rate 2000, %	Tax Rate 2002, %	Tax Rate 2004, %	Tax Rate 2006, %	Tax Rate 2008, %	Tax Rate 2010, %	Delta 2004 vs. 2002, %
	-	3.8	3.8	3.8	3.8	3.8	3.8	-
	10,000	3.8	3.8	3.8	3.8	3.8	3.8	-
Missouri	20,000	3.8	3.8	3.8	3.8	3.8	3.8	-
	40,000	3.8	3.8	3.8	3.8	3.8	3.8	-
	100,000	3.8	3.8	3.8	3.8	3.8	3.8	-
	-	3.7	3.7	3.7	3.7	3.7	3.7	-
	10,000	3.7	3.7	3.7	3.7	3.7	3.7	-
Alabama	20,000	3.7	3.7	3.7	3.7	3.7	3.7	-
	40,000	3.7	3.7	3.7	3.7	3.7	3.7	-
	100,000	3.7	3.7	3.7	3.7	3.7	3.7	-
	-	3.1	3.1	3.1	3.1	3.0	3.0	-
	10,000	6.8	6.8	7.0	6.7	3.0	3.0	3.7
Oklahoma	20,000	6.8	6.8	7.0	6.7	3.0	3.0	3.7
	40,000	6.8	6.8	7.0	6.7	3.0	3.0	3.7
	100,000	6.8	6.8	7.0	6.7	3.0	3.0	3.7
	-	3.5	3.5	3.5	3.5	3.5	3.5	-
	10,000	3.5	3.5	3.5	3.5	3.5	3.5	-
Georgia	20,000	3.5	3.5	3.5	3.5	3.5	3.5	-
	40,000	3.5	3.5	3.5	3.5	3.5	3.5	-
	100,000	3.5	3.5	3.5	3.5	3.5	3.5	-
	-	3.5	3.5	3.4	3.4	3.4	3.4	- 0.7
	10,000	3.5	3.5	3.4	3.4	3.4	3.4	- 0.7
Maryland	20,000	3.5	3.5	3.4	3.4	3.4	3.4	- 0.7
	40,000	3.5	3.5	3.4	3.4	3.4	3.4	- 0.7
	100,000	3.5	3.5	3.4	3.4	5.5	5.5	- 0.7
	-	6.0	6.0	6.0	6.0	6.0	6.0	-
	10,000	6.0	6.0	6.0	6.0	6.0	6.0	-
Tennessee	20,000	6.0	6.0	6.0	6.0	6.0	6.0	-
	40,000	6.0	6.0	6.0	6.0	6.0	6.0	-
	100,000	6.0	6.0	6.0	6.0	6.0	6.0	-
	-	6.0	5.6	5.3	5.3	5.3	5.3	- 5.4
	10,000	6.0	5.6	5.3	5.3	5.3	5.3	- 5.4
Massachu-setts	20,000	6.0	5.6	5.3	5.3	5.3	5.3	- 5.4
	40,000	6.0	5.6	5.3	5.3	5.3	5.3	- 5.4
	100,000	6.0	5.6	5.3	5.3	5.3	5.3	- 5.4
	-	5.0	5.0	5.0	5.0	5.0	5.0	-
	10,000	5.0	5.0	5.0	5.0	5.0	5.0	-
New Hampshire	20,000	5.0	5.0	5.0	5.0	5.0	5.0	-
	40,000	5.0	5.0	5.0	5.0	5.0	5.0	-
	100,000	5.0	5.0	5.0	5.0	5.0	5.0	-
	-	3.0	3.0	3.0	3.0	3.0	3.0	-
	10,000	4.0	4.0	4.0	4.0	4.0	4.0	-
West Virginia	20,000	4.5	4.5	4.5	4.5	4.5	4.5	-
	40,000	6.3	6.3	6.3	6.3	6.3	6.3	-
	100,000	6.3	6.3	6.3	6.3	6.3	6.3	-

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Table 1.C -- *Continued from previous page*

State*	Tax Bracket, US$ **	Tax Rate 2000, %	Tax Rate 2002, %	Tax Rate 2004, %	Tax Rate 2006, %	Tax Rate 2008, %	Tax Rate 2010, %	Delta 2004 vs. 2002, %
	-	4.7	4.7	4.7	4.7	5.0	5.0	-
	10,000	4.7	4.7	4.7	4.7	5.0	5.0	-
Utah	20,000	4.7	4.7	4.7	4.7	5.0	5.0	-
	40,000	4.7	4.7	4.7	4.7	5.0	5.0	-
	100,000	4.7	4.7	4.7	4.7	5.0	5.0	-
	-	4.4	4.2	4.0	3.9	4.4	4.4	- 4.8
	10,000	4.4	4.2	4.0	3.9	4.4	4.4	- 4.8
Michigan	20,000	4.4	4.2	4.0	3.9	4.4	4.4	- 4.8
	40,000	4.4	4.2	4.0	3.9	4.4	4.4	- 4.8
	100,000	4.4	4.2	4.0	3.9	4.4	4.4	- 4.8
	-	1.1	1.1	1.1	1.1	1.0	0.9	-
	10,000	3.2	3.3	3.3	3.2	2.9	2.6	-
Ohio	20,000	4.3	4.5	4.5	4.3	3.9	3.5	-
	40,000	5.8	6.0	6.0	5.8	5.3	4.8	-
	100,000	7.2	7.5	7.5	7.2	6.6	5.9	-
	-	3.0	3.0	3.0	3.0	3.0	3.0	-
	10,000	4.5	4.5	5.0	5.0	5.0	5.0	11.1
Connecticut	20,000	4.5	4.5	5.0	5.0	5.0	5.0	11.1
	40,000	4.5	4.5	5.0	5.0	5.0	5.0	11.1
	100,000	4.5	4.5	5.0	5.0	5.0	6.5	11.1
	-	1.4	1.4	1.4	1.4	1.4	1.4	-
	10,000	1.4	1.8	1.4	1.4	1.4	1.4	- 20.0
New Jersey	20,000	2.6	3.0	2.6	2.6	2.6	2.6	- 11.8
	40,000	5.9	5.9	5.9	5.9	5.9	5.9	-
	100,000	5.9	5.9	9.0	9.0	9.0	9.0	50.9
	-	3.4	3.4	3.4	3.4	3.4	3.4	-
	10,000	3.4	3.4	3.4	3.4	3.4	3.4	-
Indiana	20,000	3.4	3.4	3.4	3.4	3.4	3.4	-
	40,000	3.4	3.4	3.4	3.4	3.4	3.4	-
	100,000	3.4	3.4	3.4	3.4	3.4	3.4	-
	-	3.0	3.0	3.0	3.0	3.0	3.0	-
	10,000	3.0	3.0	3.0	3.0	3.0	3.0	-
Illinois	20,000	3.0	3.0	3.0	3.0	3.0	3.0	-
	40,000	3.0	3.0	3.0	3.0	3.0	3.0	-
	100,000	3.0	3.0	3.0	3.0	3.0	3.0	-
	-	2.8	2.8	3.1	3.1	3.1	3.1	9.6
	10,000	2.8	2.8	3.1	3.1	3.1	3.1	9.6
Pennsylvania	20,000	2.8	2.8	3.1	3.1	3.1	3.1	9.6
	40,000	2.8	2.8	3.1	3.1	3.1	3.1	9.6
	100,000	2.8	2.8	3.1	3.1	3.1	3.1	9.6
	-	-	-	-	-	-	-	-
	10,000	-	-	-	-	-	-	-
Alaska	20,000	-	-	-	-	-	-	-
	40,000	-	-	-	-	-	-	-
	100,000	-	-	-	-	-	-	-

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Table 1.C -- *Continued from previous page*

State*	Tax Bracket, US$ **	Tax Rate 2000, %	Tax Rate 2002, %	Tax Rate 2004, %	Tax Rate 2006, %	Tax Rate 2008, %	Tax Rate 2010, %	Delta 2004 vs. 2002, %
	-	-	-	-	-	-	-	-
	10,000	-	-	-	-	-	-	-
Florida	20,000	-	-	-	-	-	-	-
	40,000	-	-	-	-	-	-	-
	100,000	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	10,000	-	-	-	-	-	-	-
Nevada	20,000	-	-	-	-	-	-	-
	40,000	-	-	-	-	-	-	-
	100,000	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	10,000	-	-	-	-	-	-	-
South Dakota	20,000	-	-	-	-	-	-	-
	40,000	-	-	-	-	-	-	-
	100,000	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	10,000	-	-	-	-	-	-	-
Texas	20,000	-	-	-	-	-	-	-
	40,000	-	-	-	-	-	-	-
	100,000	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	10,000	-	-	-	-	-	-	-
Washington	20,000	-	-	-	-	-	-	-
	40,000	-	-	-	-	-	-	-
	100,000	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
	10,000	-	-	-	-	-	-	-
Wyoming	20,000	-	-	-	-	-	-	-
	40,000	-	-	-	-	-	-	-
	100,000	-	-	-	-	-	-	-

Source: Author's computations based on State income tax form, CCH State Tax Handbook; information available at www.taxfoundation.org

Notes: Value of income tax rates reported in the table is rounded to the nearest tenth, but the percentage increase from 2004 to 2002 is computed using not rounded tax rates. Thus, the discrepancy between reported differences and those computed using the tax rates reported in the table are due to the rounding.

* States are listed in decreasing order of average tax rate in the year 2000.

** Dollar values of tax brackets are normalised such as to be comparable to the tax brackets provided by Taxsim Table: "State taxes for representative taxpayers through time" available at http://users.nber.org/ taxsim/state-tax-tables/

TABLE 1.D: **Filed Federal Returns by State: Mortgage interest deduction**

State*	Mortgage Interest p.Filer 2000, US$	Proportion Filers with Mortgage Interest 2000, %	Mortgage Interest p.Filer 2002, US$	Proportion Filers with Mortgage Interest 2002, %	Mortgage Interest p.Filer 2004, US$	Proportion Filers with Mortgage Interest 2004, %	Mortgage Interest p.Filer 2006, US$	Proportion Filers with Mortgage Interest 2006, %	Mortgage Interest p.Filer 2008, US$	Proportion Filers with Mortgage Interest 2008, %	Mortgage Interest p.Filer 2010, US$	Proportion Filers with Mortgage Interest 2010, %	CAGR Mortgage Interest p. Filer 2010 vs 2000, %	Delta pp Proportion Filers with Mortgage Interest 2010 vs 2000
California	13,247	31%	13,972	32%	14,393	32%	19,153	32%	18,876	29%	15,756	27%	2%	- 3.44
Hawaii	12,581	26%	12,322	26%	12,622	26%	15,504	26%	16,730	24%	14,955	23%	2%	- 2.74
D.C.	11,193	25%	11,732	27%	12,092	28%	16,552	29%	16,720	27%	14,986	25%	3%	0.16
Nevada	11,059	31%	11,378	33%	11,802	33%	16,532	33%	15,502	30%	12,192	25%	1%	- 6.43
Washington	11,005	31%	11,221	32%	11,142	33%	13,038	34%	14,262	31%	12,615	30%	1%	- 0.59
Colorado	10,434	36%	11,232	38%	11,976	38%	12,993	38%	13,300	35%	11,746	33%	1%	- 2.79
Connecticut	10,175	35%	10,086	36%	9,872	37%	12,359	37%	12,509	35%	10,971	34%	1%	- 0.24
Wyoming	9,821	17%	9,402	18%	8,954	18%	11,433	20%	11,350	20%	10,392	20%	1%	3.34
Florida	9,660	24%	9,714	25%	10,195	26%	12,529	28%	13,375	25%	11,169	19%	1%	- 4.10
Maryland	9,619	38%	9,929	40%	10,022	40%	14,077	40%	14,162	38%	12,448	37%	3%	- 1.25
Virginia	9,571	33%	9,941	35%	10,328	35%	13,463	36%	14,094	34%	12,591	33%	3%	- 0.13
New Jersey	9,342	33%	9,796	35%	9,706	35%	12,260	35%	13,215	33%	11,412	32%	2%	- 1.18
Arizona	9,316	33%	9,674	35%	9,741	34%	12,724	34%	13,616	32%	11,282	28%	2%	- 4.51
Texas	9,220	18%	9,041	20%	8,792	21%	9,866	22%	9,955	20%	9,112	20%	0%	1.48
Massachusetts	9,166	32%	9,741	33%	10,082	34%	12,247	34%	12,805	32%	11,367	31%	2%	- 0.40
Alaska	9,105	23%	9,352	23%	9,344	22%	10,882	24%	11,994	22%	11,120	22%	2%	- 1.05
Tennessee	9,077	19%	8,972	21%	8,422	22%	9,803	22%	10,349	21%	9,419	20%	0%	0.18
New York	9,035	25%	9,186	26%	9,572	26%	12,162	26%	12,206	24%	10,645	23%	2%	- 2.40
Oregon	9,003	34%	9,127	36%	8,868	35%	10,847	35%	11,885	32%	10,538	31%	2%	- 2.75
Illinois	8,978	29%	9,156	31%	9,489	30%	11,700	31%	11,593	29%	9,973	28%	1%	- 1.22
Utah	8,964	35%	9,217	36%	8,667	35%	9,887	35%	11,683	33%	10,204	33%	1%	- 2.19
Georgia	8,886	31%	9,293	34%	10,482	33%	10,528	33%	10,844	31%	9,591	27%	1%	- 4.22
Delaware	8,473	32%	8,810	34%	8,946	32%	11,138	33%	12,006	32%	10,811	31%	2%	- 1.70
New Mexico	8,248	21%	8,814	24%	8,485	23%	9,983	23%	10,969	21%	9,858	21%	2%	- 0.04
New Hampshire	8,179	30%	8,733	32%	8,989	31%	10,873	33%	12,142	31%	10,206	30%	2%	0.68
South Dakota	8,110	13%	8,076	14%	7,805	15%	8,970	16%	9,404	15%	8,580	16%	1%	2.59
North Carolina	8,092	30%	8,299	32%	9,049	31%	9,348	31%	10,122	29%	9,050	28%	1%	- 1.81
Minnesota	8,025	35%	8,752	37%	9,009	36%	10,638	36%	11,016	34%	9,757	33%	2%	- 1.99
Idaho	7,869	31%	7,902	32%	8,156	30%	9,751	31%	10,587	29%	9,461	27%	2%	- 3.77
Michigan	7,847	31%	8,404	33%	8,273	32%	9,383	32%	9,505	28%	8,324	26%	1%	- 5.27
Louisiana	7,623	17%	7,729	18%	9,714	17%	11,552	19%	9,526	19%	9,009	18%	2%	1.24
South Carolina	7,612	27%	7,839	29%	9,782	28%	9,351	28%	9,959	26%	9,021	25%	2%	- 2.22
Missouri	7,472	25%	7,624	27%	7,565	26%	8,930	27%	9,303	26%	8,333	25%	1%	- 0.51
Pennsylvania	7,442	26%	7,661	27%	7,837	26%	8,955	27%	9,728	25%	8,837	25%	2%	- 1.21
Rhode Island	7,392	31%	7,733	32%	8,170	32%	10,358	32%	10,951	31%	9,629	30%	3%	- 0.81
Alabama	7,375	25%	7,501	26%	7,414	25%	8,885	25%	9,267	24%	8,610	22%	2%	- 2.20
Indiana	7,293	27%	7,466	29%	7,597	26%	8,246	27%	8,637	24%	7,758	23%	1%	- 4.01
Kansas	7,181	24%	7,476	26%	7,324	25%	8,259	25%	8,647	24%	7,846	24%	1%	- 0.41
Ohio	7,139	29%	7,280	30%	7,109	29%	8,132	30%	8,475	27%	7,552	26%	1%	- 3.01
Mississippi	7,110	18%	7,122	19%	6,754	18%	7,983	19%	8,301	18%	7,649	17%	1%	- 0.56
Nebraska	7,069	23%	7,174	25%	6,987	25%	7,878	25%	8,233	23%	7,479	24%	1%	0.66
Vermont	6,969	26%	7,082	28%	7,139	25%	8,575	26%	9,299	25%	8,502	24%	2%	- 2.07
Kentucky	6,854	26%	6,952	27%	6,873	26%	7,931	26%	8,345	25%	7,554	24%	1%	- 1.82
West Virginia	6,773	15%	6,807	16%	6,938	14%	8,289	15%	8,870	15%	8,132	15%	2%	0.36
Montana	6,755	24%	7,065	26%	7,257	24%	8,831	25%	9,890	23%	8,982	23%	3%	- 0.89
Wisconsin	6,689	31%	6,949	33%	6,847	32%	8,199	32%	8,739	30%	7,793	29%	2%	- 1.61
Arkansas	6,606	19%	6,810	20%	6,832	19%	8,093	20%	8,365	19%	7,764	19%	2%	- 0.58
North Dakota	6,536	14%	6,661	15%	6,578	14%	7,705	15%	8,372	15%	7,920	15%	2%	0.66
Maine	6,501	26%	6,702	28%	6,892	26%	8,564	27%	9,798	26%	8,298	26%	2%	- 0.40
Iowa	6,336	24%	6,588	26%	6,568	25%	7,518	25%	8,104	20%	7,177	24%	1%	0.57
Oklahoma	6,282	24%	6,426	25%	6,340	24%	7,670	24%	7,992	21%	7,645	20%	2%	- 3.50

Source: Author's computations based on Internal Revenue Service data

* States are listed in decreasing order of dollar amount of mortgage interest per filer in the year 2000

TABLE 1.E: **State level controls**

State	MID	Homeowner ship,%		Unemploy ment,%		House Price Index		Real GDP, mln US$		Real GDP per capita, US$		Personal Income per capita, US$		Republicans at Presidential Elections		Tot. Population		Inc. Urban Population, %		Nr. Obs. in PSID	
		2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2012*	2000	2010	2000	2010	2000	2010
D.C.	Yes	23	13	6	9	95	223	80,650	104,407	140,986	172,577	43,206	69,431	0	0	572,059	601,723	100	100	35	54
Rhode Island	Yes	75	60	4	11	95	147	43,311	48,719	41,238	46,277	30,201	43,013	0	0	1,048,319	1,052,567	91	91	4	5
Vermont	Yes	75	63	3	6	98	159	22,331	26,349	36,630	42,097	28,547	40,134	0	0	608,827	625,741	38	39	4	8
North Dakota	Yes	83	100	3	4	100	155	22,945	34,564	35,738	51,254	25,872	43,275	1	1	6,422	672,591	56	60	6	6
Oregon	Yes	61	56	5	11	100	139	132,124	190,136	38,523	49,538	28,867	35,898	0	0	3,421,399	3,831,074	79	81	133	141
North Carolina	Yes	57	47	4	11	99	119	345,483	418,473	42,749	43,778	27,859	35,435	1	1	8,049,313	9,535,483	60	66	303	428
Minnesota	Yes	81	78	3	7	96	116	238,122	268,941	48,264	50,641	32,326	42,572	0	0	4,919,479	5,303,925	71	73	108	130
Hawaii	Yes	38	20	4	7	98	192	53,646	66,432	44,207	48,694	28,927	41,668	0	0	1,211,537	1,360,301	92	92	8	5
Montana	Yes	80	50	5	7	99	154	29,028	36,576	32,119	36,918	23,593	34,612	1	1	902,195	989,415	54	56	5	10
Idaho	Yes	57	57	5	9	100	127	45,686	54,702	35,158	34,825	25,258	32,100	1	1	1,293,953	1,567,582	66	71	7	14
Wisconsin	Yes	58	49	4	9	99	121	225,812	252,794	42,019	44,431	29,384	38,728	0	0	5,363,675	5,686,986	68	70	93	103
New Mexico	Yes	60	75	5	8	100	142	69,703	81,179	38,273	39,316	23,417	33,175	0	0	1,819,046	2,059,179	75	77	5	12
Maine	Yes	76	63	3	8	97	146	45,993	50,945	36,015	38,374	27,108	37,213	0	0	1,274,923	1,328,361	40	39	21	27
Kansas	Yes	64	54	4	7	99	121	108,178	124,521	40,160	43,556	28,764	38,811	1	1	2,688,418	2,853,118	71	74	39	50
New York	Yes	50	46	5	9	96	153	997,743	1,182,857	52,508	60,974	35,307	49,582	0	0	18,976,457	19,378,102	88	88	297	298
California	Yes	53	40	5	12	95	136	1,661,865	1,924,438	48,896	51,546	33,366	42,282	0	0	33,871,648	37,253,956	94	95	568	712
Colorado	Yes	67	59	3	9	96	115	219,194	252,035	50,658	49,923	34,227	41,689	1	0	4,301,261	5,029,196	85	86	113	145
Iowa	Yes	77	71	3	6	99	120	116,880	140,473	39,904	46,052	27,583	39,033	0	0	2,926,324	3,046,355	61	64	142	146
Delaware	Yes	75	86	4	8	97	150	51,306	56,684	65,244	62,994	32,097	40,969	0	0	7,836	897,934	80	83	4	7
South Carolina	Yes	57	54	4	11	99	120	146,759	162,616	36,469	35,078	25,124	32,669	1	1	4,012,012	4,625,364	61	66	261	322
Nebraska	Yes	73	70	3	5	100	115	71,939	89,873	41,976	49,119	28,967	39,926	1	1	1,711,263	1,826,341	70	73	45	67
Arkansas	Yes	74	68	4	8	99	123	86,174	110,065	32,171	37,658	22,782	32,017	1	1	2,673,400	2,915,918	53	56	160	167
Louisiana	Yes	49	46	5	8	99	139	182,897	220,819	40,899	48,594	23,552	37,199	1	1	4,468,976	4,533,372	73	73	91	117
Mississippi	Yes	56	51	5	10	100	121	83,563	93,027	29,337	31,331	21,564	30,834	1	1	2,844,658	2,967,297	49	49	205	269
Kentucky	Yes	72	60	4	10	99	119	145,060	164,068	35,826	37,746	24,938	32,929	1	1	4,041,769	4,339,367	56	58	104	121
Virginia	Yes	57	57	2	7	97	157	332,961	417,978	46,857	52,084	32,453	44,836	1	0	7,078,515	8,001,024	73	75	208	250
Arizona	Yes	62	65	4	10	98	113	202,574	245,032	39,254	38,222	26,538	33,993	1	1	5,130,632	6,392,017	88	90	100	109
Missouri	Yes	66	57	4	10	98	117	235,031	255,496	41,915	42,610	28,006	36,606	1	1	5,595,211	5,988,927	69	70	189	223
Alabama	Yes	62	58	5	11	99	121	149,360	172,998	33,548	36,156	24,628	33,894	1	1	4,447,100	4,779,736	55	59	86	107
Oklahoma	Yes	54	49	3	7	99	131	117,692	148,038	34,071	39,377	24,802	35,912	1	1	3,450,654	3,751,351	65	66	35	59
Georgia	Yes	54	41	4	10	98	99	376,077	406,992	45,711	41,894	28,672	34,341	1	1	8,186,453	9,687,653	72	75	160	269
Maryland	Yes	51	46	4	8	97	162	243,810	313,016	45,906	54,080	35,331	50,035	0	0	5,296,486	5,773,552	86	87	188	250
Tennessee	No	66	62	4	10	100	122	224,830	252,035	39,418	39,649	27,483	35,426	1	1	5,689,283	6,346,105	64	66	122	141
Massachusetts	No	74	65	3	8	95	133	350,177	396,122	55,050	60,354	38,430	51,487	0	0	6,349,097	6,547,629	91	92	132	140
New Hampshire	No	91	65	3	6	94	130	53,958	62,187	43,519	47,224	34,280	44,963	1	0	1,235,786	1,316,470	59	60	11	20
West Virginia	No	80	54	5	9	100	130	57,997	64,553	32,096	34,818	22,096	31,798	1	1	1,808,344	1,852,994	46	49	15	13
Utah	No	72	73	3	8	100	126	86,873	116,761	38,705	42,075	24,770	32,447	1	1	2,233,169	2,763,885	88	91	57	85
Michigan	No	61	53	4	12	99	75	423,952	385,779	42,598	39,056	30,015	35,082	0	0	9,938,444	9,883,640	75	75	311	366
Ohio	No	62	55	4	10	100	99	482,655	488,557	42,474	42,342	28,620	36,199	1	0	11,353,140	11,536,504	77	78	290	337
Connecticut	No	65	68	2	9	97	139	207,734	231,643	60,887	64,766	42,198	55,216	0	0	3,405,565	3,574,097	88	88	46	44
New Jersey	No	66	68	4	10	96	156	449,275	493,213	53,291	56,025	39,156	50,941	0	0	8,414,350	8,791,894	94	95	166	178
Indiana	No	55	51	3	10	100	106	252,559	280,408	41,458	43,207	28,114	34,344	1	1	6,080,485	6,483,802	71	72	210	243
Illinois	No	51	48	4	10	98	116	615,909	645,829	49,534	50,296	32,934	42,033	0	0	12,419,293	12,830,632	88	88	203	255
Pennsylvania	No	62	54	4	8	99	149	517,523	584,412	42,129	45,976	30,482	41,635	0	0	12,281,054	12,702,379	77	79	268	327
Alaska	No	58	90	6	8	98	156	36,334	49,023	57,859	68,656	31,491	45,565	1	1	626,932	710,231	66	66	12	10
Florida	No	66	61	4	11	96	125	618,717	721,007	38,555	38,258	29,570	38,478	1	0	15,982,378	18,801,310	89	91	294	327
Nevada	No	65	61	4	14	98	97	98,325	119,242	48,706	44,102	31,208	36,657	1	0	1,998,257	2,700,551	92	94	46	56
South Dakota	No	77	55	2	5	99	134	27,522	37,960	36,412	46,507	27,260	40,613	1	1	754,844	814,180	52	57	26	31
Texas	No	57	50	4	8	98	128	937,705	1,201,992	44,771	47,617	28,341	38,065	1	1	20,851,820	25,145,561	83	85	327	493
Washington	No	64	63	5	10	99	140	298,577	356,398	50,516	52,850	32,865	42,547	0	0	5,894,121	6,724,540	82	84	120	139
Wyoming	No	57	36	4	6	98	165	24,831	37,392	50,235	66,256	28,930	45,025	1	1	493,782	563,626	65	65	14	11

Note: Real dollar values are stated in terms of chained 2009 dollars. House price index is constructed such that December 2000 is normalised to 100. Unemployment rate is seasonally adjusted. CPI is based upon a chained year 1982-1984 = 100. Unemployment is seasonally adjusted. Columns 15-16 assign value 1 if Republican party won at the presidential elections.

TABLE 1.F: **Summary statistics for home- and mortgage-owners in the PSID sample, panels 2001 - 2011**

	All states			States with no MID			States allowing for MID		
	N	**Mean**	**Median**	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**
Homeowners									
Value of the house ($)	26,718	204,714	150,000	11,312	207,625	150,000	15,406	202,576	145,000
Mortgage ownership (%)	27,741	70.9		11,651	70.8		16,090	71.0	
Second mortgage ownership (%)	27,741	11.0		11,651	10.9		16,090	11.1	
Income($)	27,741	46,274	34,000	11,651	48,301	36,000	16,090	44,806	33,000
Unemployed (%)	27,741	3.5		11,651	3.1		16,090	3.7	
Retired (%)	27,741	15.7		11,651	17.0		16,090	14.8	
Self-employed (%)	27,741	12.1		11,651	11.8		16,090	12.3	
Male	27,741	79.4		11,651	79.1		16,090	79.6	
Age of the head	27,741	49.7	48.0	11,651	50.2	49.0	16,090	49.3	48.0
Married (%)	27,741	67.2		11,651	67.2		16,090	67.1	
Number of Children	27,741	81.6		11,651	80.9		16,090	82.1	
Years of education	27,741	14.6	12.0	11,651	15.0	12.0	16,090	14.3	12.0
Changed state in the sample (%)	28,285	1.9		11,886	2.0		16,399	1.9	
Mortgage owners									
Total Value of the mortgage ($)	18,162	340,449	268,800	7,630	344,262	274,536	10,532	337,687	262,356
Home Equity ($)	25,483	114,978	65,000	10,865	120,123	70,000	14,618	111,154	60,000
Total monthly payments ($)	19,234	1,141	922	8,059	1,167	950	11,175	1,123	900
Difficulty with mortgage payments in 2009 - 2011 (% of mortgage-holders)	6,482	24.7		2,771	24.1		3,711	25.1	
First mortgage									
Interest rate for the first mortgage (%)	17,784	6.1	6.0	7,588	6.1	6.0	10,196	6.2	6.0
Duration first mortgage (years)	18,742	24.5	30.0	7,882	24.4	30.0	10,860	24.6	30.0
Second mortgage									
Interest rate for the second mortgage (%)	2,694	7.0	7.0	1,110	6.9	7.0	1,584	7.0	7.0
Duration second mortgage (years)	2,627	15.0	14.0	1,076	14.8	14.0	1,551	15.2	14.0

Note: The table reports descriptive statistics for the sample of home- and mortgage - owners from PSID waves 2001 through 2011. Socio-demographic characteristics are of households heads. Differences in number of observations are due to missing answers on different questions. Home equity is defined to be the difference between the value of the house and the remaining mortgage principal. The total value of the mortgage is calculated based on the answers about the duration of the mortgage and monthly payments.

TABLE 1.G: **OLS Regressions of homeownership: increase in income tax in New York and Pennsylvania between 2000 and 2010**

	Pooled Cross-Section						Fixed-effects					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
NY # Post 2004	0.157***	0.077***	0.077***				0.030***	0.027***	0.027***			
	(0.004)	(0.006)	(0.006)				(0.005)	(0.005)	(0.005)			
PA # Post 2004	-0.024***	-0.019***	-0.020**				-0.025**	-0.019*	-0.023**			
	(0.008)	(0.007)	(0.008)				(0.010)	(0.010)	(0.010)			
NewYork #Year2004				0.162***	0.085***	0.083***				0.016**	0.017**	0.017**
				(0.005)	(0.005)	(0.006)				(0.007)	(0.007)	(0.007)
NewYork #Year2006				0.134***	0.066***	0.065***				0.039***	0.030***	0.031***
				(0.005)	(0.007)	(0.007)				(0.006)	(0.006)	(0.006)
NewYork #Year2010				0.227***	0.087***	0.092***				0.058***	0.066***	0.065***
				(0.005)	(0.008)	(0.008)				(0.005)	(0.006)	(0.007)
Pennsylvania#Year2004				-0.046***	-0.029***	-0.030***				-0.027***	-0.022**	-0.023**
				(0.008)	(0.007)	(0.007)				(0.009)	(0.009)	(0.009)
Pennsylvania#Year2006				-0.018*	-0.020**	-0.023***				-0.020**	-0.015*	-0.019**
				(0.009)	(0.007)	(0.008)				(0.009)	(0.008)	(0.009)
Pennsylvania#Year2010				-0.009	-0.008	-0.008				-0.027*	-0.019	-0.027*
				(0.009)	(0.008)	(0.009)				(0.015)	(0.014)	(0.014)
New York	-0.113***	-0.153***	-0.077***	-0.113***	-0.153***	-0.077***						
	(0.014)	(0.014)	(0.012)	(0.014)	(0.014)	(0.013)						
Pennsylvania	0.006	0.002	0.020**	0.006	0.002	0.021**						
	(0.014)	(0.013)	(0.009)	(0.014)	(0.013)	(0.009)						
Other States	0.013	-0.002	0.003	0.013	-0.002	0.003						
	(0.024)	(0.023)	(0.012)	(0.024)	(0.023)	(0.012)						
Other States # Post 2004	-0.003	-0.011	-0.008	-0.003	-0.011	-0.011	-0.018**	-0.018**	-0.016**	-0.018**	-0.018**	-0.016**
	(0.011)	(0.009)	(0.009)	(0.011)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
DV Mean Control Group	0.619	0.619	0.619	0.619	0.619	0.619	0.619	0.619	0.619	0.619	0.619	0.619
Observations	36,342	36,342	36,342	36,342	36,342	36,342	36,342	36,342	36,342	36,342	36,342	36,342
R-squared	0.005	0.287	0.296	0.005	0.287	0.295	0.011	0.054	0.054	0.011	0.054	0.055
Socio-demographic controls		YES	YES		YES	YES		YES	YES		YES	YES
State-level controls			YES			YES			YES			YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Individual Fixed Effects							YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: The dependent variable is a dummy, indicating a household being the owner of the residence. The table shows the result of estimating OLS models using: models (1)-(6) - pooled cross-section; models (6)-(12) - panel regressions. Individual level data is from PSID waves 2001- 2011. Year 2008 corresponding to panel 2009 is omitted. NY # Post 2004 is unity only for those tax brackets for which marginal tax rate post 2004 is higher than both in the year 2000 and 2002. Other states are those that had only minor changes in fiscal policy. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. Individual level control variables include IHS transformation of Income, age, number of family members, number of children, indicator for a Male head of the household, indicator for a married head, having at least college degree, self-employment, unemployment, retirement. All standard errors are clustered by state. *** p<0.01, ** p<0.05, * p<0.1

TABLE 1.H: **OLS Regressions of homeownership: changes in income tax rates in New York State between 2000 and 2010**

	Fixed Effects		
	(1)	(2)	(3)
Increase in Marginal Tax Rate in New York	0.511***	0.492***	0.426***
	(0.069)	(0.067)	(0.056)
Marginal Tax Rate in New York	-0.953	-1.516**	-1.079
	(0.696)	(0.686)	(0.725)
Marginal Tax Rate in Other States	0.774***	0.257	0.271
	(0.245)	(0.245)	(0.237)
IHS Income		0.005***	0.005***
		(0.001)	(0.001)
Nr. Family Members		0.045***	0.045***
		(0.005)	(0.005)
Nr. Children		-0.018**	-0.018**
		(0.007)	(0.007)
Married		0.190***	0.190***
		(0.017)	(0.018)
Self-employed		0.018*	0.018*
		(0.009)	(0.009)
Unemployed		0.018*	0.018*
		(0.010)	(0.009)
Retired		-0.005	-0.005
		(0.010)	(0.011)
Mean Control Group	0.618	0.618	0.618
Average change in MTR in New York, pp	0.08	0.08	0.08
Observations	32,152	32,152	32,152
R-squared	0.013	0.057	0.058
Individual Fixed Effects	YES	YES	YES
Year FE	YES	YES	YES
State-level controls			YES

Note: The dependent variable is an indicator that a household owns its residence and it takes value zero if a household is a renter. The table shows the result of estimating individual fixed effects models. Individual level data is from PSID waves 2001- 2011. Control group are states that never changed fiscal policy between 2000 and 2010. Other states are those, that had minor changes in fiscal policy in any given year between 2000 and 2010. Observations for Oregon and Pennsylvania are excluded from the regression. Individual controls include inverse hyperbolic sine transformation of income, number of children and number of family members residing together, indicators for head of the household being married, self-employed, unemployed or retired. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 1.I: **OLS Regressions of homeownership: decrease in standard deduction in Oregon: time window 2000 - 2010**

	Pooled Cross-Section						Fixed-effects					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Oregon # Year 2004 and 2006	0.062***	0.056***	0.054***				0.046***	0.047***	0.046***			
	(0.006)	(0.006)	(0.006)				(0.009)	(0.009)	(0.009)			
Oregon #Year2004				0.058***	0.055***	0.052***				0.042***	0.043***	0.047***
				(0.006)	(0.006)	(0.007)				(0.010)	(0.010)	(0.010)
Oregon #Year2006				0.066***	0.056***	0.056***				0.049***	0.050***	0.045***
				(0.007)	(0.007)	(0.007)				(0.008)	(0.009)	(0.008)
Oregon	0.001	-0.063***	-0.073***	0.001	-0.063***	-0.073***						
	(0.016)	(0.014)	(0.009)	(0.016)	(0.014)	(0.009)						
IHS Income	0.020***	0.020***		0.020***	0.020***		0.004***	0.004***		0.004***	0.004***	
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
Age		0.010***	0.011***		0.010***	0.011***						
		(0.000)	(0.000)		(0.000)	(0.000)						
Nr. Family Members		0.039***	0.043***		0.039***	0.043***		0.047***	0.047***		0.047***	0.047***
		(0.005)	(0.005)		(0.005)	(0.005)		(0.005)	(0.005)		(0.005)	(0.005)
Nr. Children		-0.031***	-0.034***		-0.031***	-0.034***		-0.018***	-0.018***		-0.018***	-0.018***
		(0.006)	(0.005)		(0.006)	(0.005)		(0.005)	(0.005)		(0.005)	(0.005)
Male		0.019*	0.022**		0.019*	0.022**						
		(0.010)	(0.010)		(0.010)	(0.010)						
Married		0.280***	0.273***		0.280***	0.273***		0.176***	0.176***		0.176***	0.176***
		(0.009)	(0.009)		(0.009)	(0.009)		(0.015)	(0.015)		(0.015)	(0.015)
College		0.075***	0.079***		0.075***	0.079***						
		(0.014)	(0.013)		(0.014)	(0.013)						
Self-employed		0.032***	0.031***		0.032***	0.031***		0.015*	0.015*		0.015*	0.015*
		(0.008)	(0.008)		(0.008)	(0.008)		(0.007)	(0.007)		(0.007)	(0.007)
Unemployed		-0.079***	-0.075***		-0.079***	-0.075***		0.006	0.006		0.006	0.006
		(0.012)	(0.012)		(0.012)	(0.012)		(0.008)	(0.008)		(0.008)	(0.008)
Retired		0.082***	0.082***		0.082***	0.082***		-0.006	-0.006		-0.006	-0.006
		(0.016)	(0.015)		(0.016)	(0.015)		(0.008)	(0.008)		(0.008)	(0.008)
Other States	0.011	-0.010	-0.004	0.011	-0.010	-0.004						
	(0.028)	(0.026)	(0.011)	(0.028)	(0.026)	(0.011)						
Other States # Year 2004 and 2006	-0.001	-0.004	-0.001	-0.001	-0.004	-0.001	0.004	0.003	0.005	0.004	0.003	0.005
	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)
DV Mean Control Group	0.616	0.616	0.616	0.616	0.616	0.616	0.616	0.616	0.616	0.616	0.616	0.616
Observations	41,176	41,176	41,176	41,176	41,176	41,176	41,176	41,176	41,176	41,176	41,176	41,176
R-squared	0.003	0.289	0.299	0.003	0.289	0.299	0.010	0.050	0.051	0.010	0.050	0.051
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Individual Fixed Effects							YES	YES	YES	YES	YES	YES
State-level controls			YES			YES			YES			YES

Note: The dependent variable is a dummy, indicating a household being the owner of the residence. The table shows the result of estimating OLS models using: models (1)-(6) - pooled cross-section; models (6)-(12) - panel regressions. Individual level data is from PSID waves 2001 - 2011. Control group are states that never changed fiscal policy between 2000 and 2010. Other states are those, that had minor changes in fiscal policy in any given year between 2000 and 2010. Observations for New York and Pennsylvania are excluded from the regression. Individual controls include inverse hyperbolic sine transformation of income, number of children and number of family members residing together, indicators for head of the household being married, self-employed, unemployed or retired. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 1.J: **Homeownership trends between 2000 and 2004**

	Pooled Cross-Section			Fixed-effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-treatment						
New York#Year 2004	0.033***	0.039***	0.049***	0.021***	0.023***	0.022***
	(0.007)	(0.006)	(0.008)	(0.007)	(0.007)	(0.007)
Pennsylvania#Year 2004	-0.034***	-0.020***	-0.015**	-0.026***	-0.024***	-0.025***
	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Oregon#Year 2004	0.088***	0.055***	0.069***	0.026***	0.025**	0.019*
	(0.007)	(0.006)	(0.007)	(0.010)	(0.010)	(0.010)
Other States#Year 2004	-0.000	-0.004	0.003	0.001	0.001	-0.004
	(0.009)	(0.008)	(0.010)	(0.008)	(0.008)	(0.008)
Pre-treatment						
New York#Year 2000	-0.008*	-0.000	-0.011	0.001	-0.002	-0.002
	(0.004)	(0.003)	(0.007)	(0.006)	(0.006)	(0.007)
Pennsylvania#Year 2000	0.028***	0.012***	0.010*	0.030***	0.025***	0.024***
	(0.004)	(0.003)	(0.006)	(0.007)	(0.007)	(0.008)
Oregon#Year 2000	0.022***	-0.007**	-0.010	-0.017*	-0.012	-0.008
	(0.004)	(0.004)	(0.007)	(0.009)	(0.010)	(0.011)
Other States#Year 2000	0.006	0.004	-0.000	0.009	0.010	0.011
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Fixed-effects						
NewYork	-0.096***	-0.162***	-0.086***			
	(0.015)	(0.013)	(0.012)			
Pennsylvania	-0.006	-0.005	0.012			
	(0.015)	(0.013)	(0.009)			
Oregon	-0.028*	-0.058***	-0.073***			
	(0.015)	(0.013)	(0.015)			
Other States	0.012	-0.005	0.003			
	(0.026)	(0.025)	(0.013)			
Year 2000	-0.011***	-0.015***	-0.049***	-0.033***	-0.033***	-0.017
	(0.004)	(0.003)	(0.014)	(0.006)	(0.006)	(0.011)
Year 2004	-0.008	-0.010	0.008	0.023***	0.021***	0.025***
	(0.007)	(0.006)	(0.009)	(0.006)	(0.006)	(0.008)
DV Mean Control Group	0.636	0.636	0.636	0.636	0.636	0.636
Observations	21,443	21,443	21,443	21,443	21,443	21,443
R-squared	0.002	0.269	0.277	0.012	0.040	0.041
Socio-demographic controls		YES	YES		YES	YES
State-level controls			YES			YES
Individual Fixed Effects				YES	YES	YES

Note: The dependent variable is an indicator that a household owns its residence and it takes value zero if a household is a renter. The table shows the result of estimating OLS models using: models (1)-(3) - pooled cross-section; models (4)-(6) - panel regressions. Individual level data is from PSID waves 2001- 2005. Control group are states that never changed fiscal policy between 2000 and 2010. Other states are those, that had minor changes in fiscal policy in any given year between 2000 and 2010. Individual controls include inverse hyperbolic sine transformation of income, age of the head of the household, number of children and number of family members residing together, indicators for head of the household being male, married, having at least 12 years of education (college), being self-employed, unemployed or retired. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 1.K: **Logit Regressions: increase in income tax in New York and Pennsylvania in 2004 vs 2002**

	Pooled Cross-Section		
	(1)	(2)	(3)
NewYork #Year 2004	0.031***	0.039***	0.048***
	(0.007)	(0.006)	(0.008)
Pennsylvania #Year2004	-0.032***	-0.021***	-0.016**
	(0.007)	(0.006)	(0.007)
New York	-0.092***	-0.160***	-0.088***
	(0.014)	(0.012)	(0.012)
Pennsylvania	-0.006	-0.002	0.017*
	(0.015)	(0.013)	(0.010)
Year 2004	-0.008	-0.008	0.010
	(0.007)	(0.006)	(0.009)
IHS Income		0.020***	0.020***
		(0.002)	(0.001)
Age		0.009***	0.009***
		(0.000)	(0.000)
Nr. Family Members		0.043***	0.047***
		(0.006)	(0.006)
Nr. Children		-0.041***	-0.043***
		(0.008)	(0.008)
Male		0.028**	0.033***
		(0.011)	(0.011)
Married		0.225***	0.217***
		(0.010)	(0.009)
College		0.068***	0.072***
		(0.014)	(0.013)
Self-employed		0.048***	0.047***
		(0.014)	(0.014)
Unemployed		-0.087***	-0.086***
		(0.022)	(0.022)
Retired		0.099***	0.099***
		(0.019)	(0.020)
Other States	0.012	-0.005	0.003
	(0.026)	(0.025)	(0.013)
Other States #Year 2004	-0.000	-0.004	0.001
	(0.009)	(0.008)	(0.010)
DV Mean Control Group	0.639	0.639	0.639
P-value New York 2004=Pennsylvania 2004	0.000	0.000	0.000
Observations	14,172	14,172	14,172
State-level controls			YES

Note: The dependent variable is an indicator that a household owns its residence and it takes value zero if a household is a renter. The table shows average marginal effects of the logistic regression model. Individual level data is from PSID waves 2003- 2005. Control group are states that never changed fiscal policy between 2000 and 2010. Other states are those, that had minor changes in fiscal policy in any given year between 2000 and 2010. Observations for Oregon are excluded from the regression. Individual controls include inverse hyperbolic sine transformation of income, age of the head of the household, number of children and number of family members residing together, indicators for head of the household being male, married, having at least 12 years of education (college), being self-employed, unemployed or retired. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 1.L: **Logit Regressions of homeownership: decrease in standard deduction in Oregon in 2004 vs 2002**

	Pooled Cross-Section		
	(1)	(2)	(3)
Oregon #Year2004	0.089***	0.051***	0.062***
	(0.007)	(0.006)	(0.007)
Oregon	-0.027*	-0.062***	-0.087***
	(0.015)	(0.012)	(0.020)
year_dummy3	-0.008	-0.008	0.010
	(0.007)	(0.006)	(0.009)
IHS Income		0.019***	0.020***
		(0.002)	(0.002)
Age		0.009***	0.009***
		(0.000)	(0.000)
Nr. Family Members		0.043***	0.047***
		(0.007)	(0.006)
Nr. Children		-0.040***	-0.043***
		(0.008)	(0.008)
Male		0.028**	0.033***
		(0.011)	(0.011)
Married		0.226***	0.218***
		(0.010)	(0.009)
College		0.069***	0.074***
		(0.014)	(0.014)
Self-employed		0.043***	0.042***
		(0.013)	(0.014)
Unemployed		-0.087***	-0.086***
		(0.023)	(0.022)
Retired		0.100***	0.099***
		(0.021)	(0.021)
Other States	0.012	-0.005	0.002
	(0.026)	(0.025)	(0.013)
Other States #Year2004	-0.000	-0.004	0.001
	(0.009)	(0.008)	(0.010)
DV Mean Control Group	0.639	0.639	0.639
Observations	13,224	13,224	13,224
State-level controls			YES

Note: The dependent variable is a dummy, indicating a household being the owner of the residence. The table shows average marginal effects of the logistic regression model. Individual level data is from PSID waves 2003- 2005. Individual level data is from PSID waves 2003- 2005. Control group are states that never changed fiscal policy between 2000 and 2010. Other states are those, that had minor changes in fiscal policy in any given year between 2000 and 2010. Observations for Pennsylvania and New York are excluded from the regression. Individual controls include inverse hyperbolic sine transformation of income, age of the head of the household, number of children and number of family members residing together, indicators for head of the household being male, married, having at least 12 years of education (college), being self-employed, unemployed or retired. State level controls include seasonally adjusted unemployment, house price index, Log Real GDP and Log Real GDP per capita. All standard errors are clustered by state. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Chapter 2

Peer effects in stock market participation: Evidence from immigration

jointly with:
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2.1 Introduction

Little is known about the impact of immigrants' culture on the behaviour of natives, although differences between immigrants' and natives' socio-economic outcomes, immigrants' assimilation, and the effect of immigration on, for example, labour markets, are well studied[28]. In a time when immigration numbers in Europe are on the increase this is an issue of utmost importance.

We believe that the lack of attention to the effects of immigrant economic choices on that of natives is underserved. Indeed, it has been widely documented that economic behaviour is influenced not only by the environment where one grew up, but also by the culture and social norms where one lives (e.g., Guiso et al., 2004). It has also been shown that consumption (Boneva, 2014), stock market participation (Brown et al., 2008; Hong et al., 2004), borrowing (Becker, 2006; Georgarakos et al., 2014) and housing choices (Patacchini and Venanzoni, 2014; Ioannides and Zabel, 2003) are affected to a large extent by the choices of peers in the social circle (Ioannides and Topa, 2010), at work (Duflo and Saez, 2002) and in the neighbourhood (DelBello et al., 2015; Kling et al., 2007). Furthermore, empirical research on differences in financial suggests that immigrant behaviour tends to converge over time to that of natives on several dimensions (Haliassos et al., 2015). However, to the best of our knowledge there is no study to date that investigates the impact of immigrant economic behaviour on financial choices of native population. Our first contribution to the literature is to identify a causal relation between immigrant investment decisions, in particular their decision whether to own stocks, on that of natives living in the same commune.

Our second contribution relates to established research on peer effects in financial behaviour. The two main transmission channels of such peer effects identified in the literature are *social utility* and *social learning*. However, findings diverge on which of the two matters most. On the one hand, Bursztyn et al. (2014) in the experimental study show that peer effects are transmitted through both *social learning* and *social utility* channels, where social learning comprises all knowledge spillovers, from the awareness of the subject matter to opinion transmission, and where *social utility* summarises Gali's (1994) notion of *keeping up with the Joneses* and accounts for preferences for conformity and payoff complementarities. On the other hand, Banerjee et al. (2013) show that, once it is properly conditioned on information transmission, individual behaviour no longer depends on her group behaviour. In other words, they find no evidence supporting the *social utility* channel in the transmission of peer effects. We contribute to this debate by disentangling the two mechanisms. In particular, we control for knowledge transmission channels to interpret the remaining effect as *social utility*.

To study the effect of immigrants' stock market participation on that of natives we focus on the case of Luxembourg. There are several reasons why Luxembourg represents a unique setting for our identification strategy. First, about a half of Luxembourg residents are foreign-born. At commune level, this share ranges from about 15% to as high as 65% (see Table 2.8.1). Second, the immigrant population in Luxembourg is very heterogeneous and comprises both poor and low-educated groups with very low stock-market participation and highly-educated and highly-skilled professionals mostly employed in the financial sector with stock market participation twice as high as that of natives. Third, the immigrant population tends to cluster spatially by the country of origin, thus creating communes where certain immigrant groups are dominant. Together, these facts create a substantial degree of variation in natives exposure to different investment attitudes, allowing the identification of the peer effect from immigrants to natives.

To identify the peer effect of immigrants' stock market participation on natives' and to address the so-

[28] For references, see section 2.2

called *reflection problem* (Manski, 1993), we use an instrumental variable approach by exploiting the fact that immigrants and natives satisfy the *excluded peers* property (Bramoullé et al., 2009; DeGiorgi et al., 2010)[29]. Specifically, to instrument commune-specific stock market participation rates among foreigners, we use the lagged stock market participation rates in their countries of origin weighted by the population composition shares of the commune as an instrumental variable. This instrument is valid because one's stock market participation is strongly correlated with the average ownership in one's country of origin and because the behaviour of Luxembourg natives is not directly affected by the behaviour of those living abroad, except through the behaviour of foreign peers. Thus, this approach allows correcting for the simultaneity of individual behaviour because the stock market participation in the country of origin of foreigners is not influenced by that of native Luxembourg residents and, therefore, there cannot be any reverse causality.

To further disentangle the endogenous peer effect from contextual and correlated effects (Manski, 1993) we explicitly control for individual investment preferences and for commune-specific characteristics. Finally, we attempt to isolate the *social utility* channel by controlling for attributes that represent learning, namely, individual's financial literacy, her employment in the financial sector and the proportion of neighbours working in finance.

In the empirical analysis, we use several datasets. Our main source is the second wave of the Luxembourg Household Finance and Consumption Survey (LU-HFCS) conducted in 2014. This is a representative study of the resident population in Luxembourg and provides detailed information on individuals' economic and socio-demographic characteristics, details on their country of birth and an identifier of the place of residence at the detail of 4-digit zip code, which allows placing individuals in their commune of residence. To construct the instrument, we use the data from the first wave of the Eurosystem HFCS, mainly referring to the year 2010, which provides harmonised information about stock market participation for most euro area countries. Finally, we complement individual-level data with commune-specific information from the Luxembourg Population Census collected in 2011. In particular, we use rental prices to account for contextual effects and information on the communes' population composition to weight the stock market participation rates in the Eurosystem HFCS dataset to construct the instrumental variable.

Our results show that the native population is sensitive to the financial choices of foreigners in their community. In particular, we find that the total peer effect between stock participation of foreigners and a native individual's decision to invest in stocks is 0.5, meaning that an increase in participation rate of foreigners by 10 percentage points is associated with an increase in the participation of natives by 5 percentage points. Controlling for financial learning channels, we find that at least part of this peer effect is due to *social learning*. The effect of the average participation of foreigners decreases by almost half after controlling for individual's financial literacy, her employment in the financial sector and the proportion of neighbours who are financial sector's employees and, thus, have specific financial knowledge. The latter, which seems to be driving the *social learning* effect, is around 0.5, depending on the specification. This means that a 10 percentage points increase in the proportion of peers working in the financial sector would lead to a 5 percentage points increase in the probability of an individual to invest in stocks. In our context, foreigners might be contributing to this effect to a rather large extent, since 81% of those working in the finance industry were born outside of Luxem-

[29] In fact, it is only possible to identify peer effects if peers satisfy this criterion, meaning that in our setting we can only study the effect of immigrants on natives and that we cannot rule out the *reflection problem* in any other case (e.g., peer effects from immigrants to immigrants, natives to natives, and natives to immigrants).

bourg as of 2014[30]. The positive effect of the proportion of residents employed in finance on natives' stock ownership rates cannot be interpreted as *social learning* only, however, as it might also include the pure promotion of certain financial products or be driven by the sorting of people working in finance to certain geographic areas.

Our findings are robust to a placebo test, relaxation of the linearity assumption, use of alternative instrumental variables and a variety of sample specifications.

To the best of our knowledge, this is the first study to analyse the response of the native population to the financial choices of foreigners. Although the Luxembourg results might not be representative for other countries, they are likely to hold for certain hotspots within a country, which have already experienced or are currently experiencing large immigrant inflows. Moreover, our research design provides a unique setting for the identification of peer effects by exploiting the *excluded peers* property and employing the instrumental variable approach. Improved understanding about this question is necessary to design effective and sustainable financial inclusion policies in the presence of immigration induced on-going changes in the composition of the population in Europe. Our findings suggest that peer effects generate social multiplier in financial behaviour and, thus, can both foster financial literacy and, ultimately, financial inclusion through *social learning*, and amplify panics through *social utility*. Moreover, these peer effects operate effectively via individuals acknowledged to be familiar with financial matters. Thus, greater participation in the formal financial system, and, in particular, in the stock markets, could be achieved by increasing the number of financial experts in an individual's network, which in our case is given by the neighbourhood.

The paper proceeds as follows. Section 2.2 summarises the main findings on peer effects in investment decisions. Section 2.3 reviews the setup of the analysis. Sections 2.4 and 2.5 discuss in detail the methodology and the data. Section 2.6 presents main results and describes the robustness tests. Section 2.7 concludes.

[30] Finance industry is comprised of credit institutions and professional financial services firms, insurance companies excluded. The proportion is reported as of the third quarter 2014 - the latest date available before the reporting changed. Source: Central Bank of Luxembourg tables 14.02 and 11.02 (1991-2014).

2.2 Previous research

There is a vast literature on differences in financial market outcomes between immigrants and natives[31] and on the interdependence[32] and assimilation[33] of immigrants' financial behaviour. However, the reverse question, whether immigration affects natives' financial decisions, has received little attention.[34] One exception is Brown et al. (2008), the study closest to ours, who examine the effect of stock market participation in one's neighborhood on one's decision to own stocks. To identify the causal link between community and individual stock market participation, the authors focus on the behaviour of "native" residents in the United States, i.e. whose states of birth and residence coincide, and instrument average community ownership by using information on average participation rates in states of birth of "non-native" neighbours. The results show that an individual is more likely to participate in the stock market when more people in her community are stock market investors and that this effect is stronger in communities in which individuals are more likely to seek advice from their neighbours. The main driver of this result, according to the authors, is that people must rely on what they have learned from social interactions to make their investment decisions due to elevated cost of obtaining information about financial markets.

Despite a lack of studies on the peer effects in investment decisions and portfolio allocation between immigrants and natives, there is a large body of research that analyses the role of peer effects in financial behaviour in a variety of other settings. Among the first authors to have looked empirically at the causal effect of peers' choices on individuals' financial outcomes are Duflo and Saez (2002). In their seminal paper, the authors study peer effects in retirement savings decisions by conducting the analysis within reference groups, as defined by gender, age, and tenure status at work, and by instrumenting the average participation in the retirement plan of each group with its salary and tenure structure. The results show that peer effects may be an important determinant of savings decisions.

Similar to Duflo and Saez (2002), most papers studying peer effects in financial behaviour find a

[31] Several papers document the existence of differences in financial behavior between immigrants and natives both in the United States (e.g., DalBorgo, 2015) and in Europe (e.g., Mathä et al., 2013). Many authors point out the importance of culture in explaining such differences through cultural predispositions (e.g., Haliassos et al., 2015), spoken language and intertemporal choice preferences (e.g., Chen, 2013), trust and religion (e.g., Guiso et al., 2003, 2006, 2008), social capital (Guiso et al., 2004), and behavioural attitudes (e.g., Hens and Meier, 2015). Other authors, on the other hand, find that differences in financial behaviour cannot be explained by culture. Carroll et al. (1999), for example, show that despite the fact that saving behaviour of immigrants varies significantly by country of origin, cultural differences between immigrants coming from high-saving countries and from low-saving countries alone cannot explain different saving rates. Among the main explanations of the immigrant-native wealth gap other than culture are differences in income and education (e.g., DalBorgo, 2015) and adverse location choices of immigrants and, thus, their inability to build housing wealth (e.g., Borjas, 2009).

[32] There has been vivid interest among scholars in the interrelation of immigrants' financial choices within their social network. For example, a study by Kelly and Gráda (2000) tests the role of social contagion and examines the importance of networks in the decision to leave the bank during the market panic. To construct social networks, the authors use data on depositors of a New York bank whose clients are primarily recent Irish immigrants and exploit the fact that their social network is largely determined by the place of origin in Ireland and where they lived in New York. The authors find that the social network is the main determinant of both decision whether to leave the bank and the timing of the run during market panics: immigrants from one set of counties tended to stay with the bank, while otherwise identical individuals from different counties closed their accounts at different times. Finally, the importance of the county of origin in determining behaviour did not diminish with the length of stay in America. This fact reflects the failure of immigrants, mostly very poor, to assimilate into a wider society.

[33] For example, Haliassos et al. (2015) find that despite the fact that, because of common institutions, financial behaviour of immigrants tends to converge over time to that of natives, differences do not disappear completely.

[34] There are numerous studies that pose a question similar to ours in the context of education. Two examples are Gould et al. (2009) and Angrist and Lang (2004). The former find a negative effect of immigration on long-term educational outcomes of natives and that these effects are stronger at lower levels of immigrant concentration. This finding suggests that the integration of immigrants is easier when they are present in sufficiently large numbers. In contrast, Angrist and Lang (2004) conclude that there are no long-lasting effects of an increase in proportion of racial minority students on educational outcomes of their white classmates.

positive association between the decision of a group and of an individual (see Table 2.7).[35] However, there is no consensus on what drives those effects.

In particular, Bursztyn et al., 2014 disentangle two channels of social influence in financial decisions: *social learning*, when peers want to acquire an asset because they learned from the choice of someone else who did it, and *social utility*, when someone's asset ownership directly affects peers' utility of owning the same asset. An experimental set up allows the authors to estimate the two mechanisms separately and to conclude that both matter.

Differently, Banerjee et al. (2013) distinguish between a pure *information effect*, when a participation decision depends on whether the person is aware of the opportunity, and an *endorsement effect*, which captures all interactions beyond pure information transmission, meaning that the decision to participate in a financial instrument depends on participation among one's peers. By studying the case of participation in microfinance borrowing, the authors show that only the information effect matters, whereas there is no statistical evidence of the *endorsement effect*. In other words, after properly conditioning on an individual being informed about the opportunity, the decision to participate is not significantly affected by participation among her peers.

Except for these two studies, the rest of the existing empirical literature on peer effects in financial behaviour either estimates the combined effect of social learning and social utility or focuses on one of the two.

For example, several studies investigate the effects of social interactions on portfolio choices by looking at professional trades (Hong et al., 2005; Pool et al., 2015) or private investors (Ivkovic and Weisbenner, 2007; Kaustia and Knüpfer, 2012). These papers find that investors who live in the same city (Hong et al., 2005) or the same neighbourhood (Hong et al., 2005; Ivkovic and Weisbenner, 2007; Kaustia and Knüpfer, 2012) are likely to trade the same stocks (Hong et al., 2005; Ivkovic and Weisbenner, 2007), to have a portfolio overlap (Pool et al., 2015), and to enter the stock market if their peers recently experienced positive returns (Kaustia and Knüpfer, 2012). While all these studies attribute their results to the *word-of-mouth* communication about stocks among investors, their conclusions about the quality of the shared information differ. In particular, Hong et al. (2005) and Ivkovic and Weisbenner (2007) are not able to determine whether investors share personal sentiments or pass along real information about fundamentals. Pool et al. (2015) show that, consistent with the social learning hypothesis, peer networks transmit valuable information. Kaustia and Knüpfer (2012), on the other hand, conclude that *social learning* of new investors is driven by sentiment rather than by valuable information exchange since the effect of neighbours' returns on an individual's entry decision is virtually non-existent when peers' returns are below zero while it increases significantly when returns become positive. The latter indicates that people tend not to talk about decisions with negative results and that communication is biased towards positive outcomes.

Several other papers highlight the importance of social interactions in investment decisions by arguing that sociability reduces fixed participation costs through cheaper information sharing. In particular, Georgarakos and Pasini (2011) show that households who live in more historically sociable communities are more likely to be stockholders. Hong et al. (2004) find that households who interact with their neighbours or attend church, the so-called "social investors", are more likely to participate in

[35] Beshears et al. (2015) is an exception. In their experimental study, they find a negative effect to receiving information about coworkers' savings behavior on recipients' savings choices: information on peers' savings decreased the savings of recipients. They distinguish between two possible forces behind such a shift away from the peer norm (what they called a *boomerang effect*): negative belief updates and oppositional reactions. Specifically, individuals who learn that the promoted behavior is less common than they previously believed decrease their own engagement in the behavior as a result. The second force, which is the most likely in this study, is an *oppositional reaction*, namely, a discouragement from upward social comparisons.

financial markets than "non-social" households and when more of their peers participate. By showing that the impact of sociability is stronger in communities where stock-market participation rates are higher (Georgarakos and Pasini, 2011; Hong et al., 2004) and that peer effects among neighbours are stronger in more sociable states (Ivkovic and Weisbenner, 2007), this strand of literature concludes that stock-market participation is influenced by social interactions.

Finally, a handful of papers separates *social utility* and *social learning* channels. Specifically, Li (2014) studies the importance of information sharing regarding financial decisions within family networks and finds that the probability of investing in stocks increases if children or parents recently entered the stock market. By showing that the results hold only for entry decisions and that there is no correlation in stock market exits, the author concludes that information sharing is driven by *social learning*. Cooper and Rege (2011), on the other hand, provide evidence consistent with Bursztyn et al.'s (2014) *social utility* hypothesis. To study what drives peer effects in choices under uncertainty, they conduct an experiment designed to rule out social norms, payoff complementarities, group affiliation and knowledge spillovers channels. By showing that rational social learning and imitation do not play an important role in peer effects transmission, the authors conclude that the main driving force of peer effects in their setting is *social interaction*, i.e. when others' action appear directly in an individual's utility function. Interestingly, they find that *social regret* rather than *taste for conformity* explains the results.

Closely related to our article is the literature on peer effects in consumption (Agarwal et al., 2016; Boneva, 2014; Cai et al., 2009), indebtedness (Becker, 2006; Georgarakos et al., 2014), housing choice (Patacchini and Venanzoni, 2014; Ioannides and Zabel, 2003) and programme participation (Aizer and Currie, 2004). In particular, Boneva (2014) identifies neighbourhood effects in consumption and shows that households change the composition of their consumer basket in a way that mimics the compositional change in the neighbourhood. Cai et al. (2009) find that observational learning, driven by both rational learning and conformity effects, plays an important role in explaining consumer choices. Moretti (2011) shows that if quality is ex ante uncertain, social learning is an important determinant of movie sales. Becker (2006) notices that the purchase of many conspicuous goods such as cars, boats, home appliances, and jewellery is motivated by a desire to advance in the social ranking. One consequence of this status race is higher consumer borrowing - a question studied by Georgarakos et al. (2014), who find that a higher perceived average income in the social circle increases a household's tendency to borrow. Ioannides and Zabel (2003) and Patacchini and Venanzoni (2014) find that there are statistically significant peer effects within one's neighbourhood on the individual demand for housing quality. Finally, Aizer and Currie (2004) find that take-up of a publicly-funded maternity care programme is highly correlated within neighbourhoods and ethnic groups, which, however, does not seem to be explained by information sharing among peers.

Thus, there is a vast literature studying effects of peer choices on individual economic behaviour. However, most of these papers are only able to identify the overall effect of social interaction without determining what are its drivers. Moreover, all previous studies focus on peer effects within communities based on similarities in some characteristics. We contribute to the literature, by, first, robustly identifying peer effects in stock market participation and by separating *social utility* and *social learning* channels of its transmission; and, second, by answering the question whether these effects exist between immigrants and natives. Our results, in combination with recent findings on the nature of peer effects in financial behaviour and on differences between immigrants and natives, indicate that financial culture and investment attitudes can be transmitted through peer effects, which should be

taken into consideration to design effective policies aimed at fostering financial inclusion.

2.3 Background and study set-up: Luxembourg and immigrants

Luxembourg offers a unique context to study the effects of immigration and of the exposure to different financial cultures on the portfolio choices of natives.[36] There are several reasons for this. First, roughly half the Luxembourg population are immigrants, with this fraction reaching more than 60% in certain areas of the country (see Table 2.8.1). Most foreigners come to Luxembourg from the neighbouring countries (Belgium, France and Germany) and from Southern Europe (Portugal and Italy), and make up between 53% and 92% of the foreign-born population depending on the commune (Table 2.8.1).[37] The rest of the immigrant population originates from other European countries and the rest of the world.

Despite a highly developed financial sector and high living standards, over years Luxembourg attracted not only skilled foreigners, but also low-skilled workers. Heterogeneity among the immigrant population is, amongst others, reflected in stock market participation rates (Table 2.4). Interestingly, for immigrants from Portugal not only the stock market participation is one of the lowest across immigrant groups, but also the probability to be a stock holder is lower for those who moved from Portugal than for those who stayed. This is the opposite for Germans, Italians and Belgians: the probability that an immigrant from these countries is a stock market investor is almost twice higher than it is on average in their country of origin. This suggests differential selection into immigration across these countries. Namely, while Germans, Italians and Belgians working in Luxembourg are most probably to be employed at positions requiring high education, immigrants from Portugal are more likely to occupy low-skilled jobs and, thus, have low educational attainment and lower income. The data confirm that significantly more immigrants have completed either high education or only primary/lower secondary education whereas more natives have obtained upper secondary diploma. This again is driven by the fact, that the oldest immigrant group, namely Portuguese, have low educational attainment rates, reflecting both income and cohort effects.

Despite sharp differences across immigrant groups, the distribution of socio-economic characteristics across natives and immigrants overall depends on the dimension of comparison. In particular, the immigrant population are on average younger than natives (Table 2.2), reflecting a continuous increase in net immigration rates. Reflecting the age differences, more natives are widowed and retired, while there are no differences in divorce and marriage rates. As expected, more than half of foreign heads of households have a foreign partner comparing to only 12% among the natives. From the economic perspective (Table 2.3), natives in Luxembourg have significantly higher homeownership rates but there are no differences in life insurance ownership or the probability to hold some debt. Further,

[36] The composition of the population in Luxembourg is comparable to such countries as United Arab Emirates, Qatar or Kuwait, where, however, most of the immigrants are employed in the construction sector or other low-skilled jobs and are isolated from the native population. Thus, it is difficult to immagine how native population might be in contact with immigrants in daily life. Among other suitable cases to study a question similar to ours would be Singapore or Hong Kong. One could also focus on certain cities with a large share of foreign-born residents, such as Lausanne in Switzerland (41.9%), Mannheim in Germany (38.7%), London in the U.K. (36.7%), and Brussels in Belgium (35%) (Burdett, 2015).

[37] One of the reasons for why immigrants in Luxembourg are mostly Europeans is an implicit immigration policy to accept in the country mainly white, Catholic, European immigrants. This policy was in place for much of the 20th centrury. Among other reasons is the high demand for skilled workers and elevated costs of living. *Source*: Migration Policy Institute, Immigration in Luxembourg: New Challenges for an Old Country by Serge Kollwelter, March 2007; available at http://www.migrationpolicy.org.

Luxembourgish natives' income and net wealth are, on average, higher than immigrants'. The former is driven by the fact that Luxembourgish tend to be employed in public sector (47% of Luxembourgish are employed in public jobs relative to 14% of immigrants), which, differently to many other countries, offers on average higher salaries than does the private sector. The latter is a direct consequence of higher homeownership rates and the fact that house prices in Luxembourg experienced a remarkable increase during the past decades. This is confirmed by the fact that the natives have higher conditional mean levels of both main residence and liabilities, but there are no differences in financial wealth between the two groups. Lastly, immigrants on average are more financially literate, more risk loving, and more likely to work in the financial sector (12% of immigrants work in the financial sector compared to 5% of natives).

Finally, the composition of the immigrant population varies greatly across communes, as does their financial behaviour. Specifically, the overall proportion of foreigners ranges between 15% and 65% across communes, while the main immigrant groups account for between 11% and 55% of total population. An interesting feature is that certain immigrant nationalities tend to cluster in certain communes. For example, in some communes Portuguese make up 45% of the total population and 82% of the total foreign population. A similar pattern is also present for French and Belgians, whose shares in the communes where they choose to live reaches 14% (27%) and 18% (64%) respectively of the total (foreign) population. In context of this paper, such a choice of place of residence creates a substantial variation in the exposure of natives to different cultures, and in particular to investment attitudes and stock market participation behaviour. As can be seen from Table 2.5, the stock market ownership rates differ substantially at commune level, with a higher variation among foreigners. This is not surprising given the difference in the composition of the population of communes and the fact that immigrants themselves are very diverse on this dimension. In particular, as shown in Table 2.4, while stock market participation rates of the Portuguese is among the lowest, the participation rates of Germans and Belgians are twice as high as those of natives.

To conclude, there are substantial differences in stock participation rates across communes that cannot be explained solely by socio-demographic characteristics. Moreover, natives in Luxembourg are exposed to diverse investment attitudes because immigrants, who have widely ranging stock-ownership rates, tend to cluster in different geographical areas. This variation makes it possible to study how native population change their portfolio allocations as a result of portfolio choices of their foreign-born community peers.

2.4 Methodology and empirical strategy

2.4.1 Endogenous, contextual and correlated effects

The objective of this paper is to analyse the effect of stock market participation - directly or indirectly through mutual funds - among immigrants on the decision of natives living in the same commune to invest in stocks. The most common econometric specification of this question in the literature on peer effects is the *linear-in-means* model (Bramoullé et al., 2009), meaning that an individual's outcome is regressed on the average outcome of her reference group. However, as is well known, the coefficient of the community average in this regression would be confounded by the *reflection problem* and would capture not only the peer effect of interest, but also the so-called contextual and unobserved correlated

effects. This section follows Manski (1993) in describing the nature of these effects.
In many applications, average behaviour of a group is positively correlated with the behaviour of individuals making up this group. However, causal interpretation of this correlation would be erroneous. In other words, an observed positive correlation would not necessarily imply that by changing average behaviour of one's peers, keeping everything else constant, it is possible to affect one's own behaviour - a question that is almost always of interest and relevance for policy makers. What may confound the identification of the peer effect of interest?
Consider a specification of an individual's outcome y given by Equation 2.1[38]:

$$y = \alpha + z'\eta + \beta\mathbb{E}(y|x) + \mathbb{E}(z|x)'\gamma + u \tag{2.1}$$

Where the error term u is such that:

$$\mathbb{E}(u|x,z) = x'\delta \tag{2.2}$$

In this specification x characterizes a person's reference group, z is a column vector of observed characteristics, and $(\alpha, \beta, \gamma, \delta, \eta)$ is a vector of parameters.
Given such a definition of an individual's outcome, the mean regression of y on (x, z) takes the following linear form:

$$\mathbb{E}(y|x,z) = \alpha + z'\eta + \underbrace{\beta E(y|x)}_{\textit{Peer effect}} + \overbrace{\underbrace{\mathbb{E}(z|x)'\gamma}_{\textit{Contextual effects}} + \underbrace{x'\delta}_{\textit{Correlated effects}}}^{\textit{Potential confounding factors}} \tag{2.3}$$

In particular, this specification breaks down the individual decision into parts related to her own observable characteristics z and a part which is related to her community. The latter can be further decomposed into:

- "*Endogenous* (or *peer*) *effect*", which is the peer effect of interest, is captured by the coefficient β. This effect means that a person's outcome y varies with $\mathbb{E}(y|x)$, the mean of y among the persons in the reference group x. $\beta \neq 0$ implies that if one changes an individual's reference group x, thus potentially changing the average behaviour of her peers by, for example, policy intervention, one could affect individual's own behaviour. In practice, when information sharing is properly accounted for in the model, such a propensity of an individual to behave in some way that varies with the behaviour of her group expresses Gali's (1994) notion of "keeping up with the Joneses", i.e. when individuals who observe their neighbours' decisions adjust their own. In our application, the endogenous effect shows how natives change their stock ownership participation when being exposed to different financial attitudes of their foreign neighbours, everything else being equal.
- The vector of "*exogenous* (or *contextual*) *effects*" are captured by the parameters in γ. Contextual effects show how the individual outcome y varies with $\mathbb{E}(z|x)$ - the mean of exogenous observed characteristics z among the persons in the peer group. In other words, it shows the propensity of an individual to behave in some way that varies with the exogenous characteristics of her community. In principle, this definition means, that one could control for the set of commune-specific

[38]The notation of this section is that of Manski (1993). The goal of this section is to describe the nature of the factors which might confound the identification of the peer effect of interest. This section serves as a foundation for our further discussion on the empirical strategy and the specification of the estimated model described in details in section 2.4.2.

characteristics constructed as averages of all the individual variables included in the regression. In practice, however, to account for *contextual effects* the approach oftentimes is to include the set of neighbourhood fixed effects which would absorb time-invariant characteristics of the area of residence (see, for example Brown et al. (2008)). In our setting, we are limited by the cross-sectional dimension and a rather small sample size. Therefore, we include commune-specific controls that would capture these effects the best. In particular, we control for communes' affluence proxied by rental prices, and the share of people working in the financial sector, meant to capture population composition of the commune.

- "*Correlated effects*" captured by the parameter δ, indicate that people belonging to group x tend to behave similarly because they have similar unobserved individual characteristics x or because of their exposure to similar institutional environments, i.e. $\mathbb{E}(u_i|c, Z) = x_i'\delta$. This problem is particularly relevant when assignment into groups is not random and it can be plausibly suspected that people self-select themselves into groups based on unobservables. Correlated effects would bias the estimate of the peer effect β if, for example, more risk loving natives and more risk loving immigrants sort themselves into certain communes. If this were the case, both Luxembourgish and immigrants living in more risk-loving communes would invest more in stocks and we would observe a positive correlation between their outcomes. However, this observed association would be driven exclusively by their correlated propensity to risk and not by conformist behaviour arising from *social utility* or by knowledge spillovers due to *social learning*.

In most applications, the coefficient of interest for policy makers is the parameter β, which indicates the elasticity of individual behaviour to the behaviour of her peers, net of contextual and correlated effects. To understand how individuals change their behaviour as a response to the behaviour of their group is particularly important in the context when many countries in Europe encounter a considerable inflow of immigration, which brings different sets of beliefs, knowledge and financial culture. Moreover, it is important to disentangle what affects the behaviour the most: a desire for conformity, by means of keeping up with the behaviour of the peers , or learning from the knowledge of the group. Finally, to improve our understanding of the mechanisms of portfolio decision making, it is of interest *per se* to analyse how contextual characteristics, risk attitudes and financial literacy affect individual's portfolio choices. The next section formalizes our empirical strategy in order to answer these questions.

2.4.2 Identifying and estimating the peer effects: instrumental variable approach

To identify the effect of stock market participation of foreigners on the investment decision of a native residing in the same commune, we, first, specify our baseline estimating equation by a linear probability model including the variable meant to capture endogenous peer effects and a standard set of socio-demographic and economic characteristics[39]:

$$y_{icN} = \alpha * + \beta * \hat{\mathbb{E}}(y|c, F) + Z_{icN}'\eta * + u_{icN}, \tag{2.4}$$

[39]The linear probability model is a good linear approximation of the expectation of the binary dependent variable conditional on a set of explanatory variables. However, to address potential consequences of the linearity assumption, we report results of a probit model in the appendix, as in Nicoletti et al. (2014).

where y_{icN} is an indicator taking value one if a native (N) household i residing in commune c has investments in stocks or mutual funds. Z'_{icN} is a row vector of exogenous households' socio-demographic and economic characteristics and $\hat{\mathbb{E}}(y|c,F)$, specified in equation 2.5, is the stock market participation rate among foreign peers of a household i living in commune c.

$$\hat{\mathbb{E}}(y|c,F) = \frac{\sum_{j \in P_{Fci}} y_{jcF}}{N_{cF}}, \tag{2.5}$$

where P_{Fci} is a set of foreign (F) neighbours of a native individual i living in a commune c, y_{jcF} is the individual participation decision of immigrants residing in commune c, and N_{cF} is the number of immigrants living in commune c.

As has been shown in Section 2.4.1, a simple regression of a native's decision to invest in stocks on the stockownership rate among foreigners in her community would not produce a consistent estimation of the peer effect of interest, i.e. how natives change their stock market participation behaviour facing different investment attitudes of their foreign peers. Specifically, the estimate of the coefficient $\beta*_F$ meant to capture this effect would be biased in any of these three cases: there is a reverse causality, there are contextual effects, or there are correlated effects, which are altogether referred to as the *reflection problem*. To identify the peer effect of interest and to address the endogenous sorting and selection issues, recent papers have adopted three main approaches[40]: using experimental or quasi-experimental variation in exposure (e.g., Banerjee et al., 2013; Boneva, 2014; Bursztyn et al., 2014; Cooper and Rege, 2011); aggregating to a level at which sorting is arguably reduced or eliminated (e.g., Bayer et al., 2008); and using the instrumental variable approach (e.g., Brown et al., 2008; Duflo and Saez, 2002; Ioannides and Zabel, 2003).[41]

In our context, the ideal experiment to rule out the possibility that correlation of investment behaviour

[40] For an excellent review see Durlauf (2004), Topa and Zenou (2014) and Ioannides and Topa (2010). They survey the research on neighbourhoods' and social networks' effects and their role in shaping behaviour and economics outcomes. They illustrate the importance of peer effects for financial choices and risk-sharing within households, communities and villages, and underline the fact that decisions of individuals who share spatial and social space, defined by ethnicity, race, age, nationality, tastes and other attributes, are likely to be interdependent. Ioannides and Topa (2010) further discuss both empirical significance of the social context in economic decisions and problems in identification of peer, neighbourhood and network effects. The importance of sorting and homophily in peer groups formation is discussed in Caetano and Maheshri (2015).

[41] Well-developed literature on peer effects covers educational and labour market outcomes. There are several identification strategies commonly used in this literature. First, some papers rely on an instrumental variable approach, which solves the problem of reflection if peers' networks are partially overlapping (DeGiorgi et al., 2010). An example of a paper that builds its identification strategy on the intransitivity of peers is Nicoletti et al. (2014). Specifically, they study the effect of peers (here, siblings and cousins) on mother's decision to work in the year after childbirth. They use average characterisics of mothers living in the cousins' and siblings' neighbourhoods as instrumental variables for peers' decision. This instrument solves the simultaneity problem because mothers do not interact directly with their peers' peers. To solve the remaining identification issues (correlated effects and unobserved neighbourhood characteristics shared by mothers who live in the same neighbourhood), the authors control for observed characteristics of mothers and fathers and use neighbourhood fixed effects respectively. The latter is required because the instrumental variable is at the neighbourhood level. Other authors, such as Lavy and Schlosser (2011), employ within-individual variation across a set of outcomes to address identification issues. In particular, their paper studies peer effects in schools by specifiying regressions with pupil fixed-effects and exploiting variation in achievements across subjects. The third approach is to combine the two. In particular, Nicoletti and Rabe (2014) test sibling spillover effects in school achievements. Their identification strategy exploits both inter-subject differences in test scores and the variation in the composition of school mates between siblings. The second "ingredient" exploits the fact that siblings and school mates are two peer groups that are not perfectly overlapping (Bramoullé et al., 2009; DeGiorgi et al., 2010). In particular, the authors instrument the older sibling's test scores using the average test scores of their school mates - this strategy based on the presence of some intransitivity in the network of peers which occurs if a person interacts with sibling's peers but not with all of the peers of their peers. The fourth strategy to identify peer effects without experiment is to use a reform as an instrument in a quasi-experimental set-up. An example is Dahl et al. (2014), who use a reform in Norway in a regression-discontinuity design setting to study the effect of peers on a decision to take a paternity leave of co-workers and brothers. Finally, DelBello et al. (2015) attempts to study links between neighbourhood and social networks effects in educational attainment by using a Bayesian methodology that takes into account both the observable and unobservable characteristics. By doing so the authors find that the effect of peers-in-neighbourhood on school performance is insignificant while the effect of other peers is significant. The reason for this result, according to the authors,

between natives and immigrants is driven by unobserved correlated characteristics would be to allocate immigrants randomly in the communes. However, in an absence of such an experiment we propose the twofold approach to clean the association between an individual's stock market participation and her group participation rate of the confounding factors. First, we solve the reverse causality problem and separate endogenous and exogenous effects by relying on an instrumental variable approach. Second, we take a step further and address the *contextual* and *correlated* effects by controlling explicitly for commune-specific characteristics and individuals' risk preferences.

To solve the issue of reverse causality, we exploit the fact that the network of neighbours, consisting of natives and immigrants, and the network of foreigners, consisting of immigrants living in Luxembourg and those who stayed in their countries of origin, are partially overlapping. As shown in Bramoullé et al. (2009) and DeGiorgi et al. (2010), identification of the peer effect and the separation of endogenous and exogenous effects are only possible if individuals do not interact in groups since it allows the use of instrumental variables. In the terminology of DeGiorgi et al. (2010), such intransitivity of network allows instrumenting the peers' mean behaviour by using the mean of characteristics of peers's peers who do not interact directly with the person in question, or in other words of the *excluded peers*.[42] Thus, intransitivity guarantees the existence of instrumental variables for the foreign peers' stock market participation rates.

In our application, we rely on the intuition of Guiso et al. (2004) that there may be long lasting effects of one's place of birth on one's financial outcomes. Following Brown et al. (2008), we construct an instrumental variable for the commune-specific participation rates of foreigners by using information on lagged stockownership rates in the countries of birth of the immigrants. To derive this instrument we rely on the intransitivity of networks given by the assumption that Luxembourg natives do not interact directly with foreigners who did not immigrate to Luxembourg. This implies that, while ownership rates in the country of birth of immigrants are correlated with ownership rates of the immigrants residing in Luxembourg, there is no direct effect from those who stayed in their country of birth on the financial choices of the native population in Luxembourg if not indirectly through the foreign peers. Thus, a native resident of Luxembourg is influenced by the behaviour of those living in other countries only through the behaviour of her foreign peers living in Luxembourg. This fact implies that the stock ownership rates in the countries of origin can be used as an instrumental variable for participation rates of immigrants in Luxembourg.

Formally speaking, the fact that average characteristics of immigrants' countries of origin can affect the natives' decisions only through the decision of their foreign neighbours means that we can use the observable characteristics Z of those living outside of Luxembourg, i.e. $\hat{\mathbb{E}}(Z|\text{country origin}, F) = \frac{\sum_{j \in P_{Fi}} Z_{jF,\text{country origin}}}{N_{F,\text{country origin}}}$, to instrument $\hat{\mathbb{E}}(y|c, F)$. In particular, we use as an instrument for immigrants' stock market participation the mean of the dependent variable y of those who stayed in the countries of origin, i.e. $\hat{\mathbb{E}}(y|\text{country origin}, F) = \frac{\sum_{j \in P_{Fi}} y_{jF,\text{country origin}}}{N_{F,\text{country origin}}}$. To rule out simultaneous correlated responses across countries to the release of new information and to reduce the potential for picking up a spurious correlation, we use lagged values of the instrument. To construct a commune -specific instrument, we weight participation rates in the countries of origin by the commune-specific population composition, i.e. by the proportion of immigrants coming from a certain country.

To be valid, the chosen instrumental variable should satisfy two main conditions. First, it must be rel-

is that the effect of peers who reside in the same neighbourhood is mainly due to unobservable common characteristics that drive the link formation process and thus there is no real impact of peers-in-the neighbourhood on school outcome.

[42] We cannot (and we do not aim to) consistently identify the effect of native neighbours on investment decision of a native resident. The reason for this is the fact that native neighbours do not satisfy the partial overlapping condition, crucial for the identification.

evant, meaning that it should be correlated with the endogenous variable - stock market participation among the foreigners. Second, it must satisfy the exclusion restriction, i.e. it should not be correlated with unobserved variables explaining natives' stock market participation decisions - the dependent variable - and it must influence this decision only indirectly through the average participation decision of their foreign peers. In other words, stock ownership rates in the country of birth of immigrants should be correlated with stock ownership rates of the immigrants in Luxembourg, but should not affect directly choices of the native Luxembourgish population. If the instrument is valid, then a two-stage least square estimation provides a consistent estimation of the endogenous neighbourhood peer effects by solving the reverse causality problem, provided other concerns are addressed.

Since we use an instrumental variable at the level of the neighbourhood, there remain two potential threats to the identification, which have to do with the exogeneity of instrument. In particular, the instrument is exogenous only if, first, there are no omitted characteristics of those who live abroad that are correlated with the characteristics of the natives and explain the investment decision; and, second, if the population of immigrants' countries of origin do not interact directly with Luxembourg native residents.

While the latter does not seem to be of a considerable concern, the former might arise if immigrants and natives sort themselves into neighbourhoods based on unobservable correlated characteristics which also characterise those who stayed in their countries of origin. If this is the case and individuals living in the same neighbourhood share similar unobserved characteristics that are also correlated with the stock market participation decision, then these individuals will also have similar investment preferences, and thus correlated outcomes, even in the absence of the endogenous peer effect (Goldsmith-Pinkham and Imbens, 2013).[43] Failing to control for such characteristics might therefore lead to an overestimation bias of the endogenous peer effect.

To address this concern we control for individual characteristics that might affect both investment preferences and the choice of the location of residence but are rarely observed in the data and thus remain "unobservable" in most of the empirical studies, as well as for a set of neighbourhood-specific covariates. In particular, to solve the issue of correlated effects, i.e. characteristics that are shared by natives and foreigners living in the same commune, we include an indicator for individuals' preferences for risk (Bramoullé et al., 2009, Cooper and Rege, 2011)[44], as well as information on financial literacy and on whether an individual herself is employed in financial sector. As for the neighbourhood characteristics, we control for communes' average rental prices, which captures their economic condition and location within Luxembourg, and for the proportion of communes' residents working in the financial sector, which accounts for the population composition. Explicitly controlling for these characteristics allow partialling out the potential bias arising due to sorting of natives and immigrants with similar characteristics, which might affect their portfolio allocation decisions, into same communes of residence. This approach has a further advantage that, by controlling explicitly for the individual- and neighbourhood-specific attributes, we are able to analyse the determinants of the investment decisions as well as the mechanisms of the peer effect transmission.

Formally speaking, to control for the confounding factors, that is contextual and correlated effects, we

[43] In the social networks literature such a not random self-selection into groups, i.e. sorting, is often explained by homophily, see for example Currarini et al. (2010) and Goldsmith-Pinkham and Imbens (2013).

[44] Information on natives' risk attitudes is meant to address a concern raised in (Cooper and Rege, 2011) that if peers have similar unobserved taste for risk, possibly due to self-selection into peer groups, there would be observed positive behavioural correlation even in the absence of social interaction effects.

re-write equation 2.4 including neighbourhood and individuals' characteristics discussed above:

$$y_{icN} = \alpha + \beta_F \hat{\mathbb{E}}(y|c,F) + Z'_{icN}\eta + \hat{\mathbb{E}}(K|c)'\gamma + x'_{icN}\delta + \epsilon_{icN}, \tag{2.6}$$

such that:

$$\hat{\mathbb{E}}(K|c) = \frac{\sum_{j \in P_{ci}} K_{jc}}{N_c} \tag{2.7}$$

where K_{jc} is a set of neighbourhood specific characteristics (rental prices and proportion of people working in financial sector) and x'_{icN} is a vector of risk preferences, and financial literacy and an individual's employment in financial industry indicators. Since in this specification $\mathbb{E}(\epsilon_i|c,Z,K,x)$ is likely to be zero, estimation of equation 2.6 provides an unbiased estimate of an endogenous peer effect of interest β_F.[45]

2.4.3 Identifying mechanisms

Most of the literature agrees that correlation between individual decisions and the behaviour of the group, net out of contextual and correlated effects, may be driven by two forces: *social utility* and *social learning* (Bursztyn et al., 2014). Both of these channels help to explain why peers might play an important role in one's savings decisions. In particular, *social utility*, which has also been labelled as *social interaction effect* (Cooper and Rege, 2011), or, simply, *keeping up with the Joneses* (Gali, 1994), is responsible for social norms and beliefs about social norms transmission and operates through *social norms*, *social regret*, *preferences for conformity* and *payoff complementarities* (Cooper and Rege, 2011). *Social learning*, on the other hand arises due to the fact that information supposed to guide financial decisions is costly and thus, individuals tend to rely on others' knowledge. According to Sorensen (2006), *social learning* is a particular form of endogenous peer effects, through which individuals might be both directly influenced by the information provided by peers and by knowledge of their decisions. Dahl et al. (2014) show that transmission of information, which includes knowledge about both the existence of the opportunity and possible returns, is one of the most important drivers of peer effects. Moreover, this channel also creates opportunities for social multiplier and "snowball" effects, thus, making *social learning* being especially relevant for policy-makers. As for its mechanisms, *social learning* might occur through *rational social learning*, when valuable information is transmitted, *imitation*, and *knowledge spillovers* (Cooper and Rege, 2011). Similar in the meaning but different in the terminology, Banerjee et al. (2013) distinguish between *endorsement channel* of peer effect transmis-

[45] We choose to control for commune-specific characteristics, instead of those related only to foreigners, which is the peer, or reference, group of interest, because in our specification there characteristics are meant to capture contextual effects and factors which might induce sorting into specific areas, and thus that are common for both natives and foreigners. The choice of these controls is driven by both data availability and sample size. In principle, following Manski's (1993) discussion, one could include the group specific averages for all individual-level covariates estimated in the regression. However, our sample size of native residents is relatively small, thus not allowing estimation of such a specification precisely. To tackle this issue, we choose neighbourhood specific covariates such as to capture potential endogenous sorting and the contextual factors the best, namely commune-specific rental prices and employment in financial sector. The data on rental prices is from the CENSUS administrative dataset and therefore is only available at the commune level, without the distinction of rents paid by natives and foreigners. To remain consistent, in the baseline specification we define proportion of residents working in financial sector, constructed from our survey, also at the commune level. To address the concern that the variable capturing endogenous peer effect is defined among foreigners while contextual effects are constructed for the whole population of the neighbourhood, thus including both natives and foreigners, and to ensure the consistency of the definition of the reference group, we also perform the analysis where we specify reference group specific characteristics constructed from our survey data only for foreign population. Further, in the robustness analysis we also include controls for foreign peers' risk aversion and financial literacy to account for the possibility that omission of these factors might confound the estimation of the peer effect. The results of these analyses are reported in table 2.22.

sion, which comprises both social utility and any opinion transmission, and the *pure learning channel*, which includes only awareness about the opportunity and, thus, real knowledge transmission.

Independently of the classification, little has been done to separate information transmission channels from the *social utility*. Despite multiple attempts to identify word-of-mouth communication by using different proxies of sociability, such analysis does not distinguish between *social utility* and *social learning* mechanisms. To fill this gap in the literature we attempt to disentangle the *social utility* and the *social learning* channels by partialling out everything that might be related to financial knowledge transmission and interpret the remaining peer effect as an *endorsement* or the *social utility* effect.[46]

To do so, we, first, control for individual's financial literacy about stocks and other financial knowledge not related to stock market. We further condition on one's employment in the financial sector, which is meant to proxy one's knowledge about financial markets and investment opportunities. Finally, we control for the proportion of one's neighbours working in financial sector, which captures not only communes' contextual effects, but also addresses possible knowledge spillovers from those familiar with the industry.

A word of caution is in place regarding the interpretation of our results. First, accounting for *social learning* mechanisms only allows us to make some judgements on the relative importance of knowledge spillovers and the remaining net effect of the stock market participation of foreign peers which we interpret as *social utility*. However, this approach does not help say much about the peer effects due to *social learning per se*. This is because the coefficient of the variable which is the closest to capturing information transmission, namely the proportion of neighbours working in the financial sector, cannot be interpreted as a learning channel in a strict sense, but rather as a combination of both knowledge spillovers and sorting based on occupation, and, thus, possibly comprises both these effects.

Second, with our specification we cannot make conclusions about how financial knowledge affects one's portfolio choices, although it is arguably of interest *per se*. Indeed, while our set of individual controls is able to tell how financial knowledge is correlated with individual investment decisions and allows netting out the learning channel, these variables cannot be interpreted causally. This is because an individual's financial literacy might represent not only her own financial knowledge and what she learned from her peers, but also everything that was learned because of the investment decision, and thus suffers from the reverse causality.

Finally, the effects that we capture with the variables accounting for *social learning* might also to some extent reflect individuals' preferences for conformity. This is because one can feel the need to *keep up with the Joneses* not only in the dimension of actual investment choices, but also in one's financial awareness.

To summarise, our research design allows us to, first, identify the *endogenous peer effect* of foreigners' stock market participation decisions; and, second to take a step further by seeking to understand what are the drivers of this effect.

[46] We cannot however disantangle social norms, social regret, preferences for conformity and payoff complementarities within the social utility channel.

2.5 Data, sample definition and descriptive evidence

2.5.1 Individual level data

We employ several dataset to perform the analysis in the paper. In particular, we use the second wave of Luxembourg Household Finance and Consumption Survey (LU-HFCS), collected in 2014 as a source of individual data on natives and to construct contemporaneous averages of foreigners' stock market participation at a commune level. This data set contains information on 1,601 households, among which there are 875 households whose head was born in Luxembourg, whom we call *natives*, and 726 households whose head was born abroad, whom we call *foreigners* or *immigrants*.

LU-HFCS is a representative sample of the Luxembourgish population and is the best available dataset for our analysis for several reasons. Firstly, it contains detailed balance sheet information along with a rich set of socio-demographic, economic, investment attitudes and financial knowledge variables. Secondly, it contains full details on the country of birth of the respondent which is missing in the analogous datasets due to the anonymisation procedures. Finally, because information on the location of the residence is available at 4-digit zip code level, we can assign individuals into their communes of residence.

Our main dependent variable is an indicator for an individual's stock market participation. This variable takes value 1 if an individual holds stocks, directly or indirectly through mutual funds, and it is zero otherwise. Our main explanatory variable is stock market participation rate among foreigners, defined as a commune-specific average of foreigners' stock market participation dummies weighted by population weights available in the sample.

Since all the information about household's wealth and investments is provided by the *financially knowledgeable person* (FKP), we use her person specific characteristics in the analysis. In particular, we include in the regression age, age squared, indicator for a male FKP, indicators for being single, widowed and divorced, and for having a partner born outside of Luxembourg. We also control for middle and high educational attainments, for self-employment, unemployment, retirement, and other occupation, and for individual's employment in financial sector. Next, we include an indicator for having risk-loving investment attitudes (*take substantial or above average risk expecting to earn substantial or above average returns*) and for answering correctly about differences is risk profiles of stocks and bonds, and the proportion of correct answers about other aspects of financial literacy (mortgage interest rates, inflation and diversification). As for household specific controls, we condition on number of household members and a log transformation of a total gross household income[47].

To construct the instrumental variable for the commune-specific foreigners' stock market participation rates, we make use of the first wave of the Eurosystem Household Finance and Consumption Survey (HFCS), collected around year 2010. This dataset has several advantages. First, it contains information on 14 European countries[48], immigrants from which make up 78% of all foreigners and 34% of total population in Luxembourg. Second, this data was collected in a homogenous way across the European countries and between waves, and thus, allows using comparable variables which define participation in the stock market. Finally, we use the lagged value of the instrument, which allows accounting for possible correlated shocks between endogenous variable and an instrument. To construct the instrumental variable, we calculate stock market participation rates (directly and indirectly

[47] We add 1 to income if it is nil.

[48] 14 European countries (excluding Luxembourg) covered in the first wave of Household Finance and Consumption Survey are Belgium, Germany, Greece, Spain, France, Italy, Cyprus, Malta, the Netherlands, Austria, Portugal, Slovenia, Slovakia and Finland.

through mutual funds) of all the population in immigrants' country of origin[49] and weight them by the proportion of population from a corresponding country living in a commune by using CENSUS 2011 data.[50]

In the main analysis we restrict the full sample of all households residing in Luxembourg to 875 native households, i.e. whose FKP is born in Luxembourg.[51] We drop observations on households who reside in communes where no foreigners were surveyed (42 observations) and where foreigners surveyed are not from the European countries present in the first wave of the Eurosystem HFCS (26 observations). Finally, due to the multiply imputed nature of the dataset, 2 observations are dropped for households which do not appear in all implicates. This selection leads to a sample of 805 observations which we use to obtain the main results. In the robustness analysis, we further refine the sample selection and perform all the tests on a sample where there are at least 2, 3, 5 and 10 observations available for both natives and foreigners in a commune. Due to the small sample size, however, the number of observations drops dramatically after such selections. Thus, we keep our sample as large as possible to estimate the main results.

2.5.2 Commune level data

To analyse peer effects within neighbourhoods we exploit the variation in stockownership rates and in the population composition across communes.[52] The reason for why we choose communes to define peer groups is twofold. First, the commune is a geographic area small enough for peer effects to show themselves. The maximum surface of a commune in Luxembourg is 113 square kilometres, while the average is 22.3 square kilometres (Table 2.5). This is small enough, since previous research suggests that peer effects decay only after between 5-10 (Pool et al., 2015) and 50 miles' radius (Ivkovic and Weisbenner, 2007), which translates to areas between 78 and 7,854 square miles.[53] Second, although we have data available at the 4-digit zip code level, only aggregation to communes allows having enough observations in a neighbourhood and administrative data on the composition of the population.

Thus, we analyse peer effects in stock ownership behaviour between immigrants and natives at a commune level. In 2011 in Luxembourg there were 116 communes.[54] Our sample of individual data covers 107 of them. We supplement the individual survey data with the administrative data from the Population Census 2011 collected by National Institute of Statistics and Economics Studies of the Grand Duchy of Luxembourg (STATEC). This dataset contains information on the population of Luxembourg at a commune-level by the country of birth, which we use to construct our instrumental variable by

[49] The rationale for using all the population in the country of origin is twofold. First, in presence of peer effects, financial culture of immigrants would affect financial culture of natives, and, thus, would affect those who emigrated from their country of origin to Luxembourg as well. Secondly, in several countries (France, the Netherlands and Spain) the data was not collected on the country of origin, thus using all the population, and not only natives, allows using homogenous data across countries. To address possible concerns, we also use an instrument constructed using only data on the native population in the countries of origin where available. Although the first stage changes, overall results remain the same.

[50] We also use as weights for the instrumental "population weights" of LU-HFCS sample we used to construct our main explanatory variable and the results do not change.

[51] The number of observations is minimum across 5 implicates.

[52] We also do the analysis at a bigger - canton - level, where more observations per group is available. The results are robust to such an aggregation.

[53] To put the size of Luxembourg into perspective, the total surface of Luxembourg country is 2,586 km^2 , which is divided into 116 communes (as of 2011) or 12 cantons. In comparison, the surface of New York city is 1,214 km^2, which has 5 boroughs - a typical unit of analysis of neighborhood peer effects in the US setting.

[54] Currently there are 106 communes. However, we use the division which was in effect in 2011 due to our reliance on Census population composition shares to construct the instrumental variable.

weighting stock-ownership rates in the immigrants' countries of origin by the corresponding shares in communes' population. We also use information from CENSUS to construct the commune-specific controls, namely, dummies for the quintiles of the distribution of rental prices per square meter of the residence dwellings.

2.6 The effect of foreigners' stock market participation on the stock market participation of natives

2.6.1 Main empirical results: OLS and two-stage least squares

Our main results are presented in Table 2.7, which shows the estimates of the linear-in-means model of a native's stock market participation decision on the stockownership rates among her foreign peers. Our baseline specification is the model estimated including the variable of interest, that is the stock market participation among the foreign neighbours, and a set of socio-demographic and economic controls, such as income, level of education and other relevant characteristics (columns 1 and 2 of the table 2.7). The results show that there is a strong positive correlation between stockownership of natives and that of foreigners. In particular, the total effect of foreigners' stock market participation on natives' is 0.18 (0.53) in the OLS (2SLS) specification, which means that by increasing the ownership rate of foreigners by 10 percentage points, the probability of a native to invest in stocks increases by 1.8 (5.3) percentage points.

The coefficient in the 2SLS specification is higher than the coefficient of OLS. The reason for this is that, due to high living standards and developed financial markets in Luxembourg, the probability to invest in stocks is higher for immigrants than in their countries of origin. Table 2.6, presenting the results of the first stage for all specifications, shows that stockownership rates in the countries of origin of immigrants are strongly positively correlated with the stock market participation of immigrants in Luxembourg. In fact, by coming to Luxembourg, one is almost three times more likely to invest in stock market than back in one's country of origin, while the ordinal property is preserved: immigrants from countries where stock market participation rates are higher are more likely to have stock holdings in Luxembourg than immigrants from the countries where fewer people invest in stocks.[55] This result is what we have expected, is in line with previous findings, and justifies the choice of the instrumental variable. As regards to formal tests, the p-values of the F-statistic confirm the explanatory power of the instrument whereas the p-values of the endogeneity test suggest that the use of instrument is preferable over OLS because there is evidence of the endogeneity of the explanatory variable. [56]

Next, we control for one's investment risk preferences and financial literacy (columns 3-4 of Table 2.7), the effect of foreigners' participation shrinks to 0.16 and 0.52 in the OLS and the 2SLS specifications, respectively. This suggests that the correlation between a group's investment behaviour and individuals' choices can be partly attributed to sorting and correlated preferences - particularly those

[55] One concern about the validity of the instrument might be risen if the first stage is driven by, for example, income effects and not by the cultural persistence of financial behavior we are relying on. By looking at the Table 2.4, however, it can be seen that the order of stock market participation rates among the countries constituting main immigrant groups is preserved. This indicates that immigrants from high-participation countries tend to participate more than immigrants from low-participation countries. This fact addresses the concern.

[56] In our baseline specification, we have one endogenous variable and one instrument, as well as the heteroscedasticity robust standard errors. Thus, to evaluate the relevance of the instrument and ensure that the estimates in the second stage are reliable, we are guided by the "rule of thumb" value of the F-statistics of 10 recommended by Stock et al. (2002). Stock and Yogo (2005) in addition provide critical values for at least 3 exclusion restrictions if there is one endogenous regressor, since at least two overidentifying exclusion restrictions are required.

on risk attitudes. Unsurprisingly, the results indicate that the lower is the risk aversion (the more the individual is risk loving) the higher is her probability to invest in stocks. Specifically, risk loving individuals are 20 percentage points more likely to invest in stocks than those who prefer below average risk despite below average returns. As for financial literacy, interestingly, only financial knowledge about stocks, summarised by the variable *financial literacy related to stockownership*, seems to matter for the stock market participation decision: knowledge about the differences in risk profiles between bonds and stocks is associated with a 10 percentage point increase in the probability to invest in the stock market. Although this result is in line with findings that more financially knowledgeable people are more likely to invest in stocks (Lusardi and Mitchell, 2011b,c; van Rooij et al., 2011), in our application this correlation cannot be interpreted causally. This is because knowledge about stocks might be driven by learning through investment experience and thus, suffers from simultaneity. Moreover, on top of the own knowledge acquired prior to the investment decision, financial literacy might also contain knowledge transmitted by word-of-mouth and, hence, can be attributable to social learning. Although difficult to interpret, controls for individuals' financial literacy are necessary in our specification since they help to, first, isolate the *endogenous peer effect* by taking care of correlated preferences, and, second, rule out learning in our attempt to separate the *social utility* effect. Interestingly, once financial knowledge about differences in stocks and bonds is accounted for, neither employment of an individual in the financial sector nor other financial knowledge have explanatory power over natives' decision to invest in stocks. Overall, by including these controls the effect of average participation of foreigners decreases further but remains significant for both OLS and 2SLS.

Next, we control for the share of people working in the financial sector per commune (columns 5-6 of Table 2.7). This control is meant to account for two factors: sorting and *social learning*. Sorting, because it is plausible that people working in the financial sector self-select themselves into certain areas, which might be closer to the financial centre of Luxembourg, or simply to be better located. On the other hand, part of the effect of this variable will account for the *social learning* since being simply surrounded by people employed in the industry, and, thus, made aware of opportunities, could increase the likelihood to learn about these opportunities and about specific financial products. Our estimates suggest that even after controlling for one's own employment in financial sector, living in proximity to people working in finance increases the probability of investing in the stock market by around 50 percentage points. Moreover, by controlling for the proportion of peers who work in the financial sector, the effect of the stock market participation of foreign neighbours goes down by half to 0.1 and 0.3 in OLS and 2SLS regressions, respectively[57]. This suggests that the total effect of the stock market participation of foreigners is at least partly driven by knowledge spillovers from the neighbours familiar with the financial industry. Indeed, although the share of neighbours working in finance cannot be interpreted in a strict *social learning* sense, it most probably represents two effects: one part of it accounts for *social learning* and another is due to sorting.

Finally, we include controls for commune-specific residential rental prices as a proxy of commune wealth to account for possible commune-specific effects and to address contextual effects and sorting on wealth or income (columns 7-8 of Table 2.7). Inclusion of this control slightly decreases the positive effect of the proportion of peers employed in the financial industry, but does not affect the overall results.

Our findings can be interpreted as follows. First, by employing instrumental variable approach we

[57]The estimate of OLS in a full sample is not significant, whereas it is in the sample where there are at least two observations for both natives and foreigners in commune. Although we present the results for the full sample in the main section, the results for the reduced sample might be more credible, because it excludes the possibility that the commune averages are calculated based on one observation only.

conclude that there exists a peer effect between foreigners' stock market participation behaviour and portfolio choices of natives. Second, by including a set of controls meant to capture contextual and correlated effects, we show that the peer effect we find is endogenous, and thus is of relevance for policy makers. Finally, we attempt to go further by disentangling mechanisms of what drives the endogenous peer effects by shutting down learning channels and by interpreting the remaining effect of the average participation of foreigners on individual decisions as a *social utility* effect due to preferences for conformity or payoffs complementarities, which we find to be positive and statistically and economically significant. From the policy perspective, it means that, first, there is evidence of herding in financial behaviour, and second, that natives can quite plausibly change their financial attitudes in face of different financial cultures. Interestingly, the composition of the peer group plays an important role in explaining individual financial behaviour In particular, the fact that the higher is the incidence of people in the neighbourhood working in finance the higher is the probability of an individual to invest in stocks suggests that both *social learning* and sorting matters, and that people learn from those they think might be familiar with the subject matter.

Our estimates of the *endogenous peer effect* are in line with those obtained in the literature (Table 2.7). Our findings on the mechanisms of the peer effects transmission are in line with those of Bursztyn et al. (2014) who show that both *social utility* and *social learning* matter. Furthermore, Bursztyn et al. (2014) also show that social learning effects are the greatest when a peer who observes the behaviour of others is financially unsophisticated, and vice versa, when peers whose behaviour is observed by the others are financially sophisticated. This result confirms our finding: significant positive effects of people working in the financial sector indicate that natives do learn from the behaviour of those they consider to be financially knowledgeable. This is also in line with the results of Banerjee et al. (2013), who show that peer effects are higher if people transmitting the knowledge are more important in a network sense, which in our case might be people who are part of the financial sector. Next, the sizable combined effect of variables meant to capture *social learning* in our analysis confirms that learning is arguably the main driver of peer effects in financial choices, with different authors showing the importance of the "*information diffusion*" (Cai and Szeidl, 2016) and "*awareness of the opportunity*" channels (Banerjee et al., 2013) in peer effects transmission over other channels. Finally, our results are in consonance with those of Haliassos et al. (2016) who find that exposure to financially literacy neighbours increase households' participation in stock markets, and that the effect of the transfer of relevant knowledge is more important than pure imitation.

2.6.2 Robustness checks

2.6.2.1 Placebo tests

The first robustness test we perform is to randomly assign individuals into different communes. If the effect we find, namely those of stock market participation among foreigners and fraction of individuals working in the financial sector in a commune of residence, are indeed peer effects and are not driven by spurious correlation or by a small sample, we expect to find no results if individuals are randomly assigned to a commune of residence.[58] To make the evidence sharper and to analyse the interrelation between the main variables of interest, we limit the covariates included in the specifica-

[58]The reason we choose to randomly assign individuals into communes of residence is because at time the number of observations within a commune is rather small, therefore we use the placebo regression in order to assure that our results are not driven by small sample size.

tion of this placebo regression by stock market participation of foreigners and the proportion of peers working in finance, and, and in the first four specifications we also control for one's own employment in financial sector. The results of the placebo tests are shown in the Table 2.8. In the first column we report the results of the OLS and 2SLS specifications with both commune-level explanatory variables correctly assigned. As can be seen, the results of column 1 are comparable to those in Table 2.7 columns 7 through 10, which summarise the main results. Specifically, the probability of individuals to participate in stock market increases by 20 percentage points if twice as many foreigners invest in the stock market in a neighbourhood and by 60 percentage points if twice as many neighbours work in the financial sector. The second column shows the results when stock ownership of foreigners is assigned correctly whereas the fraction of individuals working in the financial sector is assigned randomly. As can be seen, the latter does not matter anymore, while the effect of the stock ownership increases and indicator of people's employment in the financial sector becomes significant. This suggests that the effect of people who work in financial sector is not spurious, and that it indeed accounts for peer effects through the *social learning* channel. Next, we randomly assign both explanatory variables and find that they both become insignificant, while the effect of individual employment in the financial sector matters more. Finally, we randomly assign the stockownership of foreigners and correctly assign the fraction of neighbours working in the financial sector. Consistent with previous results, the only effect that matters is the fraction of people working in the financial sector, and its effect is larger than in the specification where we properly control for all the channels that might represent peer effects. The main difference between the specifications in columns 1-4 and columns 5-8 is that, by omitting the control for individual working in the financial sector, as expected, the effect of the fraction of individuals working in financial sector in a commune matters more, when assigned correctly.

To make these placebo checks more informative, we repeat the randomisation within six Luxembourg regions. This means that we randomly assign individuals in the commune of residence within their region of residence. This design helps addressing the concern that there might be unobserved characteristics of the macro-area of the residence which might affect stock market participation decisions. The results shown in the Table 2.23 confirm that coefficient of the stock market participation of foreigners, when it is randomly assigned, is no longer significant. This means that behaviour of the foreigners with whom the natives share the region of residence but are expected to have negligible interactions does not affect their decisions. As for the randomly assigned proportion of peers working in the financial sector, it's coefficient remain significant in the OLS specification, although it is lower than when it is correctly assigned, and it is no longer significant in the 2SLS specification. The fact that it remains significant but smaller in magnitude in the OLS specification might be indicative of the fact that there remains some interaction between individuals living in different communes but in the same region, since Luxembourg is a very small country, and that this interaction is less intensive as the effect has decayed. On the other hand, it could signal that there might be some sorting on occupation across regions.

This placebo exercise confirms that the effect of foreign neighbours' behaviour represents peer effects through the *social utility* channel, and that people working in the financial sector in one's commune, represent both sorting and *social learning* channels. Thus, the estimated peer effects are not driven by spurious correlation.

2.6.2.2 Exploring additional instruments and models

To check the validity of the instrument further, we use additional available instruments. This approach allows verifying the exogeneity of the main instrument by testing the over-identifying restrictions. We consider several other instruments. First, we include as an additional instrument the total share of foreigners in a commune of residence. Although overidentification test points towards the validity of the instrument, the F test on the joint predictive power of the instruments is relatively low. Thus, using these two instruments is not our preferred specification and we rely on the conclusions drawn from using only the main instrument, that is lagged stockmarket participation in the immigrants country of origin, as a unique overidentification restriction in a just-identified model. As for the endogeneity test, it indicates the presence of endogeneity of the instrumented variable. Overall, results do not change by using these instrumental variables (Table 2.10). Next, we include the detailed population composition of the commune and the conclusions remain the same (Table 2.11). Finally, we relax the linearity assumption and repeat the analysis using probit model, which does not change our conclusions either (Table 2.9). Thus, our results are robust to different model specifications and to a variety of instrumental variables.

2.6.2.3 Exploring additional samples

To address the concern that commune-specific averages are sometimes constructed using only few observations we repeat the analysis for different samples. In particular, we analyse samples where there are at least 2, 3, 5 and 10 observations for both natives and foreigners available in a commune. Although the total size decreases very rapidly due to such restrictions, overall conclusions are robust to different sample selections.

2.6.2.4 Exploring other characteristics of the reference group

To analyse which reference group, foreigners or the overall commune population, drives knowledge spillovers through financially literate peers, we restrict the reference group definition to only foreigners. We then include in the analysis the proportion of individuals working in the financial sector among the foreigners only, as well as the proportion of risk loving and financial literate among the foreigners. We define financial literacy as an index constructed from a proportion of the correct answers to all four available financial literacy questions. Table 2.22 shows that none of the three included covariates affect the stock market participation decision of the natives, while the coefficient of the stock market participation goes up relative to the baseline estimates. This result suggests that financial competence as well as risk attitudes defined among the foreigners fail to capture the transmission of financial knowledge or investment behaviour. This means that, as has been already found in some studies (e.g. Duflo and Saez (2002)), individuals are more sensitive to the information spillovers within their own reference group, which in our case would be that of the native Luxembourg population.

2.7 Discussion and conclusions

The literature on peer effects in financial behaviour is well developed. However, there is no consensus on what are the main channels through which peer effects occur. Most of the scholars emphasise the role of *social learning* as a main transmission channel. Others, on the other hand, show that *social utility* also matters. We contribute to this literature by exploring peer effects in stock market participation behaviour between immigrants and natives in Luxembourg. We focus on the peer effects coming from immigrants for three reasons. First, immigrants in Luxembourg are very diverse in terms of financial behaviour with almost no Portuguese participating in stock markets and with Germans and Belgians having twice as high participation rates as Luxembourgish natives. Second, immigrants in Luxembourg tend to cluster in certain communes by country of origin, thus creating variation in the commune-level population composition. These two reasons combined create variation in the exposure of natives to a wide range of different financial attitudes which we exploit to identify peer effects in stock market participation behaviour. Finally, we focus on immigrants because it is the only group which satisfies the *excluded peer group* property, and thus, allows identification of peer effects by using an instrumental variable approach.

Thus, by exploiting the spatial variation in the financial behaviour of immigrants across Luxembourgish communes and by employing instrumental variable strategy, we are able to identify *peer effects*. By including controls for commune-specific characteristics and by accounting for correlated preferences and sorting, we are able to separate *contextual* and *correlated* effects. Finally, we further control for potential *social learning* channels to attempt to partial out the *social utility* channel. Our results show that after controlling for financial knowledge and risk attitudes we still observe the effect of stock ownership rates of foreigners, which means that *social utility* matters. We also show that social learning drives at least half of the peer effect. We cannot, however, interpret variables we include to proxy information sharing as purely learning channels, as they will partly account for sorting into communes on social and employment status.

Our findings are in line with those of Bursztyn et al. (2014), who show that not only the *social learning* matters in driving the peer effects, but also the *social utility*. Thus, in contrast to Banerjee et al. (2013), we conclude that there is something more in peer effects transmission than simple *awareness of the opportunity*. One fact that can possibly reconcile the two conclusions is that Banerjee et al. (2013) study the borrowing behaviour, which has been shown to be intrinsically different from the investment behaviour, which this study and Bursztyn et al. (2014) focus on, and which individuals are found to be less willing to both copy and share about.

TABLE 2.1: **Previous papers on community effects on individual financial decision-making**

Authors	Outcome	Explanatory variable of interest	Method	Controls	Data	Effect
Beshears et al. (2015)	-Participation in savings plan -Contributions in savings plan	Information about participation of the peers	OLS	Socio-demographic controls	Data collected from a randomized trial	Participation: -0.040**; -1.760*** to 1.083* Contributions: -0.221**; -10.663** to 5.558*
Brown et al. (2008)	Equity ownership (stocks and equity mutual funds)	Average participation in a native's commune, excluding own observation	2SLS IV: average ownership in the birth states of "non-native" neighbors	Household fixed effects (capturing also community fixed effects), state-year fixed effects, time-varying community-level controls (income, age etc.), community-specific time-trends, trends in community median home value and firms' covariates	US panel of tax returns	0.418***[a]
Bursztyn et al. (2014)	Investment decision to purchase an asset	Investment decision to purchase an asset of a peer investor: the willingness to purchase and an actual possession	Randomized field experiment	Broker fixed effects and socio-demographic controls	Data collected from a randomized trial	"social learning": 0.285**-0.328** "social utility": 0.220**-0.242**
Duflo and Saez (2002)	Participation in a supplemental pension plan	Average participation in a reference group, excluding own observation	2SLS IV: average salary and tenure structure in the peer group	Individual socio-demographic and income controls	US University administrative data	0.168**-0.411***
Georgarakos and Pasini (2011)	Participation in stocks	Fraction of trusting individuals in a region and an indicator for engagement in social activities	Probit and test for endogeneity; IV: quality of the political institutions in the past and frequency of contacts with grandchildren	Country fixed-effects and individual socio-demographic characteristics	Survey of Health, Ageing and Retirement in Europe	trust:0.0206**-0.0211** sociability: 0.0311***-0.0358***
Hong et al. (2004)	Stocks and mutual funds ownership	Sociability indicator	OLS	Risk tolerance, education, age, urban indicator, other socio-demographic controls, dummies for wealth quintiles	Health and Retirement Study	0.0215**-0.0411***

Table continues on the next page

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Authors	Outcome	Explanatory variable of interest	Method	Controls	Data	Effect
Hong et al. (2005)	Share of portfolio allocated to a certain stock	Average share across all funds in the city allocated to this stock, excluding own fund	OLS	Model estimated in first differences	CDA Spectrum	0.1310***
Ivkovic and Weisbenner (2007)	Proportion of stocks bought (sold) in a certain industry in a certain quarter	Proportion of stocks bought (sold) in a certain industry in a certain quarter by all neighboring households within 50 miles	OLS	Industry-quarter dummies	Private dataset on individual investor's monthly positions and trades	0.207***-0.365***
Li (2009)	Entrance in the stock market in a time interval	Entry in the stock market of parents and children in the past	Logit	Socio-demographic and economic controls; time dummies	Panel Study of Income Dynamics	0.298***-0.475***
Pool et al. (2015)	Portfolio overlap in holdings	Neighbors indicator	OLS	Controls for portfolio characteristics; county-specific control for religiosity and zip-level median home prices	Morningstar, Thomson Financial CDA/Spectrum Mutual Fund Database	0.88***-2.24**

Note: *** p<0.01, ** p<0.05, * p<0.1.

[a] The coefficient presented in this table is rescaled to ensure comparability with other studies

TABLE 2.2: **Summary statistics of socio-demographic characteristics of natives and foreigners**

	Native born	Foreign born	Difference Natives vs. Foreigners	P-value Difference
Demographic characteristics				
Male, %	55.33	58.12	-2.80	0.363
	(2.02)	(2.32)	(3.08)	
Age	52.74	47.30	5.44***	0.000
	(0.73)	(0.70)	(1.02)	
Household characteristics				
Never married, %	28.42	25.58	2.84	0.321
	(1.92)	(2.13)	(2.86)	
Widowed, %	12.23	5.88	6.35***	0.001
	(1.48)	(1.18)	(1.90)	
Divorced, %	12.49	15.21	-2.71	0.208
	(1.32)	(1.70)	(2.16)	
Foreign partner, %	12.24	52.49	-40.25***	0.000
	(1.24)	(2.35)	(2.66)	
Household size	2.22	2.65	-0.43***	0.000
	(0.05)	(0.07)	(0.09)	
Educational attainment, %				
High education	27.99	39.66	-11.67***	0.000
	(1.75)	(2.30)	(2.89)	
Middle education	45.14	26.69	18.45***	0.000
	(2.03)	(2.10)	(2.93)	
Occupation , %				
Self-employed	5.22	3.52	1.70*	0.074
	(0.71)	(0.64)	(0.95)	
Unemployed	2.32	4.66	-2.34**	0.044
	(0.63)	(0.98)	(1.16)	
Retired	32.84	17.70	15.14***	0.000
	(1.92)	(1.84)	(2.66)	
Work in financial sector	5.10	11.59	-6.49***	0.000
	(0.86)	(1.52)	(1.76)	
Work in public sector	46.62	14.26	32.36***	0.000
	(2.82)	(2.03)	(3.49)	
Financial literacy and investment attitude, %				
Financial literacy	73.69	76.51	-2.82*	0.060
	(1.01)	(1.16)	(1.50)	
Risk loving	2.71	8.39	-5.68***	0.000
	(0.62)	(1.40)	(1.54)	
Country of birth out of total sample, %	54.7	45.3		
Number of observations	875	726		

Note: The table reports descriptive statistics for socio-demographic characteristics of foreigners and natives residing in Luxembourg. To compute them, the second wave 2014 of LU-HFCS 2014 is used. Data is collected for 1601 households. Data is weighted and multiply imputed. All individual socio-demographic characteristics are defined as those of the financially knowledgeable person (FKP) of the household. Financial literacy is defined as an average number of correctly answered questions on a set of four financial literacy questions. Risk loving is an indicator taking value one if the FKP prefers to take high or above average risk to get high or above average returns (in contrast to average or low risk). Robust standard errors are in parenthesis. Natives' and foreigners' averages are not tested against zero. *** p<0.01, ** p<0.05, * p<0.1

TABLE 2.3: **Summary statistics of households' economic characteristics**

	Native born	Foreign born	Difference Natives vs. Foreigners	P-value Difference
Ownership rates, %				
Homeownership	79.50	51.79	27.71***	0.000
	(1.74)	(2.34)	(2.92)	
Stock market participation	20.84	17.00	3.84*	0.092
	(1.54)	(1.67)	(2.27)	
Life insurance	33.09	30.48	2.61	0.359
	(1.86)	(2.13)	(2.84)	
Collateralized debt	33.93	36.87	-2.95	0.307
	(1.87)	(2.20)	(2.89)	
Non-collateralized debt	34.59	32.91	1.68	0.563
	(1.91)	(2.17)	(2.90)	
Income and wealth, Euro				
Income	92,066.72	80,726.96	11,339.76***	0.010
	(2,643.97)	(3,554.31)	(4,392.75)	
Net wealth	919,752.00	567,196.31	352,555.75***	0.001
	(80,948.75)	(64,084.01)	(102,939.16)	
Financial wealth (conditional mean)	140,144.77	133,663.58	6,481.19	0.869
	(12,093.00)	(37,356.03)	(39,226.58)	
Main residence value (conditional mean)	674,498.31	593,543.00	80,955.30***	0.002
	(16,025.46)	(20,634.05)	(26,329.00)	
Total liabilities (conditional mean)	195,116.39	157,230.86	37,885.53**	0.025
	(12,827.92)	(10,962.03)	(16,881.27)	
Number of observations	875	726		

Note: The table reports descriptive statistics for socio-demographic characteristics of foreigners and natives residing in Luxembourg. To compute them, the second wave 2014 of LU-HFCS 2014 is used. Data is collected for 1601 households. Data is weighted and multiply imputed. Stock market participation is an indicator taking value 1 if individual owns stocks directly or indirectly through mutual funds. Life insurance and (non-)collateralized debt ownership rates are constructed accordingly. Robust standard errors are in parenthesis. Natives' and foreigners' averages are not tested against zero. *** p<0.01, ** p<0.05, * p<0.1

TABLE 2.4: **Composition of Luxembourgish population and stock ownership rates by the country of origin**

Groups	Country of origin	Population in Luxembourg, %	Risky assets ownership rates in Luxembourg in 2014, %	Lagged risky assets ownership rates in the country of origin in 2011 (instrument), %	
				All population	Only natives[a]
Natives	Luxembourg	56.96	20.84	24.34	27.60
Main immigrant groups	Portugal	16.08	0.48	6.34	6.13
	France	6.14	22.74	21.23	21.23
	Italy	3.52	21.49	9.24	9.96
	Belgium	3.30	42.84	25.80	27.25
	Germany	2.35	39.20	21.39	23.30
Immigrants from other European countries available in the Eurosystem HFCS dataset	Netherlands	0.76	12.97	22.48	22.48
	Spain	0.71	37.11	13.30	13.30
	Greece	0.30	0.00	3.57	3.68
	Finland	0.21	97.06	38.54	39.20
	Austria	0.15	91.41	12.94	13.73
	Slovakia	0.12	0.00	3.26	3.17
	Slovenia	0.08	0.00	19.69	20.07
	Malta	0.04	na	20.01	19.39
	Cyprus	0.01	na	35.06	37.69

Note: The table reports the composition of the population in Luxembourg by nationality based on Census 2011 and stock ownership rates in Luxembourg in 2014 based on second wave of the LU-HFCS. In addition, it contains lagged risky asset ownership rates in the country of origin based on the first wave of the Eurosystem Household Finance and Consumption Survey. Data is weighted and multiply imputed.

[a] In France, Spain and the Netherlands, data on ownership rates is computed only for the native population because an indicator on the country of origin/nationality is not collected/available.

TABLE 2.5: **Summary statistics of communes' characteristics**

	Mean	Median	Mean standard deviation
Foreigners, % (based on LU-HFCS sample)	34.7	35.9	23.4
Foreigners, % (based on CENSUS)	33.5	32.6	9.8
Stock market participation all population, %	20.2	14.3	21.2
Stock market participation of natives, %	*22.5*	*13.3*	*14.3*
Stock market participation of foreigners, %	*16.4*	*2.3*	*23.1*
Financially literate, %	72.9	75.9	13.8
Risk loving, %	4.3	0.0	12.4
High education attained, %	30.9	28.4	24.9
Unemployed, %	2.0	0.0	6.0
Working in financial sector, %	5.3	0.1	8.7
Age	50.1	51.2	8.6
Homeownership, %	77.1	78.9	22.3
Income, Euro	89 137.9	86 010.3	34 068.4
Main residence value (conditional mean), Euro	510 120.7	491 185.8	216 953.5
Net wealth, Euro	783 839.5	708 524.1	543 525.6
Commune population (based on CENSUS)	4 669	2148	9 904
Commune sq km	22.3	20.3	13.4
Commune number observations (based on LU-HFCS sample)	15	8	27

Note: The table reports descriptive statistics for socio-demographic and economic characteristics at commune level. To compute them two datasets are used: the second wave collected in 2014 of LU-HFCS and CENSUS data collected in 2011. The statistics are reported only for communes present in LU-HFCS sample. All the statistics are computed at commune level. Mean and median is not weighted by communes' population and, therefore, is not representative of the country. Total population of Luxembourg as of 2011 based on Census is 512 353 people. Our data covers communes with 499 553 residents in total, thus 98% of the population. In total, we have observation in 107 communes out of 116 communes based on the commune definition as of 2011.

TABLE 2.6: **First stage results for the full sample**

	OLS			
	(1)	(2)	(3)	(4)
Average stock market participation of foreigners in their countries of origin	2.97***	2.95***	2.73***	3.41***
	(0.75)	(0.75)	(0.90)	(1.09)
F-statistic of instrument in the first stage	15.59	15.47	9.25	9.73
P-value	*0.000*	*0.000*	*0.003*	*0.002*
F-statistic of residuals from the first stage	4.36	4.74	1.86	1.76
P-Value Endogeneity test	*0.040*	*0.032*	*0.177*	*0.188*
Socio-demographic controls	Yes	Yes	Yes	Yes
Financial knowledge and preferences controls		Yes	Yes	Yes
% of individuals working in financial sector in commune			Yes	Yes
Other commune-specific controls				Yes
Observations	805	805	805	805

Note: The table reports first stage regressions for the sample of natives from the LU-HFCS second wave 2014 such that there is at least one observation for foreigner available in a commune and an instrument is available for this foreign household, meaning his/her country of birth is among European countries available in the first wave of the Eurosystem HFCS dataset. Data is weighted and multiply imputed. The dependent variable is average participation rate in stock or mutual funds of foreigners in a commune. Instrumental variable (regressor) is average participation of foreigners in their countries of origin from the first wave 2011 of HFCS data. Socio-demographic controls (not displayed) include indicator for male, indicators for a level of education, log transformation of income, indicator for risk-loving financial attitude, working in financial sector, financial literacy related and not related to stockownership, age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation; and an indicator for a foreign partner. Commune-specific controls are % of individuals working in financial sector in a commune and dummies for 5 groups of average rental prices in Euro/square meter. Standard errors in parenthesis are clustered by commune for 83 clusters. Heteroscedasticity robust Hausman test is in form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.7: **OLS and 2SLS results for the full sample**

	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)
Stockownership of foreigners	0.18**	0.53***	0.16*	0.52***	0.09	0.34*	0.10	0.31*
	(0.08)	(0.19)	(0.08)	(0.19)	(0.08)	(0.20)	(0.08)	(0.19)
Male	0.08***	0.08***	0.06**	0.06**	0.07***	0.07***	0.07***	0.07***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Middle education	0.09**	0.09**	0.08**	0.08**	0.08**	0.08**	0.08**	0.08**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
High education	0.17***	0.14***	0.14***	0.11**	0.13***	0.12***	0.13***	0.12***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)
Log income	0.09***	0.09***	0.09***	0.08***	0.09***	0.08***	0.09***	0.08***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Risk loving			0.23**	0.19**	0.22**	0.20**	0.22**	0.20**
			(0.10)	(0.09)	(0.10)	(0.09)	(0.09)	(0.09)
Working in financial sector			0.11	0.12	0.08	0.09	0.08	0.09
			(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Financial literacy not related to stockownership			-0.05	-0.07	-0.08	-0.09	-0.08	-0.08
			(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership			0.10***	0.09***	0.09***	0.09***	0.09***	0.09***
			(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune					0.60***	0.45**	0.56**	0.42*
					(0.18)	(0.23)	(0.21)	(0.25)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls							Yes	Yes
F-statistic of instrument in the first stage		15.59		15.47		9.25		9.73
P-value		*0.000*		*0.000*		*0.003*		*0.002*
Number of Observations	805	805	805	805	805	805	805	805
Mean Stockownership	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that there is at least one observation for foreigner available in a commune and an instrument is available for this foreign household – meaning his/her country of birth is among European countries available in the first wave of the Eurosystem HFCS dataset. Data is weighted and multiply imputed. The dependent variable is an indicator for whether a household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation; and an indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental prices in Euro/square meter. The instrumental variable is the average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS. Standard errors in parenthesis are clustered by commune for 83 clusters. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.8: **Placebo treatment for the full sample**

Stockownership of foreigners assigned:	Correctly	Correctly	Randomly	Randomly	Correctly	Correctly	Randomly	Randomly
% of individuals in financial assigned:	Correctly	Randomly	Randomly	Correctly	Correctly	Randomly	Randomly	Correctly
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Controlling for individual working in financial sector				*Not controlling for individual working in financial sector*			
	OLS							
Stockownership of foreigners	0.20***	0.27***	0.09	-0.04	0.20***	0.28***	0.11	-0.05
	(0.07)	(0.08)	(0.23)	(0.08)	(0.07)	(0.09)	(0.23)	(0.08)
% of individuals working in financial sector in commune	0.62***	0.01	-0.05	0.75***	0.69***	0.02	-0.06	0.81***
	(0.19)	(0.21)	(0.08)	(0.17)	(0.18)	(0.21)	(0.08)	(0.17)
Working in financial sector	0.13	0.17**	0.18**	0.13				
	(0.09)	(0.08)	(0.09)	(0.09)				
	2SLS							
Stockownership of foreigners	0.40**	0.59***	0.12	-0.10	0.38**	0.60***	0.14	-0.10
	(0.19)	(0.19)	(0.32)	(0.22)	(0.19)	(0.20)	(0.31)	(0.21)
% of individuals working in financial sector in commune	0.49**	-0.04	-0.10	0.75***	0.57**	-0.03	-0.11	0.81***
	(0.24)	(0.19)	(0.29)	(0.17)	(0.23)	(0.19)	(0.28)	(0.17)
Working in financial sector	0.14	0.16**	0.17**	0.13				
	(0.08)	(0.08)	(0.09)	(0.09)				
	First Stage							
Average stock market participation of foreigners in their countries of origin	2.71***	2.97***	2.71***	2.97***	2.71***	2.97***	2.41***	2.82***
	(0.91)	(0.76)	(0.91)	(0.76)	(0.91)	(0.76)	(0.39)	(0.28)
F-statistic of instrument in the first stage	8.929	15.49	39.49	98.56	8,908	15.61	39.32	98.16
P-value	*0.004*	*0.000*	*0.000*	*0.000*	*0.004*	*0.000*	*0.000*	*0.000*
Observations	805	805	805	805	805	805	805	805
Mean stockownership	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213

Note: The table reports first stage regressions for the sample of natives from the LU-HFCS second wave 2014 such that there is at least one observation for foreigner available in a commune and instrument is available for this foreigner – meaning his/her country of birth is among European countries available in the first wave of the Eurosystem HFCS dataset. Data is weighted and multiply imputed. Dependent variable is average participation rate in stock or mutual funds of foreigners in a commune. Instrumental variable (regressor) is average participation of foreigners in their countries of origin from the first wave 2011 of HFCS data. Standard errors in parenthesis are clustered by commune for 83 clusters . *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.9: **Probit results for the full sample**

	Probit (1)	ProbitIV (2)	Probit (3)	ProbitIV (4)	Probit (5)	ProbitIV (6)	Probit (7)	ProbitIV (8)
Stockownership of foreigners	0.13*	0.39**	0.12*	0.38**	0.08	0.23	0.08	0.22
	(0.07)	(0.15)	(0.07)	(0.15)	(0.07)	(0.19)	(0.07)	(0.17)
Male	0.08***	0.08***	0.07**	0.06**	0.08***	0.08***	0.08***	0.08***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Middle education	0.10**	0.10**	0.09**	0.08**	0.09**	0.09**	0.09**	0.08**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
High education	0.14***	0.12***	0.12**	0.10**	0.11**	0.10**	0.11**	0.10**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Log income	0.15***	0.14***	0.13***	0.12***	0.13***	0.12***	0.13***	0.12***
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Risk loving			0.13**	0.10	0.13**	0.12*	0.12**	0.11
			(0.06)	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)
Working in financial sector			0.09	0.09*	0.06	0.07	0.06	0.07
			(0.06)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
Financial literacy not related to stockownership			-0.05	-0.07	-0.08	-0.08	-0.07	-0.07
			(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership			0.08***	0.08**	0.08***	0.07**	0.08***	0.07**
			(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune					0.50***	0.41*	0.46***	0.37*
					(0.15)	(0.21)	(0.17)	(0.21)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls							Yes	Yes
F-statistic of instrument in the first stage		15.59		15.47		9.25		9.73
P-value		*0.000*		*0.000*		*0.003*		*0.002*
Number of observations	805	805	805	805	805	805	805	805
Mean stockownership	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that there is at least one observation for foreigner available in a commune and instrument is available for this foreigner – meaning his/her country of birth is among European countries available in the first wave of Eurosystem HFCS dataset. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave 2011 of HFCS data. Standard errors in parenthesis are clustered by commune for 83 clusters. Probit IV standard errors are robust to heteroschedasticity. Probit estimates are weighted average marginal affects. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.10: **2SLS results with additional instruments for the full sample: average participation in countries of origin and total % of foreigners**

	2SLS (1)	2SLS (2)	2SLS (3)	2SLS (4)
Stockownership of foreigners	0.53***	0.52***	0.35*	0.32*
	(0.19)	(0.19)	(0.20)	(0.18)
Male	0.08***	0.06**	0.07***	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)
Middle education	0.09**	0.08**	0.08**	0.08**
	(0.04)	(0.04)	(0.04)	(0.04)
High education	0.14***	0.12**	0.12***	0.12**
	(0.05)	(0.05)	(0.04)	(0.05)
Log income	0.09***	0.08***	0.08***	0.08***
	(0.03)	(0.03)	(0.03)	(0.03)
Risk loving		0.19**	0.20**	0.20*
		(0.09)	(0.09)	(0.10)
Working in financial sector		0.12	0.09	0.09
		(0.09)	(0.09)	(0.08)
Financial literacy not related to stockownership		-0.07	-0.09	-0.08
		(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership		0.09***	0.09***	0.09***
		(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune			0.45**	0.42*
			(0.23)	(0.25)
Socio-demographic controls	Yes	Yes	Yes	Yes
Commune-specific controls				Yes
Mean stockownership	0.213	0.213	0.213	0.213
First Stage				
Average stock market participation of foreigners in	2.97***	2.95***	2.65***	3.38***
their countries of origin	(0.75)	(0.74)	(0.90)	(1.14)
% Foreigners	0.01	-0.01	-0.07	-0.04
	(0.15)	(0.15)	(0.16)	(0.27)
F-statistic of instrument in the first stage	8.024	8.004	4.713	4.938
P-value	*0.001*	*0.001*	*0.012*	*0.009*
F-statistic of residuals from the first stage	4.41	4.69	1.91	1.83
P-Value Endogeneity test	*0.039*	*0.033*	*0.170*	*0.180*
P-value Overidentification test (Sargan)	*0.183*	*0.405*	*0.711*	*0.204*
Number of observations	805	805	805	805

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least one foreigner is from a country available in HFCS dataset are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 83 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.11: **2SLS results with additional instruments for the full sample: average participation in countries of origin and % of foreigners detailed**

	2SLS (1)	2SLS (2)	2SLS (3)	2SLS (4)
Stockownership of foreigners	0.42***	0.40**	0.18	0.16
	(0.16)	(0.16)	(0.17)	(0.14)
Male	0.08***	0.06**	0.07***	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)
Middle Education	0.09**	0.08**	0.08**	0.08**
	(0.04)	(0.04)	(0.04)	(0.04)
High Education	0.15***	0.12**	0.13***	0.12***
	(0.05)	(0.05)	(0.04)	(0.05)
Log Income	0.09***	0.08***	0.09***	0.09***
	(0.03)	(0.03)	(0.03)	(0.02)
Risk loving		0.20**	0.22**	0.21**
		(0.09)	(0.09)	(0.10)
Working in Financial Sector		0.12	0.08	0.08
		(0.09)	(0.09)	(0.08)
Financial literacy not related to stockownership		-0.06	-0.08	-0.08
		(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership		0.09***	0.09***	0.09***
		(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune			0.55***	0.52**
			(0.21)	(0.23)
Socio-demographic controls	Yes	Yes	Yes	Yes
Commune-specific controls				Yes
Mean Stockownership	0.213	0.213	0.213	0.213
First Stage				
Average stock market participation of foreigners in their countries of origin	6.20**	6.20**	6.29**	6.22*
	(2.94)	(2.94)	(3.09)	(3.39)
% Germans	-0.07	-0.09	-0.07	-0.43
	(1.91)	(1.90)	(1.87)	(1.87)
% Italians	2.33	2.27	2.36	1.18
	(1.59)	(1.58)	(1.56)	(2.69)
% Portuguese	0.21	0.21	0.21	0.32
	(0.42)	(0.41)	(0.42)	(0.50)
% French	-0.64	-0.65	-0.62	2.20
	(1.43)	(1.43)	(1.45)	(1.82)
% Belgians	-3.61*	-3.60*	-3.65*	-3.72*
	(1.91)	(1.92)	(2.00)	(2.05)
% Others	-0.16	-0.16	-0.15	0.20
	(0.80)	(0.80)	(0.80)	(0.74)
F-statistic of instrument in the first stage	6.505	6.539	3.881	5.761
P-value	*0.000*	*0.000*	*0.000*	*0.000*
F-statistic of residuals from the first stage	3.00	2.96	0.31	0.25
P-Value Endogeneity test	*0.090*	*0.090*	*0.577*	*0.617*
P-value Overidentification test (Sargan)	*0.000*	*0.000*	*0.002*	*0.008*
Number of Observations	805	805	805	805

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least one foreigner is from countries available in the first wave of Eurosystem HFCS dataset. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave 2011 of HFCS data. Standard errors in parenthesis are clustered by commune for 83 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.12: **First stage for the reduced sample (at least two observations)**

	OLS			
	(1)	(2)	(3)	(4)
Average stock market participation of	2.94***	2.92***	2.77***	3.55***
	(0.80)	(0.80)	(1.01)	(1.27)
F-statistic of instrument in the first stage	13.45	13.36	7.57	7.82
P-value	0.000	0.001	0.008	0.007
F-statistic of residuals from the first stage	4.06	4.56	1.30	1.65
P-Value Endogeneity test	*0.048*	*0.037*	*0.258*	*0.204*
Socio-demographic controls	Yes	Yes	Yes	Yes
Financial knowledge and preferences controls		Yes	Yes	Yes
% of individuals working in financial sector in commune			Yes	Yes
Other commune-specific controls				Yes
Observations	764	764	764	764

Note: The table reports first stage regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least two observations for natives and at least two observations for foreigners and at least one foreigner is from a country available in HFCS dataset are available in a commune. Data is weighted and multiply imputed. Dependent variable is average participation rate in stock or mutual funds of foreigners in a commune. Instrumental variable (regressor) is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Socio-demographic controls (not displayed) include indicator for male, indicators for a level of education, log transformation of income, indicator for risk-loving financial attitude, working in financial sector, financial literacy related and not related to stockownership, age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are % of individuals working in financial sector in a commune and dummies for 5 groups of average rental price Euro/square meter. Standard errors in parenthesis are clustered by commune for 65 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.13: **OLS and 2SLS results for the reduced sample (at least two observations)**

	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)
Stockownership of foreigners	0.24**	0.58***	0.21**	0.58***	0.15*	0.36*	0.15*	0.36*
	(0.09)	(0.20)	(0.09)	(0.21)	(0.08)	(0.21)	(0.09)	(0.19)
Male	0.08***	0.08***	0.06**	0.07**	0.07***	0.07***	0.07***	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Middle Education	0.09**	0.09**	0.08**	0.08**	0.09**	0.08**	0.08**	0.08**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.04)
High Education	0.19***	0.17***	0.15***	0.14***	0.15***	0.14***	0.15***	0.14***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.05)
Log Income	0.09***	0.09***	0.09***	0.08***	0.09***	0.08***	0.08***	0.08***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Risk loving			0.23**	0.19**	0.22**	0.20**	0.22**	0.20*
			(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.10)
Working in Financial Sector			0.09	0.09	0.05	0.06	0.05	0.06
			(0.09)	(0.08)	(0.09)	(0.09)	(0.09)	(0.08)
Financial literacy not related to stockownership			-0.02	-0.03	-0.05	-0.05	-0.05	-0.04
			(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership			0.10***	0.10***	0.10***	0.10***	0.10***	0.10***
			(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)
% of individuals working in financial sector in commune					0.66***	0.53**	0.62***	0.48*
					(0.18)	(0.23)	(0.22)	(0.26)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls							Yes	Yes
F-statistic of instrument in the first stage		13.45		13.36		7.570		7.816
P-value		*0.000*		*0.001*		*0.008*		*0.007*
Number of Observations	764	764	764	764	764	764	764	764
Mean Stockownership	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least two observations for natives and at least two observations for foreigners and at least one foreigner is from a country available in the first wave Eurosystem HFCS dataset are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 65 clusters. *** p<0.01, ** p<0.05, * p<0.1

TABLE 2.14: **Placebo treatment for the reduced sample (at least two observations)**

Stockownership of foreigners assigned:	Correctly	Correctly	Randomly	Randomly	Correctly	Correctly	Randomly	Randomly
% of individuals in financial assigned:	Correctly	Randomly	Randomly	Correctly	Correctly	Randomly	Randomly	Correctly
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Controlling for individual working in financial sector				*Not controlling for individual working in financial sector*			
	OLS							
Stockownership of foreigners	0.26***	0.34***	-0.04	-0.02	0.26***	0.34***	-0.04	-0.03
	(0.08)	(0.10)	(0.08)	(0.08)	(0.08)	(0.10)	(0.08)	(0.08)
% of individuals working in financial	0.69***	0.01	0.09	0.85***	0.75***	0.02	0.10	0.90***
sector in commune	(0.19)	(0.21)	(0.23)	(0.17)	(0.18)	(0.21)	(0.23)	(0.16)
Working in financial sector	0.12	0.16*	0.16*	0.11				
	(0.09)	(0.08)	(0.09)	(0.09)				
	2SLS							
Stockownership of foreigners	0.42**	0.66***	-0.07	-0.08	0.40**	0.68***	-0.08	-0.08
	(0.19)	(0.21)	(0.29)	(0.22)	(0.18)	(0.21)	(0.28)	(0.21)
% of individuals working in financial	0.59**	-0.05	0.11	0.84***	0.66***	-0.04	0.13	0.90***
sector in commune	(0.23)	(0.19)	(0.32)	(0.17)	(0.22)	(0.19)	(0.31)	(0.16)
Working in financial sector	0.12	0.15*	0.16*	0.11				
	(0.08)	(0.08)	(0.09)	(0.09)				
	First Stage							
Average stock market participation of	2.75***	2.94***	2.53***	2.93***	2.75***	2.94***	2.53***	2.93***
foreigners in their countries of origin	(1.02)	(0.80)	(0.41)	(0.30)	(1.02)	(0.80)	(0.41)	(0.30)
F-statistic of instrument in the first stage	7.262	13.35	38.64	97.92	7.245	13.45	38.47	97.59
P-value	*0.009*	*0.001*	*0.000*	*0.000*	*0.009*	*0.000*	*0.000*	*0.000*
Observations	764	764	764	764	764	764	764	764
Mean Stockownership	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211

Note: The table reports first stage regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least two observations for natives and foreigners and at least one foreigner is from a country available in the first wave of Eurosystem HFCS dataset are available in a commune. Data is weighted and multiply imputed. Dependent variable is average participation rate in stock or mutual funds of foreigners in a commune. Instrumental variable (regressor) is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 65 clusters. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.15: **Probit results for the reduced sample (at least two observations)**

	Probit (1)	ProbitIV (2)	Probit (3)	ProbitIV (4)	Probit (5)	ProbitIV (6)	Probit (7)	ProbitIV (8)
Stockownership of foreigners	0.19**	0.43***	0.17**	0.42***	0.12*	0.21	0.12	0.23
	(0.08)	(0.15)	(0.08)	(0.15)	(0.07)	(0.21)	(0.08)	(0.17)
Male	0.09***	0.08***	0.07***	0.07**	0.08***	0.08***	0.09***	0.08***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)
Middle Education	0.11***	0.10**	0.10**	0.09**	0.10**	0.10**	0.10**	0.09**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
High Education	0.17***	0.15***	0.14***	0.12***	0.13***	0.13***	0.13***	0.13***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Log Income	0.15***	0.14***	0.13***	0.12***	0.12***	0.12***	0.13***	0.12***
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
Risk loving			0.13**	0.10	0.13**	0.12*	0.12**	0.11*
			(0.06)	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)
Working in Financial Sector			0.06	0.06	0.04	0.04	0.04	0.04
			(0.06)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
Financial literacy not related to stockownership			-0.02	-0.03	-0.06	-0.06	-0.05	-0.05
			(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership			0.08***	0.08***	0.08***	0.08***	0.08***	0.08***
			(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune					0.57***	0.52**	0.54***	0.46**
					(0.16)	(0.22)	(0.18)	(0.23)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls							Yes	Yes
F-statistic of instrument in the first stage		13.45		13.36		7.570		7.816
P-value		*0.000*		*0.001*		*0.008*		*0.007*
Number of Observations	764	764	764	764	764	764	764	764
Mean Stockownership	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that there is at least two observations for natives and at least two observations for foreigners and at least one foreigner is from a country available in the first wave of the Eurosystem HFCS dataset are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 65 clusters. Standard errors of Probit IV are robust to heteroschedasticity. Probit estimates are weighted average marginal affects. Probit estimates are weighted average marginal affects. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.16: **2SLS results with additional instruments for the reduced sample (at least two observations): average participation in countries of origin and total % of foreigners**

	2SLS (1)	2SLS (2)	2SLS (3)	2SLS (4)
Stockownership of foreigners	0.54***	0.54***	0.34*	0.36**
	(0.19)	(0.19)	(0.19)	(0.18)
Male	0.08***	0.06**	0.07***	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)
Middle Education	0.09**	0.08**	0.08***	0.08**
	(0.04)	(0.04)	(0.03)	(0.04)
High Education	0.17***	0.14***	0.14***	0.14***
	(0.05)	(0.05)	(0.04)	(0.05)
Log Income	0.09***	0.08***	0.08***	0.08***
	(0.03)	(0.03)	(0.03)	(0.03)
Risk loving		0.19**	0.21**	0.20*
		(0.09)	(0.09)	(0.10)
Working in Financial Sector		0.09	0.06	0.06
		(0.08)	(0.09)	(0.08)
Financial literacy not related to stockownership		-0.03	-0.05	-0.04
		(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership		0.10***	0.10***	0.10***
		(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune			0.54**	0.48*
			(0.22)	(0.26)
Socio-demographic controls	Yes	Yes	Yes	Yes
Commune-specific controls				Yes
Mean Stockownership	0.211	0.211	0.211	0.211
First Stage				
Average stock market participation of foreigners in	2.92***	2.90***	2.59**	3.40**
their countries of origin	(0.78)	(0.78)	(0.99)	(1.32)
% Foreigners	-0.08	-0.10	-0.16	-0.14
	(0.16)	(0.16)	(0.16)	(0.30)
F-statistic of instrument in the first stage	7.175	7.137	4.053	4.240
P-value	*0.002*	*0.002*	*0.022*	*0.019*
F-statistic of residuals from the first stage	3.39	3.84	1.17	1.79
P-Value Endogeneity test	*0.070*	*0.054*	*0.282*	*0.1856*
P-value Overidentification test (Sargan)	*0.056*	*0.141*	*0.787*	*0.681*
Number of observations	764	764	764	764

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least two observations for natives and foreigners are available in a commune and a foreigner is from a country available in the Eurosystem HFCS dataset. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 65 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage not significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.17: **2SLS results with additional instruments for the reduced sample (at least two observations): average participation in countries of origin and % of foreigners detailed**

	2SLS (1)	2SLS (2)	2SLS (3)	2SLS (4)
Stockownership of foreigners	0.35**	0.33**	0.11	0.12
	(0.14)	(0.14)	(0.15)	(0.13)
Male	0.08***	0.06**	0.07***	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)
Middle Education	0.09***	0.08**	0.09***	0.08**
	(0.04)	(0.04)	(0.03)	(0.04)
High Education	0.18***	0.15***	0.15***	0.15***
	(0.05)	(0.05)	(0.04)	(0.05)
Log Income	0.09***	0.08***	0.09***	0.09***
	(0.03)	(0.03)	(0.03)	(0.02)
Risk loving		0.22**	0.23**	0.22**
		(0.09)	(0.09)	(0.10)
Working in Financial Sector		0.09	0.05	0.05
		(0.09)	(0.09)	(0.08)
Financial literacy not related to stockownership		-0.02	-0.05	-0.05
		(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership		0.10***	0.10***	0.10***
		(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune			0.68***	0.64***
			(0.19)	(0.24)
Socio-demographic controls	Yes	Yes	Yes	Yes
Commune-specific controls				Yes
Mean Stockownership	0.211	0.211	0.211	0.211
First Stage				
Average stock market participation of foreigners in	6.63**	6.70**	6.95**	7.63*
their countries of origin	(3.14)	(3.14)	(3.29)	(3.93)
% Germans	-1.18	-1.19	-1.16	-1.58
	(2.09)	(2.08)	(2.07)	(2.01)
% Italians	1.23	1.19	1.40	0.54
	(1.71)	(1.70)	(1.67)	(2.64)
% Portuguese	0.07	0.09	0.08	0.36
	(0.45)	(0.44)	(0.45)	(0.59)
% French	-0.81	-0.83	-0.82	2.17
	(1.48)	(1.48)	(1.52)	(1.87)
% Belgians	-4.86**	-4.91**	-5.06**	-5.46**
	(1.93)	(1.93)	(2.01)	(2.15)
% Others	0.24	0.24	0.33	0.82
	(0.95)	(0.95)	(0.96)	(0.81)
F-statistic of instrument in the first stage	6.378	6.430	3.840	7.082
P-value	*0.000*	*0.000*	*0.000*	*0.000*
F-statistic of residuals from the first stage	3.39	3.84	1.17	1.79
P-Value Endogeneity test	*0.388*	*0.350*	*0.768*	*0.811*
P-value Overidentification test (Sargan)	*0.000*	*0.000*	*0.001*	*0.005*
Number of Observations	764	764	764	764

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least two observations for natives and foreigners and at least one foreigner is from a country available in the first wave of the Eurosystem HFCS dataset are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 65 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.18: **OLS and 2SLS results for the reduced sample (at least three observations)**

	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)
Stockownership of foreigners	0.25***	0.58***	0.23**	0.58***	0.15*	0.36*	0.16*	0.36*
	(0.09)	(0.19)	(0.09)	(0.19)	(0.08)	(0.19)	(0.09)	(0.19)
Male	0.08***	0.08***	0.07**	0.07**	0.08***	0.08***	0.08***	0.08**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Middle Education	0.09**	0.09**	0.08*	0.08*	0.08**	0.08**	0.08**	0.08**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
High Education	0.17***	0.16***	0.14***	0.13**	0.14***	0.13***	0.14***	0.13***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Log Income	0.13***	0.12***	0.12***	0.11***	0.12***	0.11***	0.12***	0.11***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Risk loving			0.24**	0.21**	0.24**	0.22**	0.24**	0.22**
			(0.10)	(0.09)	(0.10)	(0.09)	(0.09)	(0.10)
Working in Financial Sector			0.08	0.08	0.05	0.06	0.05	0.06
			(0.09)	(0.09)	(0.10)	(0.09)	(0.10)	(0.09)
Financial literacy not related to stockownership			-0.01	-0.02	-0.03	-0.04	-0.03	-0.03
			(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership			0.10***	0.10***	0.09***	0.09***	0.10***	0.10***
			(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune					0.64***	0.50**	0.60***	0.45*
					(0.19)	(0.23)	(0.22)	(0.27)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls							Yes	Yes
Mean Stockownership	0.223	0.223	0.223	0.223	0.223	0.223	0.223	0.223
First Stage								
Average stock market participation of foreigners in		3.10***		3.09***		2.93**		3.72***
their countries of origin		(0.87)		(0.87)		(1.11)		(1.39)
F-statistic of instrument in the first stage		12.64		12.63		6.992		7.178
P-value		*0.001*		*0.001*		*0.011*		*0.010*
F-statistic of residuals from the first stage		4.43		5.28		1.80		1.92
P-Value Endogeneity test		*0.040*		*0.025*		*0.186*		*0.171*
Number of Observations	709	709	709	709	709	709	709	709

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least three observations for natives and at least three observations for foreigners are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 55 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.19: **OLS and 2SLS results for the reduced sample (at least five observations)**

	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)
Stockownership of foreigners	0.34***	0.77***	0.31**	0.75***	0.17	0.45*	0.21	0.50*
	(0.11)	(0.22)	(0.11)	(0.23)	(0.12)	(0.26)	(0.16)	(0.30)
Male	0.08**	0.09***	0.07**	0.08**	0.08***	0.09***	0.09***	0.09**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Middle Education	0.10**	0.10**	0.09*	0.09*	0.09**	0.09**	0.09**	0.08*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
High Education	0.16**	0.15**	0.12**	0.12**	0.12**	0.12**	0.12**	0.12**
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)
Log Income	0.13***	0.12***	0.12***	0.11***	0.12***	0.11***	0.12***	0.11***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Risk loving			0.20**	0.16*	0.21**	0.18**	0.20**	0.17
			(0.10)	(0.09)	(0.10)	(0.09)	(0.10)	(0.11)
Working in Financial Sector			0.09	0.08	0.06	0.06	0.06	0.06
			(0.11)	(0.10)	(0.11)	(0.10)	(0.11)	(0.10)
Financial literacy not related to stockownership			0.03	0.01	0.00	-0.00	0.00	0.00
			(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)
Financial literacy related to stockownership			0.08**	0.09**	0.08**	0.08**	0.08**	0.08**
			(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
% of individuals working in financial sector in commune					0.67***	0.49*	0.62**	0.38
					(0.21)	(0.29)	(0.28)	(0.37)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls							Yes	Yes
Mean Stockownership	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225
First Stage								
Average stock market participation of foreigners in		2.77***		2.73***		2.53**		2.64**
their countries of origin		(0.78)		(0.76)		(1.06)		(0.98)
F-statistic of instrument in the first stage		12.53		12.88		5.669		7.329
P-value		*0.001*		*0.001*		*0.023*		*0.011*
F-statistic of residuals from the first stage		4.27		4.69		1.40		1.43
P-Value Endogeneity test		*0.470*		*0.038*		*0.246*		*0.241*
Number of Observations	566	566	566	566	566	566	566	566

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least five observations for natives and at least five observations for foreigners are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 33 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.20: **OLS and 2SLS results for the reduced sample (at least ten observations available in a commune for natives and at least five for foreigners)**

	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)
Stockownership of foreigners	0.50***	0.97***	0.49***	0.99***	0.27*	0.62	0.37**	0.72*
	(0.11)	(0.28)	(0.11)	(0.30)	(0.15)	(0.38)	(0.15)	(0.39)
Male	0.11***	0.12***	0.10**	0.11***	0.12***	0.12***	0.12***	0.13***
	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Middle Education	0.10*	0.10*	0.09*	0.09*	0.10**	0.10**	0.09*	0.08*
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)
High Education	0.17**	0.16**	0.14*	0.13*	0.14**	0.14**	0.12*	0.11*
	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
Log Income	0.12***	0.12***	0.12***	0.11***	0.11***	0.11***	0.12***	0.11***
	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)
Risk loving			0.22**	0.19**	0.23**	0.21**	0.21**	0.19*
			(0.09)	(0.08)	(0.09)	(0.09)	(0.09)	(0.11)
Working in Financial Sector			-0.02	-0.03	-0.05	-0.05	-0.06	-0.05
			(0.11)	(0.10)	(0.12)	(0.11)	(0.12)	(0.09)
Financial literacy not related to stockownership			0.01	-0.02	-0.01	-0.02	-0.00	-0.00
			(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)
Financial literacy related to stockownership			0.09**	0.10***	0.09**	0.10***	0.10**	0.10**
			(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
% of individuals working in financial sector in commune					0.73**	0.49	0.51	0.22
					(0.26)	(0.43)	(0.35)	(0.45)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls							Yes	Yes
Mean Stockownership	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208
First Stage								
Average stock market participation of foreigners in		2.25**		2.23***		1.70*		1.96*
their countries of origin		(0.79)		(0.77)		(0.91)		(0.96)
F-statistic of instrument in the first stage		8.069		8.457		3.493		4.222
P-value		*0.011*		*0.009*		*0.078*		*0.055*
F-statistic of residuals from the first stage		3.33		3.68		0.99		1.63
P-Value Endogeneity test		*0.085*		*0.071*		*0.333*		*0.218*
Number of Observations	458	458	458	458	458	458	458	458

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least ten observations for natives and at least five observations for foreigners are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 19 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1

TABLE 2.21: **OLS and 2SLS results for the reduced sample (at least ten observations available in a commune)**

	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)
Stockownership of foreigners	0.41***	0.82***	0.41***	0.82***	0.14	0.32	0.17	0.57
	(0.12)	(0.23)	(0.13)	(0.23)	(0.15)	(0.27)	(0.12)	(0.40)
Male	0.11**	0.12***	0.10**	0.12***	0.12***	0.12***	0.12***	0.13***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)
Middle Education	0.08	0.07	0.07	0.06	0.08	0.08	0.08	0.07
	(0.07)	(0.07)	(0.07)	(0.07)	(0.05)	(0.05)	(0.05)	(0.05)
High Education	0.18*	0.17*	0.14	0.12	0.14*	0.14**	0.14*	0.12*
	(0.09)	(0.09)	(0.09)	(0.09)	(0.07)	(0.07)	(0.07)	(0.07)
Log Income	0.15***	0.14***	0.14***	0.13***	0.13***	0.13***	0.14***	0.13***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
Risk loving			0.14	0.12	0.13	0.13	0.13	0.11
			(0.12)	(0.10)	(0.12)	(0.10)	(0.11)	(0.12)
Working in Financial Sector			0.02	0.01	-0.01	-0.01	-0.02	-0.01
			(0.12)	(0.11)	(0.13)	(0.12)	(0.13)	(0.09)
Financial literacy not related to stockownership			0.05	0.01	0.02	0.01	0.02	0.02
			(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.09)
Financial literacy related to stockownership			0.11**	0.12***	0.11**	0.12***	0.12**	0.12**
			(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
% of individuals working in financial sector in commune					0.81***	0.69**	0.75**	0.37
					(0.23)	(0.31)	(0.26)	(0.51)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls							Yes	Yes
Mean Stockownership	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226
First Stage								
Average stock market participation of foreigners in		2.98***		2.95***		2.66*		3.02*
their countries of origin		(0.80)		(0.74)		(1.32)		(1.62)
F-statistic of instrument in the first stage		13.92		15.73		4.065		3.473
P-value		*0.002*		*0.002*		*0.065*		*0.085*
F-statistic of residuals from the first stage		3.64		3.95		0.75		5.49
P-Value Endogeneity test		*0.079*		*0.068*		*0.403*		*0.036*
Number of Observations	351	351	351	351	351	351	351	351

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least ten observations for natives and at least ten observations for foreigners are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 14 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.22: **OLS and 2SLS results for the main sample and covariates specified for foreigners as a reference group**

	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)
Stockownership of foreigners	0.12	0.49**	0.10	0.54*
	(0.10)	(0.25)	(0.11)	(0.30)
Male	0.07**	0.06**	0.07***	0.06**
	(0.03)	(0.03)	(0.03)	(0.03)
Middle Education	0.08**	0.07*	0.08**	0.07*
	(0.04)	(0.04)	(0.04)	(0.04)
High Education	0.13***	0.11**	0.13***	0.11**
	(0.05)	(0.05)	(0.05)	(0.05)
Log Income	0.09***	0.08***	0.09***	0.08***
	(0.03)	(0.03)	(0.03)	(0.03)
Risk loving	0.21**	0.18**	0.22**	0.18*
	(0.10)	(0.09)	(0.10)	(0.09)
Working in Financial Sector	0.11	0.12	0.11	0.12
	(0.09)	(0.09)	(0.09)	(0.09)
Financial literacy not related to stockownership	-0.06	-0.06	-0.06	-0.05
	(0.07)	(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership	0.09***	0.09***	0.09**	0.09***
	(0.03)	(0.03)	(0.03)	(0.03)
% of foreigners working in financial sector in commune	0.16	-0.07	0.15	-0.03
	(0.17)	(0.22)	(0.17)	(0.22)
% risk loving individuals among foreigners			-0.11	-0.17
			(0.19)	(0.18)
% financially literate individuals among foreigners			0.12	-0.16
			(0.16)	(0.25)
Socio-demographic controls	Yes	Yes	Yes	Yes
Commune-specific controls	Yes	Yes	Yes	Yes
Mean Stockownership	0.213	0.213	0.213	0.213
First Stage				
Average stock market participation of foreigners in		3.02***		2.52***
their countries of origin		(0.96)		(0.79)
F-statistic of instrument in the first stage		9.890		10.17
P-value		*0.002*		*0.002*
F-statistic of residuals from the first stage		3.25		2.70
P-Value Endogeneity test		*0.075*		*0.104*
Number of Observations	805	805	805	805

Note: The table reports participation regressions for the main sample of natives from the LU-HFCS second wave 2014. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Other socio-demographic controls (not displayed) include age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner. Commune-specific controls are dummies for 5 groups of average rental price Euro/square meter. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of the Eurosystem HFCS data. Reference group specific covariates include proportion of individuals working in financial sector among foreigners and proportion of risk loving and financially literally individuals among foreigners. Standard errors in parenthesis are clustered by commune for 83 clusters. Heteroscedasticity robust Hausman test is in a form of auxiliary regression: coefficient on the residuals from the first stage significantly different from zero points to the endogeneity of the instrumented variable. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.23: **Placebo treatment for the full sample: randomization within regions**

Stockownership of foreigners assigned:	Correctly	Correctly	Randomly	Randomly	Correctly	Correctly	Randomly	Randomly
% of individuals in financial assigned:	Correctly	Randomly	Randomly	Correctly	Correctly	Randomly	Randomly	Correctly
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Controlling for individual working in financial sector				*Not controlling for individual working in financial sector*			
	OLS							
Stockownership of foreigners	0.20***	0.23***	0.07	0.03	0.20***	0.24***	0.07	0.02
	(0.07)	(0.08)	(0.08)	(0.08)	(0.07)	(0.09)	(0.08)	(0.08)
% of individuals working in financial sector in commune	0.62***	0.30	0.41**	0.72***	0.69***	0.29	0.41**	0.79***
	(0.19)	(0.19)	(0.19)	(0.18)	(0.18)	(0.19)	(0.18)	(0.18)
Working in financial sector	0.13	0.17**	0.18**	0.13				
	(0.09)	(0.08)	(0.09)	(0.09)				
	2SLS							
Stockownership of foreigners	0.40**	0.57***	0.33	0.22	0.38**	0.59***	0.34	0.20
	(0.19)	(0.21)	(0.21)	(0.20)	(0.19)	(0.21)	(0.21)	(0.20)
% of individuals working in financial sector in commune	0.49**	0.06	0.24	0.60***	0.57**	0.05	0.23	0.69***
	(0.24)	(0.22)	(0.23)	(0.21)	(0.23)	(0.22)	(0.23)	(0.20)
Working in financial sector	0.14	0.16**	0.18*	0.14				
	(0.08)	(0.08)	(0.09)	(0.09)				
	First Stage							
Average stock market participation of foreigners in their countries of origin	2.71***	2.62***	2.68***	2.69***	2.71***	2.63***	2.68***	2.71***
	(0.91)	(0.71)	(0.42)	(0.33)	(0.91)	(0.71)	(0.42)	(0.33)
F-statistic of instrument in the first stage	8.929	13.58	40.08	68.12	8.908	13.70	40.04	68.45
P-value	*0.004*	*0.000*	*0.000*	*0.000*	*0.004*	*0.000*	*0.000*	*0.000*
Observations	805	805	805	805	805	805	805	805
Mean stockownership	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213

Note: The table reports first stage regressions for the sample of natives from the LU-HFCS second wave 2014 such that there is at least one observation for foreigner available in a commune and instrument is available for this foreigner – meaning his/her country of birth is among European countries available in the first wave of the Eurosystem HFCS dataset. Data is weighted and multiply imputed. Dependent variable is average participation rate in stock or mutual funds of foreigners in a commune. Instrumental variable (regressor) is average participation of foreigners in their countries of origin from the first wave 2011 of HFCS data. Standard errors in parenthesis are clustered by commune for 83 clusters . *** p<0.01, ** p<0.05, * p<0.1.

2.8 Appendix

2.8.1 Data treatment and Imputation

Individual data set used in this study has been treated in the following way. Firstly, non reliable answers were edited. Secondly, missing values due to item non-response were imputed under assumption that missing values are missing at random. This assumption means that the missing mechanism depends on variables collected in the survey, and therefore depends on observables only.
Imputation is a multi-stage procedure and follows several principles that guide its implementation. Firstly, the dataset is imputed with very naive imputation models. Continuous variables are imputed by filling the missing values with the weighted mean. Missing values of dummy and categorical variables are imputed via an unconditional hotdeck. This provides a good starting point for the proper imputation and allows including all covariates right from the beginning.
Secondly, due to the complexity of the survey, variables are not ordered from variables with the lowest number of missing value to the variables with the highest number of missing values. Instead, we start with person specific demographic information (low missing rates) and continue with person specific variables on the employment. All other sections are imputed in the order of the questionnaire. The sequence of the variables remains the same over all iterations. The effect of the fact that we do not order the variables from low to high missing rates should be minor because we pre-fill the dataset with initial values. One or two additional iterations to achieve convergence based on the Gelman-Rubin indicator (Gelman and Rubin, 1992) might be necessary.
Next, we use a broad conditioning approach to preserve the correlation structure of the dataset wherever possible. According to ECB guidelines, we include the following covariates:

- good predictors of the variable of interest,
- essential explanatory variables of non-response,
- information of the sampling design summarized by sampling design variables,
- geographic information, information from the sample register file and interviewer information
- important determinants guided by economic theory of the variable to be imputed, and
- variables with a good explanatory power for covariates part of other imputation models.

To select the covariates, we use backward elimination techniques (using routines from SAS 5.1). We drop the covariates with the lowest p-value and re-estimate the model. This process is repeated until the balance between model efficiency and bias is reached. Normally, we included from our very broad set of covariates all significant variables with a p-value of at least 10%. However, technical problems for some variables, such as a low number of observations or a very deterministic model (overfitting), forced us to reduce the number of significant covariates for some variables.
To ensure the consistency of the estimates several types of bounds are used. This is because one of the main principles of rigorous imputation procedure is that imputed data is not edited and all the editing is done before the imputation. Type of the bound used depends on the variable. In particular there are three kinds of bound values that need to be respected: the imputed value must be between 1st and 99st percentile of observed values (general bounds), the bounds provided by the respondent themselves need to be respected, and logical constraint imposed by other variables need to be taken

into account (dynamic bounds).

Finally, the convergence of the imputation procedure is assessed after each iteration using the G-R indicator (Brooks and Gelman, 1998;Gelman et al., 2014).

To impute missing values, we used ECB Multiple Imputation Routine (EMIR 2.2).

TABLE 2.A: **Luxembourg population: natives, immigrants and main groups of foreigners by country of birth, %**

Commune	Native Born	Foreign Born	Germany	France	Belgium	Portugal	Italy	Other
Bascharage	72	28	1	4	3	10	4	6
Beaufort	57	43	3	3	2	25	1	9
Bech	76	24	3	4	3	5	2	7
Beckerich	73	27	2	2	11	8	1	3
Berdorf	60	40	3	4	2	12	0	19
Bertrange	52	48	3	8	5	8	7	17
Bettembourg	63	37	1	6	2	18	3	7
Bettendorf	58	42	1	1	1	34	1	3
Betzdorf	68	32	4	4	3	8	2	12
Bissen	66	34	1	3	3	18	2	7
Biwer	74	26	4	3	1	7	1	10
Boulaide	77	23	1	2	10	5	1	5
Bourscheid	75	25	3	2	4	5	0	12
Bous	75	25	2	5	1	9	1	7
Clemency	77	23	1	3	7	7	2	4
Clervaux	66	34	2	3	6	14	0	7
Colmar-Berg	61	39	2	2	3	22	2	9
Consdorf	71	29	3	3	2	14	1	5
Consthum	85	15	1	0	2	9	1	3
Contern	67	33	3	5	3	6	2	13
Dalheim	70	30	3	5	2	10	3	7
Diekirch	62	38	2	2	1	25	2	6
Differdange	48	52	1	3	1	33	5	9
Dippach	67	33	2	5	3	12	4	7
Dudelange	63	37	1	4	1	21	4	6
Echternach	55	45	5	3	1	29	1	6
Ell	72	28	1	1	18	3	1	3
Ermsdorf	69	31	3	1	2	19	1	4
Erpeldange	74	26	2	2	2	13	2	5
Esch-Alzette	48	52	1	4	1	32	4	10
Esch-Sure	56	44	2	3	12	11	0	15
Eschweiler	73	27	2	2	7	7	0	8
Ettelbruck	57	43	2	2	2	24	3	10
Feulen	72	28	1	2	2	15	3	5
Fischbach	72	28	3	2	3	12	1	7
Flaxweiler	75	25	3	2	2	8	1	9
Frisange	70	30	2	7	3	9	4	7
Garnich	74	26	2	4	6	5	2	7
Goesdorf	85	15	2	2	4	4	0	4
Grevenmacher	60	40	8	3	1	17	1	9
Grosbous	79	21	1	2	4	8	2	3
Heffingen	68	32	1	2	3	13	2	11
Heinerscheid	81	19	1	1	4	9	0	4
Hesperange	51	49	3	11	4	11	6	15
Hobscheid	67	33	1	5	13	9	1	4

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Commune	Native Born	Foreign Born	Germany	France	Belgium	Portugal	Italy	Other
Hoscheid	79	21	2	1	3	8	1	6
Hosingen	79	21	2	1	3	9	1	6
Junglinster	67	33	4	5	3	7	1	12
Kayl	67	33	1	2	1	19	3	7
Kehlen	65	35	2	6	7	6	3	12
Kiischpelt	76	24	2	2	4	6	0	10
Koerich	70	30	3	5	6	8	2	7
Kopstal	55	45	4	10	6	7	2	15
Lac Haute Sure	78	22	1	3	9	4	0	4
Larochette	38	62	1	3	3	45	2	7
Lenningen	69	31	3	3	4	9	2	11
Leudelange	67	33	2	9	4	8	3	7
Lintgen	60	40	2	3	2	24	1	9
Lorentzweiler	63	37	3	5	3	15	2	10
Luxembourg	35	65	4	14	4	14	6	23
Mamer	55	45	3	8	7	8	5	15
Manternach	76	24	5	2	2	6	1	8
Medernach	54	46	2	3	1	34	0	6
Mersch	62	38	2	3	2	21	2	9
Mertert	67	33	8	2	1	13	1	9
Mertzig	73	27	2	2	2	16	2	4
Mompach	73	27	6	5	1	8	0	7
Mondercange	76	24	1	5	1	7	5	4
Mondorf	59	41	3	9	2	18	2	6
Munshausen	76	24	3	1	6	6	1	8
Niederanven	54	46	6	5	4	6	3	20
Nommern	76	24	2	2	3	10	1	6
Preizerdaul	81	19	2	1	3	8	1	4
Putscheid	77	23	2	1	3	13	1	4
Petange	56	44	0	4	3	26	4	7
Reckange	80	20	2	4	2	5	2	5
Redange	75	25	1	3	7	6	1	7
Reisdorf	63	37	3	2	2	21	1	8
Remich	60	40	4	6	2	18	1	9
Roeser	65	35	2	7	2	13	5	7
Rosport	79	21	5	2	1	7	0	6
Rumelange	60	40	1	4	1	20	3	11
Sandweiler	53	47	3	7	3	11	4	19
Sanem	70	30	1	3	1	14	5	6
Schengen	69	31	4	4	2	14	1	5
Schieren	63	37	1	1	1	25	1	7
Schifflange	63	37	1	3	1	18	3	11
Schuttrange	51	49	5	7	4	7	3	22
Septfontaines	66	34	3	4	9	7	2	9
Stadtbredimus	68	32	3	3	2	14	1	9
Steinfort	64	36	1	5	10	10	4	6
Steinsel	62	38	3	6	3	9	4	13
Strassen	45	55	4	11	5	9	6	20
Tandel	77	23	2	1	1	15	1	4
Troisvierges	59	41	1	2	9	23	0	7
Tuntange	69	31	3	5	4	4	1	14
Useldange	77	23	0	2	3	9	1	8
Vianden	58	42	2	2	1	29	1	6

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Commune	Native Born	Foreign Born	Germany	France	Belgium	Portugal	Italy	Other
Waldbillig	75	25	2	3	2	8	0	8
Waldbredimus	73	27	3	2	2	6	1	12
Walferdange	52	48	3	7	4	12	4	17
Weiler-la-Tour	72	28	2	7	3	5	3	9
Weiswampach	65	35	2	1	11	14	1	6
Wiltz	54	46	1	3	6	20	1	15
Wincrange	79	21	1	2	7	6	1	4
Winseler	69	31	1	2	18	5	1	4
Wormeldange	62	38	4	3	2	20	1	9

Source: Authors' own computations based on Census 2011. Communes are only those present in the LU-HFCS sample.

2.8.2 Analysis including social trust

It is well known from the literature that social interactions and trust are important determinants of stock market participation (see, for example, Hong et al. (2004), Guiso et al. (2008), and Guiso et al. (2004)). According to this literature, in the locations with higher levels of trust and social interaction there should be expected higher stock market participation rates through both peer effects and trust to the political institutions. Thus, *ceteris paribus*, in the communes with higher social interaction and trust, the peer effects can be expected to be stronger. One way to test this hypothesis would be to repeat the analysis for the subsamples of natives living in communes with high and low levels of trust and interaction. However, given the small size of our sample, such an analysis would most likely fail to deliver precise estimates, and thus credible results, due to the lack of statistical power.

Another way to proceed is to include directly commune-specific indices of social trust and interaction in the estimated model. This specification would also allow addressing the omitted variable bias concern which might arise when these important determinants of stock market participation are not controlled for. However, in the EU HFCS information on social trust and interactions was not collected. Therefore, we use data from the European Social Survey (ESS) and commune-specific population composition CENSUS weights to construct commune-specific trust indices. In particular, we use three questions from the ESS, namely whether people can be trusted, and whether such political institutions as parliament and legal system can be trust worthy. We construct the commune-specific indices in a way similar to how we construct the instrumental variable. That is, we, first, construct country-specific averages using all the available ESS rounds, and then we weight these indices by the population shares at the commune level.

As can be seen from Table 2.B and Table 2.C stock market participation and social trust indices at a country and commune-level are indeed strongly correlated. Moreover, all the three chosen indices are correlated among themselves. It is not surprising therefore, that when using these variables in the regression analysis (Tables 2.D and 2.E) our main explanatory variable, namely stock market participation of foreigners, does not have predictive power over the natives' stock ownership decision anymore. Moreover, due to such high level of collinearity, the chosen instrument is no longer relevant and the first stage fails to hold.

It is worthwhile noting, however, that proportion of financially educated peers, defined as neighbours working in the financial sector, is still an important predictor of individual stock market participation

decision.

Thus, this analysis allows us to conclude, that social interactions and trust are indeed important components of stock market participation decision. One possible way of using this information could be to use these indices as additional instrumental variables. This analysis is left for the future research.

TABLE 2.B: **Composition of Luxembourgish population, stock ownership rates and trust indices by the country of origin**

Groups	Country of origin	Population in Luxembourg, %	Risky assets ownership rates in Luxembourg in 2014, %	Lagged risky assets ownership rates in the country of origin in 2011 (instrument), %		Trust in:		
				All population	Only natives[a]	People	Country's parliament	Legal system
Natives	Luxembourg	56.96	20.84	24.34	27.60	5.11	5.71	6.14
Main immigrant groups	Portugal	16.08	0.48	6.34	6.13	3.81	3.42	3.80
	France	6.14	22.74	21.23	21.23	4.44	4.30	4.91
	Italy	3.52	21.49	9.24	9.96	4.52	4.24	5.04
	Belgium	3.30	42.84	25.80	27.25	4.98	4.79	4.81
	Germany	2.35	39.20	21.39	23.30	4.74	4.34	5.58
Immigrants from other European countries available in the Eurosystem HFCS dataset	Netherlands	0.76	12.97	22.48	22.48	5.84	5.19	5.70
	Spain	0.71	37.11	13.30	13.30	5.00	4.60	4.39
	Greece	0.30	0.00	3.57	3.68	3.87	3.74	5.07
	Finland	0.21	97.06	38.54	39.20	6.51	5.85	6.96
	Austria	0.15	91.41	12.94	13.73	5.09	4.90	5.97
	Slovakia	0.12	0.00	3.26	3.17	4.05	3.59	3.79
	Slovenia	0.08	0.00	19.69	20.07	4.15	3.80	3.83
	Malta	0.04	na	20.01	19.39	na	na	na
	Cyprus	0.01	na	35.06	37.69	4.08	4.79	5.69

Note: The table reports the composition of the population in Luxembourg by nationality based on Census 2011 and stock ownership rates in Luxembourg in 2014 based on second wave of the LU-HFCS. In addition, it contains lagged risky asset ownership rates in the country of origin based on the first wave of the Eurosystem Household Finance and Consumption Survey. Data is weighted and multiply imputed. The data on social trust indices is from the European Social Survey all available rounds for each country. Each index ranges from 0 to 10 where 0 is the minimum level trust and 10 is the maximum. The observations whose answers are recored as "Don't know" are dropped.

[a] In France, Spain and the Netherlands, data on ownership rates is computed only for the native population because an indicator on the country of origin/nationality is not collected/available.

TABLE 2.C: **Pairwise correlation coefficients between foreigners' stock market participation and trust indices at commune level**

	Commune stockownership of foreigners	People trust index	Parliament trust index	Legal system trust index
		Commune specific trust indices defined among foreigners		
Commune stockownership of foreigners	1.000			
People trust index	0.456	1.000		
Parliament trust index	0.465	0.993	1.000	
Legal system trust index	0.522	0.955	0.956	1.000
		Commune specific trust indices defined for all population		
Commune stockownership of foreigners	1.000			
People trust index	0.345	1.000		
Parliament trust index	0.262	0.972	1.000	
Legal system trust index	0.310	0.983	0.993	1.000

Note: The table reports the pairwise correlation coefficients between stock market participation among foreigners and trust indices at commune level. Stock ownership rates are based on second wave of the LU-HFCS. The data on social trust indices is from the European Social Survey all available rounds for each country.

TABLE 2.D: **OLS and 2SLS results including trust indices**

	Trust index of commune defined among:			
	Foreigners		All population	
	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)
Stockownership of foreigners	0.04	3.45	0.04	-0.98*
	(0.10)	(16.18)	(0.09)	(0.53)
Risk loving	0.21**	0.10	0.21**	0.26**
	(0.09)	(0.80)	(0.09)	(0.11)
Working in financial sector	0.09	0.14	0.09	0.07
	(0.09)	(0.35)	(0.09)	(0.09)
Financial literacy not related to stockownership	-0.05	-0.13	-0.05	-0.04
	(0.07)	(0.40)	(0.07)	(0.07)
Financial literacy related to stockownership	0.09***	0.08	0.10***	0.11***
	(0.03)	(0.13)	(0.03)	(0.04)
% of individuals working in financial sector in commune	0.42*	0.51	0.48**	0.40
	(0.24)	(3.41)	(0.24)	(0.28)
People trust index in commune	-1.04	3.94	0.85	3.42**
	(0.99)	(34.04)	(0.92)	(1.61)
Parlament trust index in commune	1.28*	-1.37	1.20	-2.12
	(0.77)	(20.57)	(0.95)	(1.99)
Legal system trust index in commune	-0.19	-3.28	-1.45*	0.70
	(0.29)	(16.62)	(0.79)	(1.45)
Socio-demographic controls	Yes	Yes	Yes	Yes
Commune-specific controls	Yes	Yes	Yes	Yes
Mean stockownership	0.213	0.213	0.213	0.213
First Stage				
Average stock market participation of foreigners in		0.15		4.81
their countries of origin		(6.15)		(3.04)
F-statistic of instrument in the first stage		0.001		2.508
P-value		*0.981*		*0.117*
Correlation coefficients between stock market participation among foreigners and:				
People trust index in commune		0.46		0.34
Parlament trust index in commune		0.46		0.26
Legal system trust index in commune		0.52		0.31
Number of observations	805	805	805	805

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least one foreigner is from a country available in HFCS dataset are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Socio-demographic controls include indicator for a male FKP, age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner, log transformation of income. Commune-specific controls include dummies for 5 groups of average rental price Euro/square meter. The data on social trust indices is from the European Social Survey all available rounds for each country. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 83 clusters. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.E: **OLS and 2SLS results including trust indices: by index**

	Trust index of commune defined among:											
	Foreigners						All population					
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Stockownership of foreigners	0.03	-1.05	0.02	7.96	0.04	-1.08	0.01	-0.22	0.02	-0.01	0.03	0.05
	(0.09)	(2.74)	(0.09)	(47.69)	(0.10)	(2.18)	(0.09)	(0.40)	(0.09)	(0.31)	(0.09)	(0.34)
Risk loving	0.22**	0.28	0.22**	-0.20	0.22**	0.28	0.21**	0.22**	0.21**	0.21**	0.21**	0.21**
	(0.09)	(0.20)	(0.09)	(2.57)	(0.09)	(0.18)	(0.09)	(0.11)	(0.09)	(0.10)	(0.09)	(0.10)
Working in financial sector	0.09	0.06	0.09	0.27	0.09	0.06	0.09	0.09	0.09	0.09	0.09	0.09
	(0.09)	(0.11)	(0.09)	(1.22)	(0.09)	(0.10)	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)	(0.08)
Financial literacy not related to stockownership	-0.07	-0.04	-0.07	-0.36	-0.07	-0.06	-0.07	-0.06	-0.07	-0.07	-0.07	-0.07
	(0.07)	(0.11)	(0.07)	(1.72)	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Financial literacy related to stockownership	0.09***	0.10**	0.09***	0.04	0.09***	0.10**	0.10***	0.10***	0.10***	0.10***	0.10***	0.10***
	(0.03)	(0.04)	(0.03)	(0.37)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
% of individuals working in financial sector in commune	0.42*	0.55	0.40*	-0.86	0.43*	0.32	0.42**	0.49*	0.47**	0.48*	0.46**	0.45*
	(0.22)	(0.46)	(0.22)	(6.41)	(0.23)	(0.47)	(0.21)	(0.25)	(0.21)	(0.25)	(0.21)	(0.25)
People trust index in commune	0.16	0.70					0.40***	0.57*				
	(0.10)	(1.36)					(0.15)	(0.34)				
Parlament trust index in commune			0.16*	-3.31					0.23**	0.24		
			(0.09)	(21.42)					(0.09)	(0.16)		
Legal system trust index in commune					0.10	0.64					0.21**	0.20
					(0.09)	(1.07)					(0.09)	(0.17)
Socio-demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune-specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean stockownership	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213
First Stage												
Average stock market participation of foreigners in		2.68		0.77		-1.30		2.71*		2.95**		2.71**
their countries of origin		(5.14)		(7.11)		(2.31)		(1.47)		(1.30)		(1.26)
F-statistic of instrument in the first stage		0.271		0.0118		0.318		3.389		5.177		4.601
P-value		*0.604*		*0.914*		*0.574*		*0.069*		*0.026*		*0.035*
Number of observations	805	805	805	805	805	805	805	805	805	805	805	805

Note: The table reports participation regressions for the sample of natives from the LU-HFCS second wave 2014 such that at least one foreigner is from a country available in HFCS dataset are available in a commune. Data is weighted and multiply imputed. Dependent variable is an indicator for whether household holds stock or mutual funds. Socio-demographic controls include indicator for a male FKP, age, age squared; household size; marital status: single, widowed, divorced; occupational status: self-employed, unemployed, retired, or other occupation and indicator for a foreign partner, log transformation of income. Commune-specific controls include dummies for 5 groups of average rental price Euro/square meter. The data on social trust indices is from the European Social Survey all available rounds for each country. Instrumental variable is average participation of foreigners in their countries of origin from the first wave of Eurosystem HFCS data. Standard errors in parenthesis are clustered by commune for 83 clusters. *** p<0.01, ** p<0.05, * p<0.1.

Chapter 3

Gender Differences in Wealth and the Role of Financial Literacy

3.1 Introduction

In the recent years, much has been said about increasing wealth inequality in developed countries and about its consequences for the stability of the economy and of the political system. However, the issue that wealth inequality is present and is particularly acute across certain socio-demographic groups has been widely neglected by both academics and policy makers. To fill this gap in the literature, this study will focus on the wealth differences between women and men.

As is the case with the labour income, women happen to have lower accumulated wealth than men. However, differences in wages and other sources of income do not seem to be able to explain the gender wealth differential entirely. Given the increased role of individual's ability to save for own retirement and the fact that women tend to have longer life expectancy, it is of critical importance to build understanding on what contributes to the women's disadvantageous position in the overall wealth distribution. This study in particular, will analyse how differences in financial literacy between women and men contribute to the differences in their accumulated wealth.

It is well documented that women are less financially literate than men (Bucher-Koenen et al., 2016; Lusardi, 2008; Lusardi and Mitchell, 2011a,b,c, 2014; Lusardi et al., 2010; Xu and Zia, 2012)[59] and that this is true in most of the countries where such studies have been conducted.[60] In particular, it is found that both older (Lusardi and Mitchell, 2008) and younger women (Driva et al., 2016; Lusardi and Mitchell, 2009, 2014; Lusardi et al., 2010; Chen and Volpe, 2002) display lower levels of financial literacy than their reference population. Bucher-Koenen et al. (2016) further report that women who are in charge of their own finances, namely single women and widows, are as likely to be less financially literate than men as those living with a partner. Thus, the research has shown that gender differences in financial knowledge are present across all age groups, family statuses and in many countries.

The lack of financial knowledge among women is not area-specific. On the contrary, it is related to all aspects of finance from investment (Lusardi and Mitchell, 2008, 2009; van Rooij et al., 2011; Alessie et al., 2011) to borrowing (Lusardi and Tufano, 2009, 2015). Furthermore, van Rooij et al. (2011) show that many women lack financial knowledge not only in the domain of advanced financial literacy where the gender differences are the largest, but also regarding basic financial concepts. Finally, recent results show that among potential determinants of the gender gap in financial literacy might be a wide-spread stereotype that men are more likely to deal with financial matters and, therefore, have higher returns to financial knowledge (Driva et al., 2016), while income, education and other relevant socio-demographic and economic characteristics cannot explain this gap entirely (Bucher-Koenen et al., 2016; Fonseca et al., 2012). Thus, scholars agree that women seem to be less equipped to deal with everyday financial decisions compared to men.

It is clear, however, that financial literacy is closely related to wealth accumulation, wealth planning and management, and, ultimately, to financial well-being (Lusardi and Mitchell, 2008). Financial knowledge affects the wealth profile through a variety of channels. In particular, individuals with higher financial literacy are more likely to plan for retirement (Lusardi and Mitchell, 2007b, 2008, 2009, 2011a,b,c; Alessie et al., 2011; Bucher-Koenen and Lusardi, 2011; van Rooij et al., 2012; Xu and

[59] Lusardi and Mitchell (2014) survey the research on financial literacy and report that all studies looking at differences in financial knowledge between women and men find women to be less financially knowledgeable.

[60] In particular, this holds true in the United States, Germany, the Netherlands (Bucher-Koenen et al., 2016; Lusardi and Mitchell, 2011b; Alessie et al., 2011), as well as in Australia, France, Italy, Japan, New Zealand, Sweden, and Switzerland. Among the exceptions are Russia (Klapper and Panos, 2011), Romania (Beckmann, 2013), and East Germany (Bucher-Koenen and Lusardi, 2011) where no pronounced differences in financial literacy exist between men and women. For a complete list of references and summary see Bucher-Koenen et al. (2016). For more details see Atkinson and Messy (2012) and country-specific studies. .

Zia, 2012; Lusardi, 2008), to do it successfully (Lusardi and Mitchell, 2007a, 2008; Behrman et al., 2012), and to rely on formal financial advice (Lusardi and Mitchell, 2011a). They are more likely to have sophisticated investment behaviour (Xu and Zia, 2012), and, in particular, to invest in stocks (Arrondel et al., 2015;van Rooij et al., 2011, 2012; Yoong, 2011), to have more diversified portfolios (Guiso and Jappelli, 2008), and to have higher returns on wealth (Jappelli and Padula, 2013). On the liability side, higher financial literacy is strongly associated with lower borrowing costs (Mottola, 2013; Lusardi and Tufano, 2015), lower default rates (Gerardi et al., 2010) and better mortgage outcomes (Xu and Zia, 2012). More financially literate people are better in understanding fees and interpreting investment benefits (Hastings et al., 2011; Hastings and Tejeda-Ashton, 2008) and, thus, are less likely to commit financial mistakes (Agarwal et al., 2009). Finally, individuals who are more financially literate are less likely to make erroneous decisions in times of adverse economic conditions by making financial losses permanent (Bucher-Koenen and Ziegelmeyer, 2014). Thus, overall, financial knowledge is strongly positively associated with net worth (van Rooij et al., 2012; Lusardi, 2008; Lusardi and Mitchell, 2007a, 2011b; Behrman et al., 2012).

Given that women, on average, are less financially knowledgeable than men and that financial sophistication is closely related to financial well-being, one might expect that women, on average, have lower net wealth. In fact, it has been shown that gender wealth gap exists (Sierminska et al., 2010) and that it is particularly severe at retirement (Neelakantan and Chang, 2010). It has also been documented that stock market participation is much lower among women than among men (van Rooij et al., 2011; Haliassos and Bertaut, 1995), that women are more likely to choose a fixed immediate lifetime annuity at the retirement than to be managing their own investments (Agnew et al., 2008), and that they are not likely to seek professional advice to compensate for their lack of knowledge (Bucher-Koenen et al., 2016). Finally, it has been documented that women do worse on the liability side as well by having more costly credit card behaviour than men (Mottola, 2013).

Although several explanations have been proposed for what might be driving the gender wealth gap[61], only few works analysed the relation between gender differences in financial literacy and in wealth. Among such is Almenberg and Dreber (2015), who find that gender gap in stock market participation decreases, but does not disappear, once basic financial literacy is controlled for; Agnew et al. (2008) who show that differences in management of retirement wealth between women and men can partly be explained by differences in their risk preferences and in financial literacy; and Bannier and Neubert (2016) who conclude that improved financial knowledge among women might increase their probability to participate in financial markets. Thus, these few pieces of evidence indicate that differences in wealth between women and men exist and can be explained, at least partly, by differences in their financial sophistication.

This paper contributes to the literature by studying how differences in financial knowledge between men and women are related to differences in their financial wealth. In particular, it uses Dutch Central Bank (DNB) Household Survey to, first, document these differences and, second, to investigate whether financial literacy helps to explain gender wealth gap by using Blinder-Oaxaca decomposition at the mean (Blinder, 1973; Oaxaca, 1973) and across wealth distribution relying on re-centered influence function (RIF) regressions (Firpo et al., 2007, 2009; Fortin et al., 2011). Finally, to study how financial wealth of women could change had they financial knowledge of men, the counterfactual wealth distributions are constructed by assigning to women financial literacy indicators of men while keeping everything else constant.

The results show that women have lower financial wealth both at the mean and throughout the wealth

[61] For example, Sierminska et al. (2010) underline such factors as differences in income and in labour market experience.

distribution. As for the determinants of this gap, 30% to 40% of the explained difference in women's and men's financial wealth can be attributed to differences in their financial literacy. Moreover, the majority of this effect is driven by the most difficult financial concept in our setting, namely by the knowledge about risk diversification - the domain in which the difference in the proportion of correct answers between men and women is the largest. Finally, the importance of knowledge about diversification in explaining differences in financial wealth between the genders increases along the wealth distribution.

Although the decomposition results provide striking evidence on the implications of women's lower financial literacy for their worse, relative to men's, wealth position, the effect of financial literacy cannot be interpreted causally. Indeed, despite the fact that causality between financial literacy and financial well-being has been acknowledged (Jappelli and Padula, 2013, Behrman et al., 2012) and it has been shown that OLS tends to underestimate the effect of financial literacy on net worth (Jappelli and Padula, 2013), the causality cannot be claimed in the setting of this paper as it has also been shown that wealth has a positive, albeit small, effect on financial knowledge (Monticone, 2010) through greater financial experience (Fonseca et al., 2012), better opportunities for financial education and parental influence (Jorgensen and Savla, 2010, Lusardi et al., 2010), which overall means that there is a reverse causality between financial literacy and wealth.

Building understanding on how financial literacy relates to differences in women's and men's wealth is of paramount importance for several reasons. Firstly, as shown by Lusardi et al. (2016), inequality between men and women is an important driver of overall inequality, while differences in financial knowledge accumulation are an important source of wealth inequality. Thus, by fostering women's financial education it is possible to have potentially large positive effects on wealth accumulation and welfare. Next, it has been suggested that lack of financial literacy might have played an important role in the subprime mortgage crisis (Gerardi et al., 2010). Finally, many financial initiatives and innovations, such as, for example, privatisation programs, need to be accompanied by well-designed financial education programmes to work effectively (van Rooij et al., 2011). If women are to remain less prepared to face day-to-day financial decisions, adverse economic events, an on-going stream of financial market developments, and the necessity to plan for their own retirement, a great part of the population could be disproportionately exposed to the risk of financial distress.

This paper proceeds as follows. Section 3.2 discusses mechanisms through which financial literacy might affects wealth accumulation and the empirical framework. Section 3.3 describes financial literacy indicators and the individual data. Sections 3.4 discusses the results and section 3.5 concludes.

3.2 Methodology

3.2.1 Theoretical Framework

To understand through which channels financial literacy might affect wealth accumulation I propose the following framework. Assume, that each period a household decides how much to consume and how much to save by maximising its utility subject to a standard intertemporal budget constraint. In

this set up, the wealth[62] in the first period is household's income minus its consumption.

$$W_1^i = Y_1^i - C_1^i = S_1^i = s_1^i * Y_1^i, \tag{3.1}$$

where s_t^i is the saving rate S_t^i/Y_t^i.
In the second period, accumulated wealth has the value of the savings of the second period and those grown of the first.

$$W_2^i = (1+r)s_1^i * Y_1^i + s_2^i * Y_2^i \tag{3.2}$$

Thus, in period N the value of household's worth is given by the sum of its savings over time:

$$W_N^i = \sum_{t=1}^{N} (1+r)^{N-t} s_t^i * Y_t^i \tag{3.3}$$

To illustrate potential effects of financial literacy on accumulated wealth, assume that return rate varies across households because of their ability to, for example, find better investment opportunities. Assume also that there is a cost to be paid which is calculated as a percentage of the saved amount which is applied every period and which also varies across households due to their ability to shop for better investment offers or due to their bargaining power. Under such assumptions, the value of accumulated wealth can be written as follows:

$$W_N^i = \sum_{t=1}^{N} (1+r^i-c^i)^{N-t} s_t^i * Y_t^i \tag{3.4}$$

In line with the literature that finds that more financially literate individuals are less likely to commit financial mistakes (Agarwal et al., 2009), pay lower investment fees, better understand its benefits (Hastings et al., 2011; Hastings and Tejeda-Ashton, 2008), and overall have higher returns on wealth (Jappelli and Padula, 2013), the return might be reasonably assumed to be an increasing function of financial literacy, whereas the cost of investment decreases in financial literacy scores. Furthermore, it has been shown that financially literate individuals are more likely to be investing for retirement (Lusardi and Mitchell, 2008), have higher propensity to save and are better in budgeting and controlling their spending. Hence, saving rate might also be thought to be increasing in financial literacy.[63] If this is true and $\frac{\partial r}{\partial(\text{financial literacy})} > 0$, $\frac{\partial c}{\partial(\text{financial literacy})} < 0$, and $\frac{\partial s}{\partial(\text{financial literacy})} > 0$, then it follows that wealth is also an increasing function of financial literacy. In other words, if there are only two types of individuals, with high and low financial literacy such that $i \in H, L$, then those who have higher financial literacy will be able to accumulate more wealth over time: $W_N^H > W_N^L$
This theoretical framework yields a clear testable prediction that individuals with higher financial knowledge, in our case - men, will have higher expected wealth than individuals with lower financial literacy, women, taking into account all other characteristics.[64]

[62] This simple framework serves only to illustrate some channels through which financial literacy might affect wealth accumulation. Thus, for simplicity, I assume that borrowing is not possible and every investment yields a constant risk-free return. I also assume, that wealth accumulated in the previous period is not consumed and is left to grow in the following period. In such a set up, it is more appropriate to think about wealth as of financial wealth, left, for example, on savings accounts or invested in bonds.

[63] Although the assumption that savings rate increases with the level of financial knowledge might seem to be rather strong, it relies on the previous findings of the literature that more financially literate individuals are more likely to plan for retirement and invest in stocks (see, for example, Lusardi and Mitchell (2008). For detailed discussion and references, see Introduction). Overall, the empirical analysis performed in this paper does not depend on this assumption since it only serves to a purpose of illustrating possible channels through which financial literacy might affect wealth accumulation.

[64] In the empirical analysis presented in this paper I consider financial literacy to be an exogenous variable. This assumption is the major limitation of this study. Indeed, similarly to investment in human capital, financial literacy accumulation

3.2.2 Empirical Framework

Given the theoretical framework, the i^{th} household's wealth is a function of its financial literacy and other attributes, such as income, education, age, and employment status, summarised by column vector z_i:

$$W_i = f(Financial\ \ Literacy_i, z_i) \tag{3.5}$$

Assuming linearity, the regression model can be written as follows:

$$W_i = \beta_0 + \beta_1' Financial\ \ Literacy_i + \beta_2' z_i + \epsilon_i, \tag{3.6}$$

where $Financial\ \ Literacy_i$ is a column vector of financial literacy indicators and z_i is a vector of socio-economic attributes. From the theoretical framework, the vector of coefficients β_1' is predicted to be positive. Moreover, differences in financial literacy could help to explain differences in wealth between individuals with low and high financial literacy, i.e. in our framework between women and men. To address this question we use the decomposition technique.

Specifically, to understand how differences in financial literacy between genders contribute to the differences in their financial wealth, I decompose the latter into two additive parts: the one that can be attributed to the differences in observed characteristics and the one that is due to differences in returns, or coefficients. To do so, I perform, first, the detailed Blinder-Oaxaca decomposition at the mean of financial wealth (Blinder, 1973;Oaxaca, 1973), and second, the detailed decomposition across financial wealth distribution relying on re-centred influence function (RIF) regressions.[65]

To decompose gender difference in financial wealth, I, first, rewrite the equation 3.6 by denoting $j \in M, F$ the set of two groups, namely male and female, and X - the set of all the explanatory variables as follows:

$$W_j = \beta_{j,0} + \beta_{j,1}' X_j + \epsilon_j, \tag{3.7}$$

By using the Blinder-Oaxaca approach, the difference in mean of financial wealth [66] between women and men can be written as:

$$\bar{W}_M - \bar{W}_F = \hat{\beta}_M(\bar{X}_M - \bar{X}_F) + (\hat{\beta}_M - \hat{\beta}_F)\bar{X}_F, \tag{3.8}$$

where the first term is the so-called *composition effect*, which represents differences in the characteristics between women and men, or in other words the explained component; and the second term is

might be modelled as an endogenous decision which depends on future (heterogeneous) expected returns. Admitting this limitation, the results of this study are not interpreted causally. Rather, the conclusions drawn only characterize the observed association between differences in men's and women's financial literacy and differences in their financial wealth. The theoretical framework proposed in this section is purely stylized and serves only a purpose to motivate the consequent discussion. It thus treats the association between financial wealth and financial literacy in the most simple fashion and is silent about the endogeneity of the financial knowledge accumulation decision. For a richer theoretical framework, where investment in financial knowledge is endogenized and its effect on wealth in considered, see Lusardi et al. (2016).

[65] The details on unconditional quantile, or RIF, regressions and its properties are in Firpo et al. (2009); the survey of recent decomposition techniques and the underlying assumptions are in Fortin et al. (2011); the examples of the applications of decomposition to different distributional statistics are Firpo et al. (2007), Chi and Li (2008), Longhi et al. (2013), Nandi and Nicoletti (2014), Doorley and Sierminska (2015); the examples of the applications of decomposition techniques to wealth are Christelis et al. (2013a), Christelis et al. (2013b), Haliassos et al. (2015).

[66] In the empirical analysis, I transform financial wealth using the inverse hyperbolic sine transformation in its log form: IHS $W = ln(W + \sqrt{(1 + W^2)})$. This transformation allows reducing the influence of extreme observations by downweighting large values. However, it has an advantage over the log transformation since it admits zero and negative values of the transformed variable. Thus, by applying inverse hyperbolic sine transformation to financial wealth, there is no need to exclude households with nonpositive values from the analysis. For more discussion see Burbidge et al. (1988), Carroll et al. (2003), and Pence (2006).

the so-called *structure effect*, which is given by differences in returns (coefficients) between the two groups and reflects the unexplained component. The two effects can be further decomposed into the additive parts which allows identifying the contribution of various elements of the detailed decomposition to the overall differential:

$$\hat{\beta}_M(\bar{X}_M - \bar{X}_F) = \sum_{k=1}^{K} \hat{\beta}_{M,k}(\bar{x}_{M,k} - \bar{x}_{F,k}) \tag{3.9}$$

$$(\hat{\beta}_M - \hat{\beta}_F)\bar{X}_F = (\hat{\beta}_{M,0} - \hat{\beta}_{F,0}) + \sum_{k=1}^{K}(\hat{\beta}_{M,k} - \hat{\beta}_{F,k})\bar{x}_{F,k}, \tag{3.10}$$

where $(\hat{\beta}_{M,0} - \hat{\beta}_{F,0})$ represents the differences in the intercept terms, or the omitted group effect, and $\bar{x}_{j,k}$ and $\hat{\beta}_{j,k}$ are the $k-th$ components of the vector of variables, including both variables related to financial literacy and other attributes, and the vector of coefficients respectively.

The advantage of the Blinder-Oaxaca approach is that it is the only method allowing for the detailed decomposition. However, in its standard version - decomposition at the mean - it is limited to only this statistic, thus not allowing studying the contribution of various components to the gender wealth differentials along the distribution. To overcome this drawback, I use the re-centred influence function (RIF) approach (Firpo et al., 2009), which allows the decomposition of the differences in financial wealth between women and men at quantiles.

Specifically, the RIF is defined as a sum of the statistics of interest, in our case quantiles q_τ, and the influence function $IF(W; q_\tau)$, given by $(\tau - \mathbb{1}\{W \leq q_\tau\})/f_W(q_\tau)$:

$$RIF(W; q_\tau) = q_\tau + \frac{\tau - \mathbb{1}\{W \leq q_\tau\}}{f_W(q_\tau)} \tag{3.11}$$

In the empirical application, the quantile q_τ is replaced by its sample analogue and the density function is estimated by using a nonparametric kernel estimation.

Modelling the relationship of the conditional expectation $\mathbb{E}(RIF(W; q_\tau)|X)$ and the explanatory variables X as a linear function, one can write down the so-called unconditional quantile regression (Firpo et al., 2009) for both women and men to estimate $\mathbb{E}(RIF(W_j; q_\tau)|X_j)$:

$$RIF(W_j; q_\tau) = X_j\beta_j(q_\tau) + u_j \tag{3.12}$$

After computing RIF and regressing it on the vector of covariates separately for women and men to obtain the regression coefficients, it is possible to decompose the differences in financial wealth between the genders at quantiles of interest in equivalent to the Blinder-Oaxaca at means method (Fortin et al., 2011). In particular, the difference at quantiles can be written as:

$$\begin{aligned} q_{M\tau} - q_{F\tau} &= \mathbb{E}(RIF(W_M; q_\tau)|X_M) - \mathbb{E}(RIF(W_F; q_\tau)|X_F) = \\ &= \bar{X}_M\hat{\gamma}_{M,\tau} - \bar{X}_F\hat{\gamma}_{F,\tau} \end{aligned} \tag{3.13}$$

where $\gamma_{j,\tau}$ are coefficients from unconditional quantile regressions for each group:

$$\hat{\gamma}_{j\tau} = (\sum_{i\in J} X_i X_i)^{-1} \sum_{i\in J} \widehat{RIF}(W_{ji}; q_j\tau)X_i, \quad j = F, M \tag{3.14}$$

As in the standard Blinder-Oaxaca approach, the gender wealth differential can be re-written as a sum of explained and residual components:

$$q_{M\tau} - q_{F\tau} = (\bar{X}_M - \bar{X}_F)\hat{\gamma}_{M,\tau} + \bar{X}_F(\hat{\gamma}_{M,\tau} - \hat{\gamma}_{F,\tau}) \tag{3.15}$$

Similarly, the detailed composition can be performed to evaluate the contribution of each covariate:

$$q_{M\tau} - q_{F\tau} = \sum_{k=1}^{K}(\bar{x}_{M,k} - \bar{x}_{F,k})\hat{\gamma}_{Mk,\tau} + \bar{X}_F(\hat{\gamma}_{M,\tau} - \hat{\gamma}_{F,\tau}) \tag{3.16}$$

Thus, using this approach, the detailed composition at quantiles can be computed in the similar to the decomposition at means fashion.

3.2.2.1 Counterfactual exercise

In the last part of this paper I perform a simple counterfactual exercise. In particular, I study what would happen to the financial wealth distribution of women had they had the financial knowledge of men, keeping everything else constant. To do so, I compute average financial literacy in every analyzed domain for women and for men starting from the 10th quantile onwards at 5 - quantile intervals along the distribution of financial wealth.[67] I then assign to women the financial literacy indicators of men in their wealth quantile. For example, for women whose wealth is between 45th and 50th percentile of female financial wealth distribution, I assign the portion of correct answers on each financial literacy question among men whose wealth is between 45th and 50th percentile of male financial wealth distribution. I further estimate RIF-regressions at the same quantiles for women and men to obtain gender- and quantile-specific returns, i.e. coefficients. To construct women's counterfactual wealth distribution, I fit their financial wealth values by using their coefficients, corresponding men's financial literacy response rates, and women's socio-demographic and economic attributes. I then perform a similar exercise for men.

3.3 Data, Sample Definition and Descriptive Evidence

The main data source used for the analysis is the Dutch Central Bank (DNB) Household Survey waves 2005 and 2010. The DNB Household Survey is a panel survey data collected annually and it provides information on households' income, wealth, employment, as well as on a variety of demographic and other characteristics. The reason why the analysis is limited to the years 2005 and 2010 is that the data on financial literacy was collected only in these two years.
Despite the availability of a variety of financial literacy and retirement planning indicators in the data, only few of them are comparable across both waves. In particular, this paper focuses on three ques-

[67] Thus, the first cell for which I estimate the rate of correct answers for each financial literacy question is given by all observations whose wealth is below the 10th percentile. Other cells are formed by observations within 5-percentiles intervals. This exercise is done separately for women's and men's financial wealth distributions.

tions: interest rate numeracy, understanding of inflation and of risk diversification.[68] The questions were phrased as follows:[69]

1. *Understanding of interest rates (numeracy)*: suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?
   (i) More than €102; (ii) Exactly €102 ; (iii) Less than €102 ; (iv) Do not know; (v) Refusal.

2. *Understanding of inflation*: imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?
   (i) More than today; (ii) Exactly the same ; (iii) Less than today ; (iv) Do not know; (v) Refusal.

3. *Understanding of risk diversification*: do you think that the following statement is true or false? Buying a company stock usually provides a safer return than a stock mutual fund.
   (i) True (ii) False ; (iv) Do not know; (v) Refusal.

To assess the importance of framing, the wording in the last question was randomised in the 2005 panel and it was found that the way this question is asked has a substantial effect on the proportion of correct answers (van Rooij et al., 2011). However, since in 2010 there was not such a randomisation, I do not control for the framing of this question. Thus, to create financial literacy indicators, I generate a dummy variable equal to unity if the question is answered correctly and zero otherwise for all three financial literacy questions.

In the baseline analysis, I use both 2005 and 2010 waves. As it has been shown that financial knowledge did not increase from 2005 to 2010 (Alessie et al., 2011), I pool the two panels and account for changes between them by including a year fixed effect.[70]

The advantage of using both waves is that it allows having more observations. The drawback, however, is that in 2005 only financially knowledgeable person (FKP)[71] was asked financial literacy questions. Thus, to make the two waves comparable, the core results are obtained by defining household's financial literacy, as well as its gender and other socio-demographic characteristics, as those of the FKP. The financial wealth and income, on the other hand, are defined to be an overall amount for the whole household. In the robustness analysis, I relax this definition and repeat the analysis using individual-level financial knowledge and individual financial wealth using only 2010 wave.

The main results of this paper are based on the analysis of gross financial wealth and in the robustness section I show that the conclusions hold also for financial wealth net of short-term loans. The gross financial wealth is defined as the sum of checking accounts, employer-sponsored savings plans, sav-

[68] For more details on financial literacy modules, both waves 2005 and 2010, in DNB Household Survey data set, see Alessie et al. (2011).

[69] The translation of questions from originally phrased in Dutch is from Alessie et al. (2011).

[70] Considering a balanced panel of only household's FKPs who participated in the surveys of both 2005 and 2010 years (overall, 414 households, among which 247 men and 167 women), I find, consistently with Alessie et al. (2011), that there were no large changes in financial literacy between the waves. In particular, changes in the rate of correct answers among men is not significant for all three financial literacy questions. Whereas for women, the rate of correct responses slightly increased, by 10 percentage points, for the third question on risk diversification.

[71] Financially knowledgeable person is the person who is most involved with the financial administration of the household, where financial administration means making the payments for rent/mortgage, taking out loans, taking care of tax declarations, etc.

ings and deposit accounts, deposit books, savings certificates, insurance policies, growth and mutual funds, bonds, stocks, and loans made to family and friends. Financial wealth is set to missing if the respondent provided no information on none of the financial wealth's components. Short-term debt is defined as a sum of private loans, credit lines, and credit card debt. As with the gross financial wealth, it is set to missing if no information is provided about its components.

To account for differences in income, I condition on households' gross income, which consists of gross salary, pension payments, unemployment benefits, social transfers, and profits, and is net of alimonies. The income is set to missing if any of the components, except for profits, is missing, while if the profit is missing, it is set to zero in the calculation of the gross income.

Across both waves, the data has been collected for 3877 households, among which 1082 were interviewed in both years. To perform the analysis I drop observations where information on at least one variable used in the analysis is missing. In particular, I drop observations if information is missing about financial wealth (929 observations), income (483 observations), marital status (370 observations), financial literacy (374 observation), and education (3 observations). This sample selection leads to 1718 observations, among which there are 1012 men and 706 women.

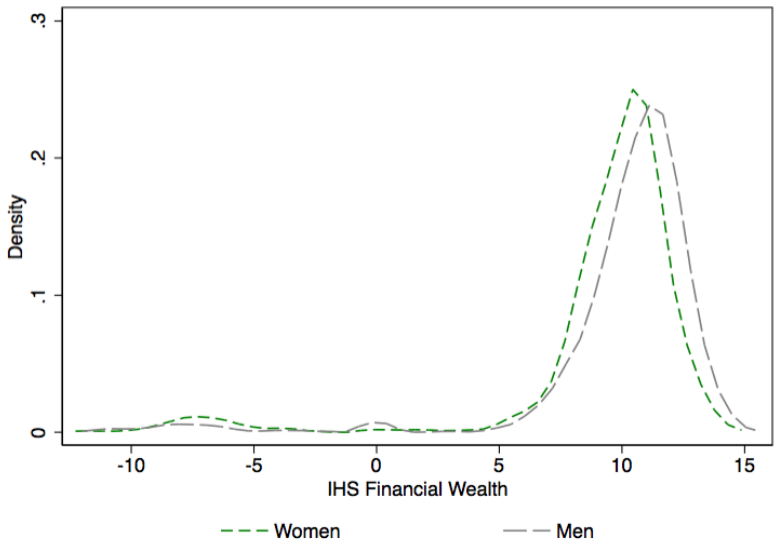
As can be seen from Table 3.1 and Figure 3.1, households whose FKP is a woman have significantly lower gross and net financial wealth both at mean and across distribution[72]. These households also have lower income levels and lower portion of them responded correctly on the financial literacy questions, with this difference being remarkably striking in what concerns the rate of correct answers about risk diversification (Figure 3.2), which is consistent with the results reported in Alessie et al. (2011).

[72] 3.5% of all households have negative gross financial wealth due to the negative position on the checking accounts.

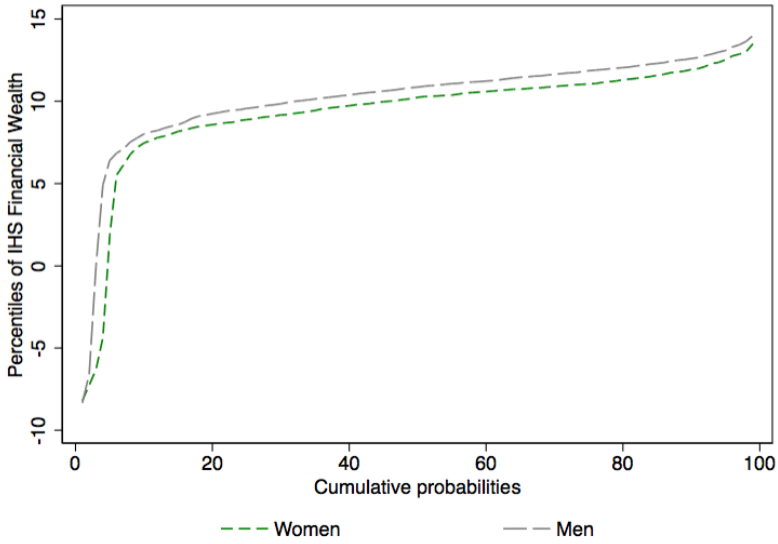
TABLE 3.1: **Descriptive Statistics by Gender from DNB Household Survey, Panels 2005 and 2010**

	Men	Women	Difference Men vs Women	P-value difference
Financial Wealth (€)	63,248.37	33,283.63	29,964.74***	0.000
	(3,796.66)	(2,610.60)	(4,607.59)	
Net Financial Wealth (€)	59,740.68	30,809.66	28,931.02***	0.000
	(3,951.07)	(2,702.98)	(4,787.18)	
Income (€)	44,344.78	32,391.96	11,952.82***	0.000
	(1,027.61)	(1,123.85)	(1,522.83)	
Financial literacy, % answered correctly				
Interest Rate	0.95	0.90	0.04***	0.001
	(0.01)	(0.01)	(0.01)	
Inflation	0.90	0.80	0.10***	0.000
	(0.01)	(0.01)	(0.02)	
Risk Diversification	0.69	0.43	0.26***	0.000
	(0.01)	(0.02)	(0.02)	
Socio-demographic attributes				
Age	55.84	50.17	5.67***	0.000
	(0.45)	(0.56)	(0.72)	
Household size	2.35	2.23	0.11*	0.057
	(0.04)	(0.05)	(0.06)	
Single (%)	0.16	0.19	-0.03	0.101
	(0.01)	(0.01)	(0.02)	
Widowed (%)	0.04	0.08	-0.04***	0.000
	(0.01)	(0.01)	(0.01)	
Divorced (%)	0.05	0.12	-0.07***	0.000
	(0.01)	(0.01)	(0.01)	
High Education (%)	0.44	0.33	0.11***	0.000
	(0.02)	(0.02)	(0.02)	
Medium Education (%)	0.52	0.62	-0.10***	0.000
	(0.02)	(0.02)	(0.02)	
Other Education (%)	0.01	0.01	-0.00	0.830
	(0.00)	(0.00)	(0.00)	
Self-employed (%)	0.05	0.03	0.02*	0.095
	(0.01)	(0.01)	(0.01)	
Unemployed (%)	0.02	0.03	-0.00	0.586
	(0.00)	(0.01)	(0.01)	
Retired (%)	0.18	0.07	0.11***	0.000
	(0.01)	(0.01)	(0.02)	
Observations	**1012**	**706**		

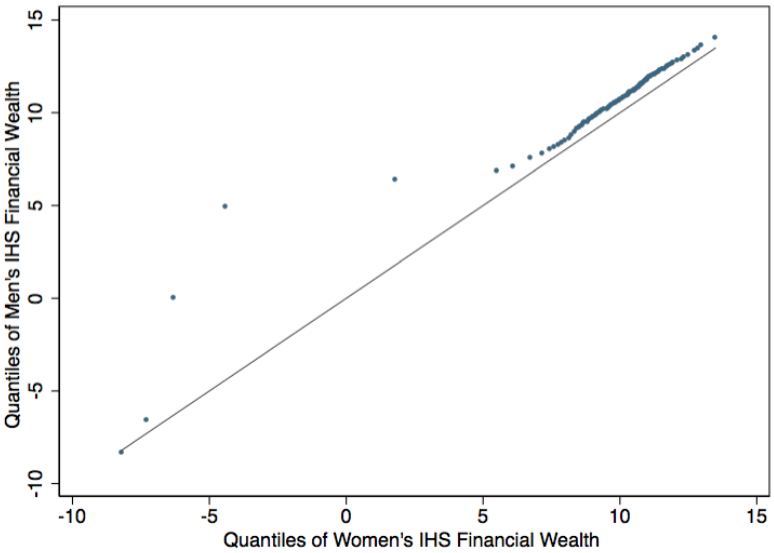
Note: The table reports descriptive statistics for households FKP in the selected DNB Household Survey sample for waves 2005 and 2010. Robust standard errors are in parenthesis. Men's and women's averages are not tested against zero. *** $p<0.01$, ** $p<0.05$, * $p<0$..



Panel A. IHS Households Total Financial Wealth Density Functions



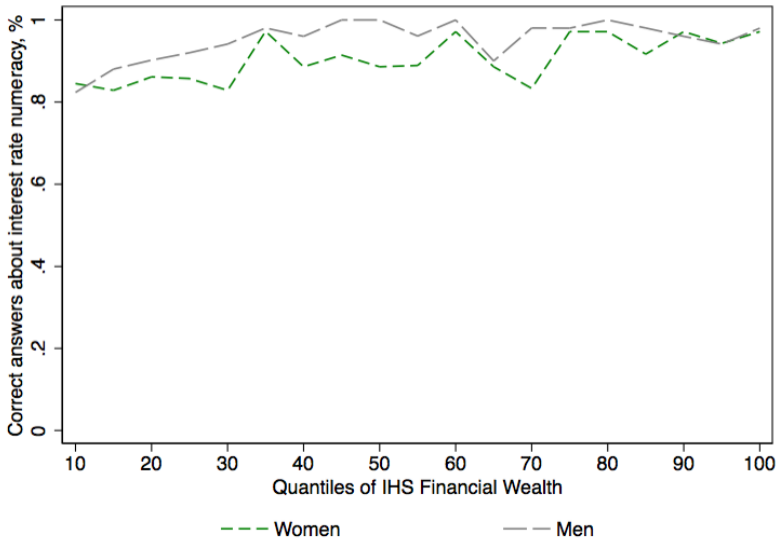
Panel B. IHS Households Total Financial Wealth Percentiles



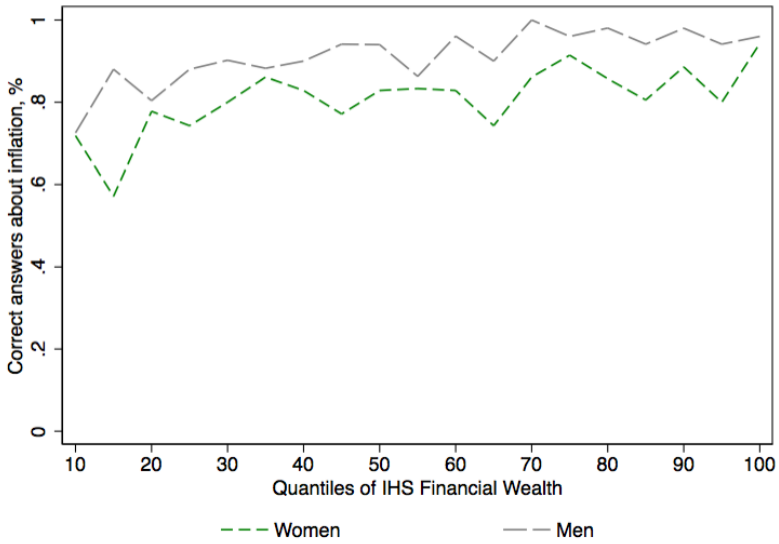
Panel C. IHS Households Total Financial Wealth Quantiles of Women's Distribution vs. Quantiles of Men's Distribution

FIGURE 3.1: **Distribution of IHS Households Total Financial Wealth of Women and Men**

Note: Panel A. shows kernel density estimates of IHS households total financial wealth for women and men (bandwidth 0.50). Panel B. shows women's and men's percentiles of IHS households total financial wealth. Panel C. plots women's vs. men's quantiles of IHS households total financial wealth. Households total financial wealth is defined as a sum of gross financial wealth of all households members. Gender is based on the gender of the FKP.
Source: Data from panels 2005 and 2010 of DNB Household Survey.



Panel A. Correct Answers about Interest Rate, %



Panel B. Correct Answers about Inflation, %

Panel C. Correct answers about risk diversification, %

FIGURE 3.2: **Financial Literacy by Gender across Households Total Financial Wealth Distribution**

Note: These graphs show the distribution of the proportion of correct answers in different domains of financial literacy by gender across financial wealth distribution. The rates of correct answers are estimated for the first 10 percentiles at the bottom of the distribution and every 5 percentiles onwards. Households total financial wealth is defined as a sum of gross financial wealth of all households members. Gender is based on the gender of the FKP.

Source: Data from panels 2005 and 2010 of DNB Household Survey.

As regards to other characteristics, male FKPs are, on average, older than female FKPs, have slightly bigger households, and fewer of them are widowed or divorced, while there is no difference in the proportion of never-married. As for the education and employment, male FKPs have, on average, higher educational attainment, and more of them are self-employed or retired, where the latter reflects differences in age.
Thus, there seem to be differences in the characteristics of households whose FKP is a man and those whose FKP is a woman, with the latter, on average, having worse economic conditions and being less educated and financially knowledgeable.

3.4 Results

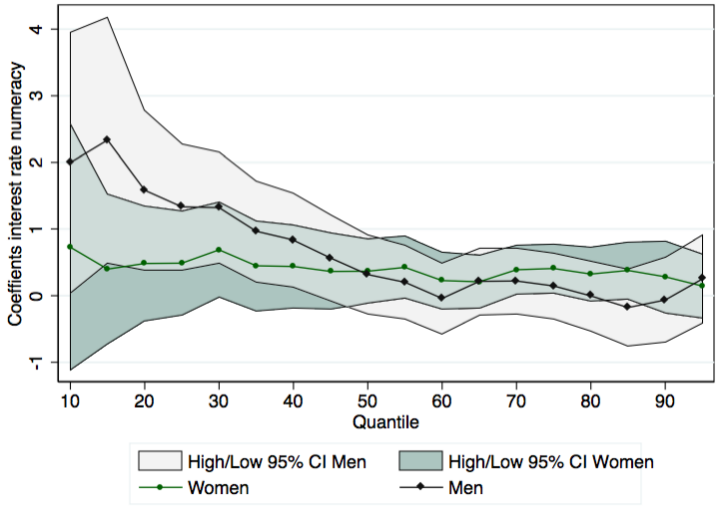
In the first step of the analysis, I estimate mean and quantiles of financial wealth distribution by gender using OLS and RIF-regressions. The results show that, conditioning on a range of socio-demographic and economic characteristics, financial literacy is overall positively associated with the level of financial wealth for both women and men (Table 3.2). Interestingly, at the mean, the coefficient is significant only for those households whose FKP is a male, while it is not statistically different from zero for the female-headed households. The question that seems to be having the strongest association with the financial wealth, is the one on risk diversification: it is positive and statistically significant across distribution for both men and women, but its point estimate is higher for the former (Figure 3.3). The knowledge about inflation matters for all the man-headed households, with the exception of those in the top of the distribution, while for woman-headed ones it plays role only at the bottom of the distribution. Finally, understanding of interest rates, which is the question where the most of the households - 95% among men and 90% among women - gave the right answer, seems to matter the least: it is statistically different from zero for men at the mean and at the bottom of the distribution, and for women - only at the 75th percentile.[73]

[73] I also test formally whether slope coefficients are gender specific by estimating fully interacted models with female dummy. The results are reported in the table 3.A. Overall the test suggests that, except for a few covariates such as financial literacy about risk diversification, high education indicator and some others, the slope coefficients are not statistically different between genders. This result is reflected in the decomposition since differences in coefficients between women and men do not explain differences in their financial wealth, with the exception of knowledge about risk diversification and attained educational level.

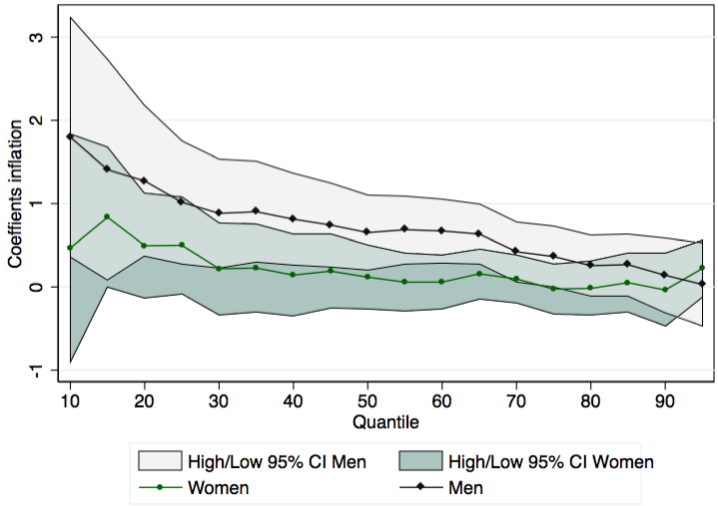
TABLE 3.2: **OLS and Unconditional Quantile (RIF) Regressions of IHS Households Total Financial Wealth by Gender**

	Men					Women				
	Mean	**25th**	**Median**	**75th**	**90th**	**Mean**	**25th**	**Median**	**75th**	**90th**
Financial literacy:										
Interest Rate	1.54**	1.33***	0.32	0.15	-0.06	0.55	0.49	0.37	0.41**	0.28
	(0.76)	(0.48)	(0.30)	(0.25)	(0.32)	(0.61)	(0.40)	(0.25)	(0.18)	(0.28)
Inflation	1.06*	1.02***	0.65***	0.36**	0.14	0.60	0.50*	0.12	-0.03	-0.04
	(0.54)	(0.38)	(0.23)	(0.18)	(0.23)	(0.43)	(0.30)	(0.19)	(0.15)	(0.22)
Risk Diversification	0.92***	0.62***	0.57***	0.48***	0.54***	0.24	0.33*	0.27*	0.25*	0.41**
	(0.25)	(0.20)	(0.15)	(0.12)	(0.13)	(0.31)	(0.20)	(0.15)	(0.13)	(0.19)
Age:										
Age	0.10*	0.10**	0.13***	0.08***	0.05	0.12	0.12**	0.14***	0.04	0.03
	(0.06)	(0.05)	(0.03)	(0.03)	(0.03)	(0.08)	(0.05)	(0.03)	(0.03)	(0.05)
Age Squared	-0.00	-0.00*	-0.00***	-0.00*	-0.00	-0.00	-0.00	-0.00***	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household Size	-0.18	-0.03	-0.11	-0.05	-0.01	-0.03	-0.00	-0.06	0.06	0.01
	(0.14)	(0.10)	(0.08)	(0.07)	(0.08)	(0.18)	(0.12)	(0.09)	(0.08)	(0.10)
Education:										
Middle	-0.11	0.66	0.26	-0.17	-0.31	2.05	0.32	0.49	0.34	0.15
	(0.45)	(0.50)	(0.37)	(0.35)	(0.43)	(1.27)	(0.61)	(0.37)	(0.26)	(0.45)
High	0.16	1.02**	0.56	0.26	0.02	2.89**	1.03	1.12***	0.98***	0.77
	(0.47)	(0.51)	(0.38)	(0.36)	(0.45)	(1.29)	(0.64)	(0.40)	(0.29)	(0.50)
Other	1.38*	1.01	1.21*	0.48	0.73	3.30**	0.94	2.09**	1.61**	-0.18
	(0.79)	(1.05)	(0.72)	(0.66)	(1.00)	(1.56)	(1.20)	(0.82)	(0.80)	(0.50)
Employment Status:										
Self - employed	-1.13	-0.62	0.04	0.13	0.33	-0.27	-0.10	-0.08	0.33	1.11
	(0.90)	(0.48)	(0.33)	(0.26)	(0.33)	(0.91)	(0.52)	(0.41)	(0.43)	(0.82)
Unemployed	-0.26	-0.25	-0.13	0.58	0.63	-1.27	-0.51	-0.53	0.13	0.53
	(0.99)	(0.62)	(0.44)	(0.41)	(0.55)	(1.23)	(0.67)	(0.45)	(0.41)	(0.69)
Retired	-0.39	0.24	-0.06	-0.23	-0.13	-0.39	-0.02	0.34	0.21	0.03
	(0.39)	(0.30)	(0.24)	(0.23)	(0.27)	(0.60)	(0.35)	(0.32)	(0.34)	(0.56)
Other	-1.15**	-0.85**	-0.39	0.03	-0.20	-1.06***	-0.66***	-0.29	-0.22	-0.22
	(0.57)	(0.39)	(0.25)	(0.21)	(0.20)	(0.37)	(0.25)	(0.18)	(0.14)	(0.20)
IHS Income	0.12	0.09	0.04	0.05	0.00	0.07	0.02	0.06**	0.03	0.06*
	(0.09)	(0.06)	(0.04)	(0.03)	(0.04)	(0.07)	(0.05)	(0.03)	(0.03)	(0.03)
Marital Status:										
Single	-0.52	-0.70**	-0.52**	-0.34	-0.06	-1.06**	-0.86**	-0.99***	-0.45**	-0.49
	(0.38)	(0.33)	(0.25)	(0.21)	(0.25)	(0.51)	(0.34)	(0.26)	(0.22)	(0.31)
Widowed	-1.05	-0.53	-0.75**	-0.06	0.14	-1.12*	-0.75*	-1.02***	-0.55*	-0.28
	(0.74)	(0.45)	(0.36)	(0.34)	(0.45)	(0.61)	(0.41)	(0.32)	(0.30)	(0.50)
Divorced	-1.67**	-1.86***	-0.69**	-0.40	-0.27	-1.27**	-1.33***	-0.93***	-0.27	-0.29
	(0.72)	(0.48)	(0.33)	(0.29)	(0.30)	(0.51)	(0.35)	(0.23)	(0.21)	(0.31)
Year 2010	0.19	0.00	0.19	0.25*	0.20	0.25	0.19	0.03	-0.02	-0.19
	(0.29)	(0.21)	(0.16)	(0.14)	(0.16)	(0.29)	(0.21)	(0.16)	(0.14)	(0.21)
Constant	2.52	2.26	4.87***	7.79***	10.27***	1.78	3.84***	4.59***	8.04***	9.09***
	(2.08)	(1.55)	(1.06)	(0.89)	(1.04)	(2.12)	(1.43)	(0.96)	(0.81)	(1.16)
Observations	1012	1012	1012	1012	1012	706	706	706	706	706
R-squared	0.12	0.13	0.13	0.10	0.05	0.11	0.14	0.19	0.14	0.08
Dependent Variable :	10.10***	9.56***	10.86***	11.85***	12.60***	9.28***	8.88***	10.24***	11.06***	11.93***
IHS Financial Wealth	(0.11)	(0.09)	(0.07)	(0.06)	(0.07)	(0.15)	(0.10)	(0.08)	(0.07)	(0.10)

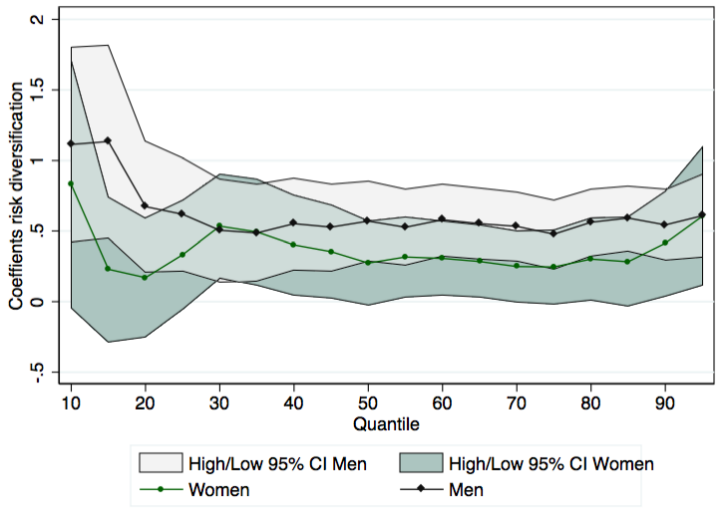
Note: The table reports the results of the OLS and RIF, or unconditional quantile, regressions of IHS transformation of total households financial wealth by gender using the selected DNB Household Survey sample waves 2005 and 2010. Financial wealth is calculated as a sum of household's financial assets. All the individual characteristics as well as financial literacy indices are defined for household's FKP. Omitted group for education is low educational attainment, for employment - employee, and for marital status- married FKPs. Income is an IHS transformation of gross household's income, which is defined as a sum of incomes of all households members. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.



Panel A. Interest rate numeracy



Panel B. Inflation



Panel C. Risk Diversification

FIGURE 3.3: **Rif-regression Coefficients of Financial Literacy by Gender**

Note: The graphs show the coefficients of the RIF-regressions across distribution of IHS total households financial wealth by gender, controlling for socio-demographic and economic characteristics. Coefficients on financial literacy are reported as follows: Panel A. depicts coefficients on interest rate question; Panel B. -on inflation question; Panel C. - on risk diversification question. The regressions are estimated every 5 percentiles starting from the 10th onwards.
Source: Data from panels 2005 and 2010 of DNB Household Survey.

The decomposition results show that most of the difference in financial wealth between households where FKP is a man and those with a woman can be attributed to differences in the observed characteristics. In particular, at the mean and in the lower half of the distribution, differences in characteristics play a great role in contributing to the gender wealth gap, while differences in coefficients oppose this effect. At the top of the distribution, both differences in covariates and in coefficients increase the gap and their contribution is roughly half-half. As for what contributes to the explained part of the gender wealth gap, 30% to 40% of the difference in financial wealth between women and men, depending on the statistics, might be explained by differences in their financial literacy. Specifically, 34% of the explained component (0.41 out of 1.22 - column 1 Table 3.3), is due to differences in financial literacy at the mean, 32% - 33% at the lower half of the distribution (0.32 out of 0.99 and 0.23 out of 0.7 at the 25th and 50th quantiles respectively), and its role increases along the distribution, up to 38% - 40% at the upper half. The rest of the explained part might be attributed to differences in other characteristics included in the regression, such as differences in age, employment and marital status. As to what matters the most among financial literacy questions, it is the knowledge about risk and portfolio diversification. In particular, differences in this domain account for 50% - 90% of the difference explained by financial knowledge as a whole, and their importance increases along the wealth distribution (it is 0.16 out of 0.32 at the 25th percentile and it is 0.14 out of 0.15 at the 90th percentile).

TABLE 3.3: **Decomposition of IHS Transformation of Households' Total Financial Wealth**

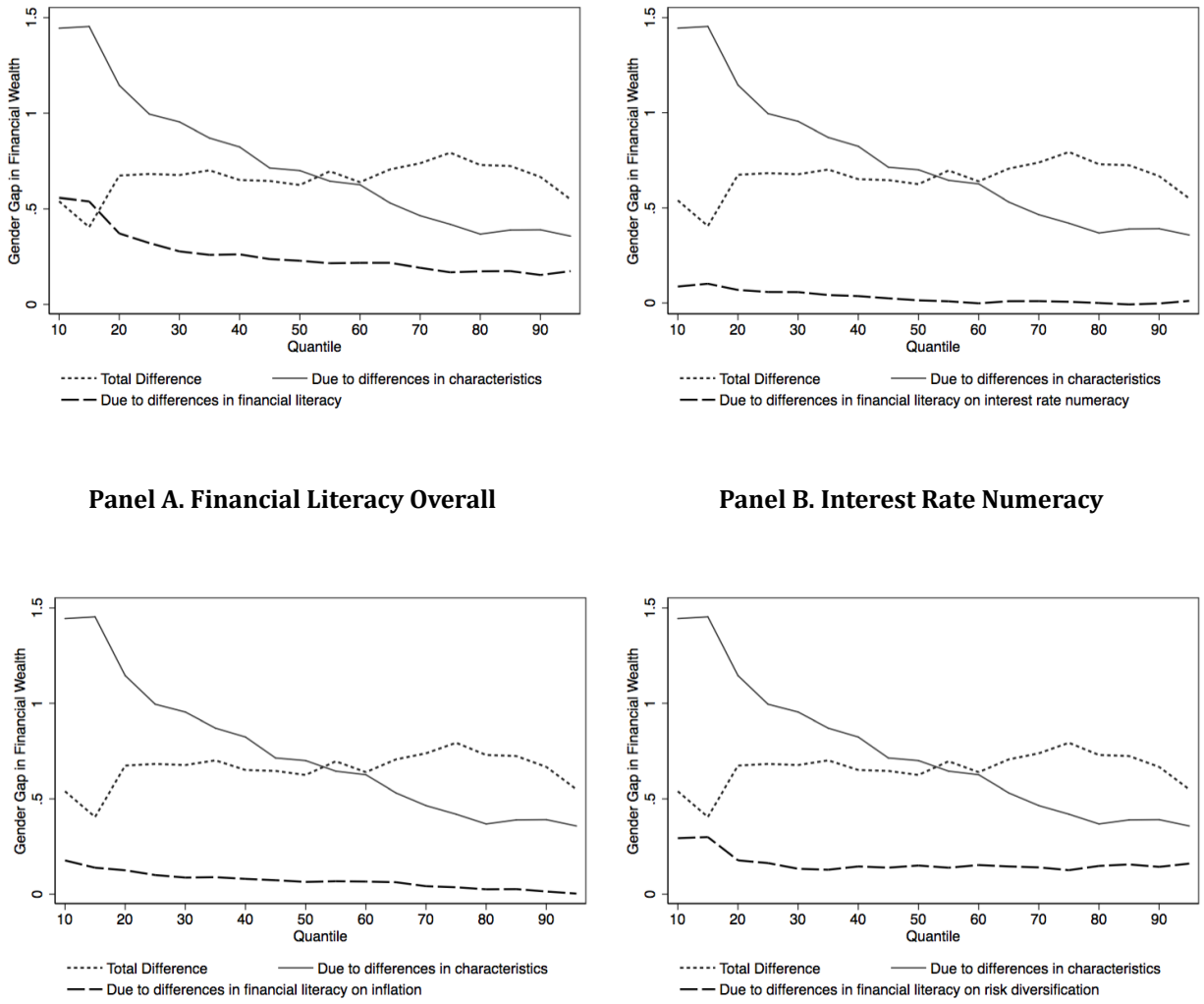
	IHS Financial Wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	10.10***		9.56***		10.86***		11.85***		12.60***	
	(0.11)		(0.09)		(0.07)		(0.06)		(0.07)	
Women	9.28***		8.88***		10.24***		11.06***		11.93***	
	(0.15)		(0.10)		(0.08)		(0.07)		(0.10)	
Total difference	0.82***		0.68***		0.62***		0.79***		0.67***	
	(0.19)		(0.14)		(0.10)		(0.09)		(0.12)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	1.22***	-0.40	0.99***	-0.31	0.70***	-0.08	0.42***	0.37***	0.39***	0.28**
	(0.21)	(0.29)	(0.14)	(0.19)	(0.09)	(0.13)	(0.08)	(0.10)	(0.08)	(0.12)
Financial literacy:	**0.41*** **	**1.55***	**0.32*** **	**1.30*** **	**0.23*** **	**0.51**	**0.17*** **	**0.18**	**0.15*** **	**-0.12**
	(0.09)	**(0.94)**	**(0.07)**	**(0.54)**	**(0.04)**	**(0.34)**	**(0.03)**	**(0.27)**	**(0.03)**	**(0.33)**
Among which:										
Interest Rate	0.07*	0.90	0.06**	0.76	0.01	-0.05	0.01	-0.24	-0.00	-0.31
	(0.04)	(0.88)	(0.03)	(0.56)	(0.01)	(0.35)	(0.01)	(0.28)	(0.01)	(0.38)
Inflation	0.10*	0.36	0.10**	0.42	0.06**	0.43*	0.04*	0.31	0.01	0.14
	(0.06)	(0.56)	(0.04)	(0.39)	(0.03)	(0.24)	(0.02)	(0.19)	(0.02)	(0.26)
Risk Diversification	0.24***	0.29*	0.16***	0.12	0.15***	0.13	0.13***	0.10	0.14***	0.06
	(0.07)	(0.17)	(0.06)	(0.12)	(0.04)	(0.09)	(0.03)	(0.08)	(0.04)	(0.10)
Other attributes:	**0.80*** **	**-2.66**	**0.67*** **	**0.05**	**0.47*** **	**-0.93**	**0.24*** **	**0.34**	**0.23*** **	**-0.94**
	(0.18)	**(2.90)**	**(0.13)**	**(2.06)**	**(0.09)**	**(1.42)**	**(0.07)**	**(1.20)**	**(0.07)**	**(1.59)**
Among which:										
Age	0.26***	-0.63	0.14***	-0.72	0.21***	-0.37	0.17***	0.86	0.14***	0.08
	(0.07)	(2.46)	(0.05)	(1.69)	(0.04)	(1.16)	(0.03)	(0.98)	(0.03)	(1.38)
Household Size	-0.02	-0.35	-0.00	-0.07	-0.01	-0.10	-0.01	-0.25	-0.00	-0.04
	(0.02)	(0.50)	(0.01)	(0.34)	(0.01)	(0.26)	(0.01)	(0.23)	(0.01)	(0.28)
Education	0.03	-2.26*	0.05**	0.21	0.03**	-0.34	0.04***	-0.57	0.03*	-0.53
	(0.03)	(1.29)	(0.02)	(0.75)	(0.02)	(0.50)	(0.02)	(0.41)	(0.02)	(0.60)
Employment Status	0.27*	-0.03	0.26**	-0.06	0.11	-0.05	-0.03	0.06	0.04	-0.03
	(0.16)	(0.27)	(0.11)	(0.18)	(0.07)	(0.13)	(0.06)	(0.11)	(0.06)	(0.12)
IHS Income	0.07	0.55	0.05	0.70	0.03	-0.20	0.03	0.20	0.00	-0.55
	(0.05)	(1.16)	(0.04)	(0.80)	(0.02)	(0.51)	(0.02)	(0.44)	(0.03)	(0.55)
Marital Status	0.19***	0.06	0.18***	-0.02	0.10***	0.14	0.04	0.04	0.02	0.12
	(0.07)	(0.20)	(0.05)	(0.15)	(0.04)	(0.11)	(0.03)	(0.10)	(0.03)	(0.13)
Year fixed effect	Yes		Yes		Yes		Yes		Yes	
Observations	1718		1718		1718		1718		1718	

Note: The table reports the results of the detailed Blinder-Oaxaca decomposition of IHS transformation of financial wealth at means and across wealth distribution by gender using the selected DNB Household Survey sample waves 2005 and 2010. Total household financial wealth is calculated as a sum of total gross household financial wealth of each family member. All the individual characteristics as well as financial literacy indices are defined for household's FKP. *E* means explained differences, i.e. differences in covariates between the genders. *U* means unexplained differences, i.e. differences in returns (coefficients) between the two groups. The variables are aggregated as follows. Age group comprises age and age squared. Household size - number of household members. Education - indicators for high educational attainment, low educational attainment and other types of education (omitted group is low educational attainment). Employment status group includes indicators for self-employment, unemployment and retirement and other occupation (omitted group is employees). Income is an IHS transformation of gross income of all household's members. Marital status includes indicators for single, widowed and divorced. The contribution of the year is omitted from the table, thus explained part does not sum up to the total explained difference. The differences in constants are omitted from the table, which is why contributions of reported unexplained components do not sum up to the overall difference due to differences in coefficients. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

The role of financial literacy in explaining the differences in financial wealth between women and men across the financial wealth distribution is depicted at the Figure 3.4. In particular, it shows the contribution of the gender differences in financial literacy overall and by financial literacy question to the total difference in financial wealth and to the explained component.[74] As can be seen, the total

[74]The decomposition results are plotted starting from 10th percentile and every 5 percentiles onwards, e.g. at 15th, 20th and so on.

difference in financial wealth between households whose FKP is a woman and those whose FKP is a man, can be said to be slightly increasing along the financial wealth distribution, while the contribution of the differences in characteristics decreases. The fact that in the lower half of the distribution the magnitude of the explained component is greater than the overall difference suggests that the return to the characteristics, or in other words, difference in coefficients, is negative, thus favouring women. As for the contribution of the overall financial knowledge (Panel A. Figure 3.4), it also slightly decreases along the financial wealth distribution, but at a slower rate than does the importance of the explained component, thus, its relative to other attributes contribution increases. Panels B through D of Figure 3.4 show the contribution of questions on interest rate numeracy, inflation and risk diversification. The plots confirm that what matters the most, is the knowledge about portfolio diversification, domain in which differences in the knowledge between women and men are also the most striking. What matters the least, on the other hand, is the knowledge about inflation - the question on which over 90% respondents provided the right answer. Interestingly, at the top of the distribution, only differences in the understanding of risk diversification matter, while differences related to interest rates only matter at the mean and at the lower quarter of the distribution, and those related to the inflation matter up till 75th percentile.



Panel A. Financial Literacy Overall

Panel B. Interest Rate Numeracy

Panel C. Inflation

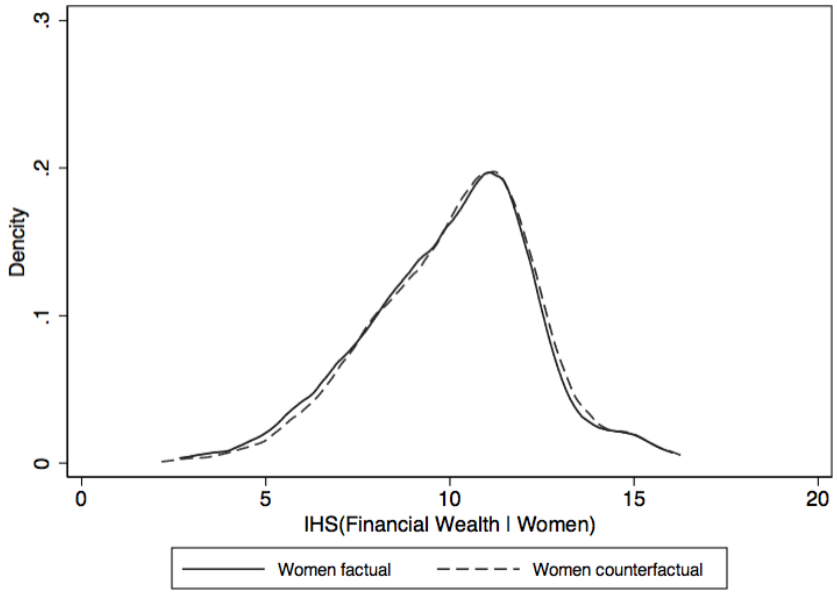
Panel D. Risk Diversification

FIGURE 3.4: **Differential in IHS Financial Wealth between Women and Men across Distribution and Its Determinants**

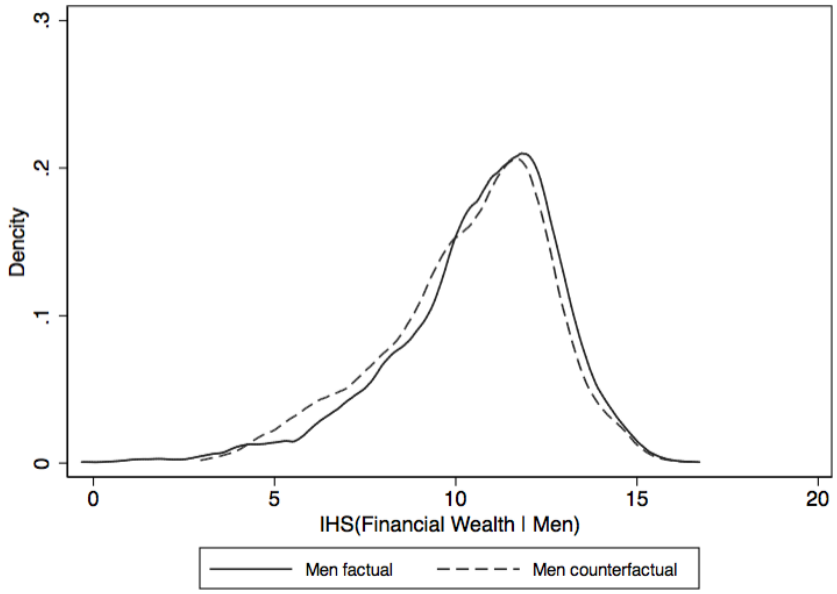
Note: The graphs show the results of the Blinder-Oaxaca decomposition of differences in financial wealth between women and men across the distribution: the total gender differential in IHS financial wealth, the explained part of the difference, i.e. the one that can be attributed to the differences in the observed characteristics, and the contribution of differences in financial knowledge overall (Panel A) and in different areas: interest rate question (Panel B.); inflation question (Panel C.); risk diversification question (Panel D.). Gender and financial literacy are defined as that of a household's FKP. The RIF-regressions and the decomposition results are obtained for quantiles starting from the 10th percentile and each 5th percentile onwards. *Source:* Data from panels 2005 and 2010 of DNB Household Survey.

Finally, I perform a counterfactual exercise based on the regression estimates to gain understanding on how women's and men's financial wealth distribution would have changed had they swapped their financial literacy. The results are shown on the Figure 3.5 and indicate that the effect of the decrease (for men) and increase (for women) in the financial literacy on their financial wealth is asymmetric between the genders. In particular, although women's financial wealth distribution slightly shifts to the right after men's financial literacy response rates are attributed to women, the negative effect for men is much larger than the positive effect for women. The intuition on what underlines the

asymmetry of the responses can be gained from the Figure 3.3 which plots RIF-regression coefficients for women and men across the wealth distribution. As can be seen, with only few exceptions, the magnitude of the coefficients' point estimates is systematically higher for men than for women and this holds true for all the three questions. Although the difference in the coefficients between the genders is not statistically significant, the fact they are higher for men almost at each point of the distribution is enough to generate the big negative effect for men while changing women's distribution only slightly. Moreover, the fact the women's coefficients are rather low in absolute terms explains why their distribution of financial wealth does not improve much with better financial literacy. Thus, this exercise demonstrates that in order to eliminate the gender wealth gap it would not be enough to simply equip women with better financial knowledge, but it is also important to teach women how to use it as there seems to be a big difference in how women transform their financial literacy into wealth.



Panel A. Women's Financial Wealth



Panel B. Panel B. Men's Financial Wealth

FIGURE 3.5: **Factual and Counterfactual Densities of IHS Transformation of Financial Wealth Using RIF-regressions**

Note: The graphs show kernel density estimates of women's and men's factual and counterfactual IHS financial wealth (bandwidth 0.50). The values of counterfactual financial wealth are obtained by fitting the RIF-regressions at each 5th percentile starting from the 10th by gender and by assigning to women (men) the response rates of men(women) in their corresponding interval of financial wealth distribution defined for groups of 5 percentiles starting from the 10th onwards and keeping the factual coefficients of RIF-regressions. The factual financial wealth are fitted values from RIF-regressions.
Source: Data from panels 2005 and 2010 of DNB Household Survey.

Therefore, the results confirm that women, on average, have both lower financial wealth and are less financially sophisticated. The results of the decomposition indicate that half of the total difference in financial wealth between women and men at the mean can be explained by the differences in their financial literacy, with this portion decreasing from 47% at the 25th quantile to 22% at the 90th quantile of wealth distribution. Although the role of differences in observed characteristics decreases

throughout distribution, which is also reflected by the decrease of the contribution of financial literacy to the overall difference in wealth, the relative importance of financial literacy to other attributes goes up, which is driven mainly by the importance of understanding of the risk diversification. Finally, increase in financial literacy of women to the level of men would not be sufficient to eliminate the financial wealth gap, since women seem to have lower returns on their financial knowledge.

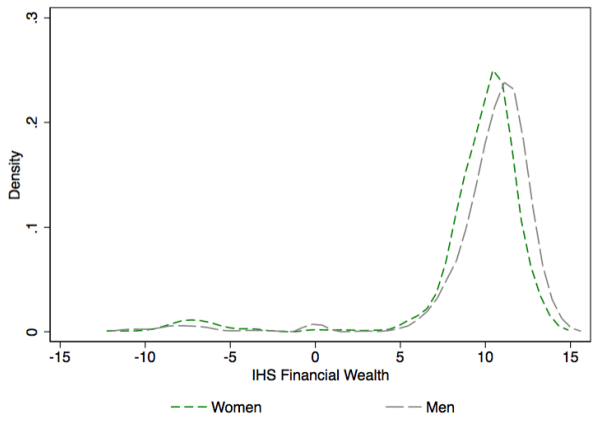
3.4.1 Robustness

The core analysis and the main results of the paper are obtained using a sample of DNB Household Survey 2005 and 2010 and by defining financial wealth as a total gross financial wealth of a household, while the gender and other individual characteristics as those of a household's FKP. Two concerns might arise regarding these definitions. First, whether the results would hold for the net instead of gross financial wealth and, second, whether the results are robust to the gender definition.

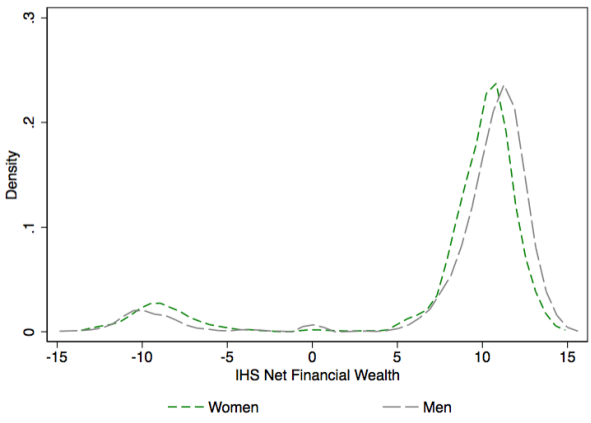
To address the first issue, I re-define the financial wealth by subtracting all short-term liabilities. To study the sensitivity to the gender definition, I repeat all the analysis by using only the 2010 wave, where all financial literacy questions were asked at the individual level (differently from the year 2005, where only the FKP was asked to complete the financial literacy module).[75] To address the difficulty of individualising households wealth further, I repeat the analysis for a sample of households who are not married under the common property regime. When defining gender and financial literacy as characteristics of single individuals and not as those of a household FKP, I use data on individual financial wealth and on individual incomes.

The estimated densities of household- and individual-level financial wealth, both gross and net, are shown on the Figure 3.6. As can be seen, the gender gap in financial literacy persists throughout different definitions of wealth and gender. The results of the decomposition are shown in the Table 3.4 Panel A through C and Figure 3.7 and indicate that differences in financial literacy play an important role in explaining differences in both gross and net financial wealth defined both at a household and at individual level. Moreover, throughout all the specifications it is still the case that the concept that matters the most is the one related to the risk diversification. Although the results estimated for the sample without individuals living under the common property regime are not precise because of the small number of observations, the overall conclusions are upheld.

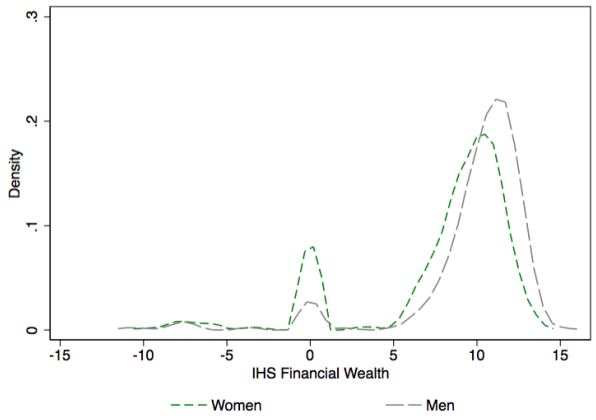
[75] Despite the fact that the DNB Household Survey suffers from a considerable within household non-response, I still find it informative to conduct the analysis at the individual level as a robustness check of the overall conclusions. This is because in the main analysis the gender is defined as that of a FKP. Therefore, the fact that the results hold true when individual characteristics and wealth are considered is reassuring of the validity of the finding that differences in financial literacy between women and men play an important role in explaining differences in their financial wealth.



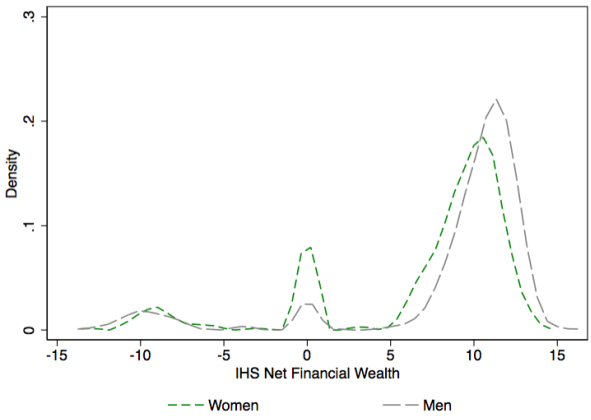
Panel A. Household Total Financial Wealth



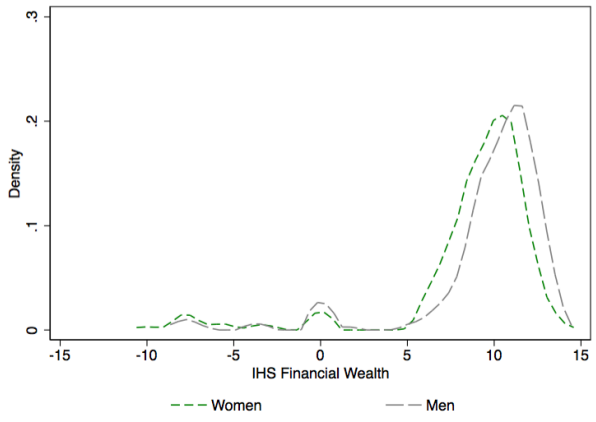
Panel B. Household Net Financial Wealth



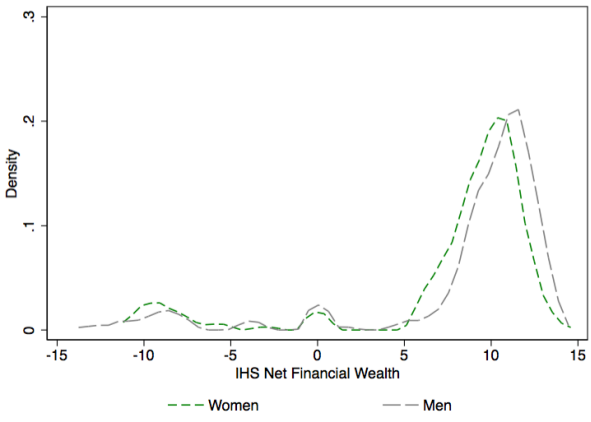
Panel C. Individual Total Financial Wealth



Panel D. Individual Net Financial Wealth



Panel E. Individual Total Financial Wealth (Common Property Regime Excluded)



Panel F. Individual Net Financial Wealth (Common Property Regime Excluded)

FIGURE 3.6: **Distribution of IHS Total and Net Financial Wealth of Women and Men**

Note: The graphs show kernel density estimates of household and individual IHS total and net financial wealth for women and men (bandwidth 0.50). The gender is defined as a gender of a household FKP (Panels A and B) or as a gender of a respondent (Panels C through F).

Source: Data from panels 2005 and 2010 of DNB Household Survey.

TABLE 3.4: **Decomposition of IHS Transformation of Financial Wealth**

Panel A. Decomposition of IHS Transformation of Total and Net Financial Wealth at Household Level

	IHS total financial wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	10.10***		9.56***		10.86***		11.85***		12.60***	
	(0.11)		(0.09)		(0.07)		(0.06)		(0.07)	
Women	9.28***		8.88***		10.24***		11.06***		11.93***	
	(0.15)		(0.10)		(0.08)		(0.07)		(0.10)	
Total difference	0.82***		0.68***		0.62***		0.79***		0.67***	
	(0.19)		(0.14)		(0.10)		(0.09)		(0.12)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	1.22***	-0.40	0.99***	-0.31	0.70***	-0.08	0.42***	0.37***	0.39***	0.28**
	(0.21)	(0.29)	(0.14)	(0.19)	(0.09)	(0.13)	(0.08)	(0.10)	(0.08)	(0.12)
Financial literacy:										
Interest rate	0.07*	0.90	0.06**	0.76	0.01	-0.05	0.01	-0.24	-0.00	-0.31
	(0.04)	(0.88)	(0.03)	(0.56)	(0.01)	(0.35)	(0.01)	(0.28)	(0.01)	(0.38)
Inflation	0.10*	0.36	0.10**	0.42	0.06**	0.43*	0.04*	0.31	0.01	0.14
	(0.06)	(0.56)	(0.04)	(0.39)	(0.03)	(0.24)	(0.02)	(0.19)	(0.02)	(0.26)
Risk diversification	0.24***	0.29*	0.16***	0.12	0.15***	0.13	0.13***	0.10	0.14***	0.06
	(0.07)	(0.17)	(0.06)	(0.12)	(0.04)	(0.09)	(0.03)	(0.08)	(0.04)	(0.10)
	IHS net financial wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	9.00***		9.40***		10.83***		11.82***		12.59***	
	(0.19)		(0.11)		(0.07)		(0.06)		(0.07)	
Women	7.86***		8.60***		10.12***		11.05***		11.93***	
	(0.24)		(0.14)		(0.09)		(0.07)		(0.09)	
Total difference	1.13***		0.80***		0.71***		0.78***		0.66***	
	(0.31)		(0.18)		(0.11)		(0.09)		(0.12)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	1.66***	-0.52	1.22***	-0.42*	0.73***	-0.02	0.44***	0.33***	0.41***	0.25**
	(0.29)	(0.44)	(0.17)	(0.25)	(0.10)	(0.13)	(0.08)	(0.11)	(0.09)	(0.12)
Financial literacy:										
Interest rate	0.04	0.16	0.06*	1.03	0.02	0.03	0.01	-0.31	-0.01	-0.38
	(0.05)	(1.33)	(0.03)	(0.74)	(0.01)	(0.38)	(0.01)	(0.29)	(0.01)	(0.39)
Inflation	0.17*	0.48	0.12**	0.40	0.07***	0.44*	0.04*	0.34*	0.02	0.22
	(0.09)	(0.91)	(0.05)	(0.50)	(0.03)	(0.26)	(0.02)	(0.20)	(0.02)	(0.25)
Risk diversification	0.28**	0.55*	0.17**	0.25	0.15***	0.11	0.15***	0.12	0.14***	0.06
	(0.12)	(0.28)	(0.07)	(0.16)	(0.04)	(0.10)	(0.04)	(0.08)	(0.04)	(0.10)
Observations	1718		1718		1718		1718		1718	

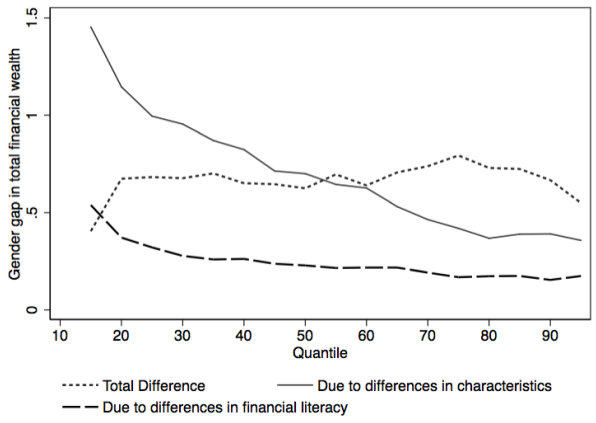
Panel B. Decomposition of IHS Transformation of Total and Net Financial Wealth at Individual Level

	IHS total financial wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	9.82***		9.31***		10.81***		11.81***		12.59***	
	(0.17)		(0.14)		(0.10)		(0.09)		(0.09)	
Women	7.99***		7.51***		9.46***		10.77***		11.68***	
	(0.22)		(0.29)		(0.15)		(0.12)		(0.12)	
Total difference	1.82***		1.79***		1.35***		1.04***		0.91***	
	(0.28)		(0.32)		(0.17)		(0.15)		(0.15)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	1.56***	0.27	1.27***	0.52	0.74***	0.61**	0.52***	0.51**	0.20	0.71***
	(0.40)	(0.50)	(0.31)	(0.44)	(0.19)	(0.24)	(0.18)	(0.21)	(0.22)	(0.25)
Financial literacy:										
Interest rate	0.03	-0.39	-0.01	-1.37	0.02	0.52	0.01	0.06	-0.01	-0.11
	(0.05)	(1.11)	(0.04)	(1.11)	(0.03)	(0.59)	(0.02)	(0.39)	(0.02)	(0.46)
Inflation	0.18*	1.30	0.25***	2.31***	0.09**	0.46	0.06**	0.43	0.01	0.06
	(0.10)	(0.82)	(0.09)	(0.79)	(0.04)	(0.41)	(0.03)	(0.28)	(0.03)	(0.30)
Risk diversification	0.33***	0.47*	0.25***	0.36	0.19***	-0.08	0.17***	0.07	0.14***	0.05
	(0.10)	(0.28)	(0.08)	(0.29)	(0.05)	(0.16)	(0.04)	(0.13)	(0.04)	(0.13)
	IHS net financial wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	8.85***		9.14***		10.75***		11.80***		12.59***	
	(0.25)		(0.17)		(0.11)		(0.09)		(0.09)	
Women	7.31***		7.06***		9.38***		10.77***		11.67***	
	(0.28)		(0.37)		(0.16)		(0.13)		(0.12)	
Total difference	1.54***		2.08***		1.37***		1.03***		0.92***	
	(0.38)		(0.41)		(0.19)		(0.15)		(0.15)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	2.17***	-0.63	1.74***	0.34	0.81***	0.56**	0.54***	0.49**	0.20	0.71***
	(0.58)	(0.71)	(0.39)	(0.56)	(0.21)	(0.26)	(0.18)	(0.22)	(0.22)	(0.25)
Financial literacy:										
Interest rate	0.03	-0.70	0.02	-0.42	0.02	0.58	0.01	0.05	-0.01	-0.11
	(0.08)	(1.68)	(0.05)	(1.48)	(0.03)	(0.63)	(0.02)	(0.41)	(0.02)	(0.47)
Inflation	0.20	1.15	0.26***	1.67	0.09**	0.38	0.06**	0.42	0.01	0.04
	(0.14)	(1.13)	(0.10)	(1.03)	(0.04)	(0.44)	(0.03)	(0.29)	(0.03)	(0.31)
Risk diversification	0.43***	0.66*	0.25***	0.37	0.18***	-0.10	0.18***	0.08	0.14***	0.09
	(0.15)	(0.38)	(0.09)	(0.38)	(0.05)	(0.18)	(0.04)	(0.14)	(0.04)	(0.14)
Observations	965		965		965		965		965	

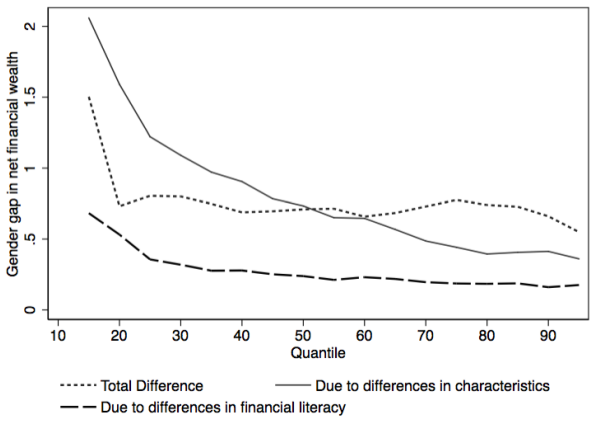
Panel C. Decomposition of IHS Transformation of Total and Net Financial Wealth at Individual Level (Common Property Excluded)

	IHS total financial wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	9.67***		9.19***		10.71***		11.74***		12.51***	
	(0.28)		(0.23)		(0.19)		(0.16)		(0.16)	
Women	8.87***		8.42***		9.82***		10.86***		11.81***	
	(0.31)		(0.23)		(0.19)		(0.16)		(0.18)	
Total difference	0.80*		0.77**		0.90***		0.88***		0.70***	
	(0.42)		(0.33)		(0.27)		(0.22)		(0.24)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	0.94**	-0.14	0.74**	0.03	0.63**	0.27	0.52**	0.36	0.30	0.40
	(0.41)	(0.55)	(0.33)	(0.42)	(0.26)	(0.33)	(0.23)	(0.28)	(0.24)	(0.30)
Financial literacy:										
Interest rate	0.18	3.29*	0.16	2.97**	0.03	1.30	0.00	-0.07	-0.03	-0.58
	(0.13)	(1.80)	(0.10)	(1.16)	(0.05)	(0.84)	(0.04)	(0.66)	(0.05)	(0.84)
Inflation	0.16	0.44	0.17	0.56	0.14	0.44	0.10*	0.71	0.07	0.68
	(0.12)	(1.25)	(0.12)	(0.98)	(0.08)	(0.64)	(0.05)	(0.45)	(0.05)	(0.57)
Risk diversification	0.37**	0.21	0.18	-0.28	0.21*	-0.29	0.25**	0.22	0.11	-0.04
	(0.17)	(0.42)	(0.14)	(0.34)	(0.12)	(0.28)	(0.10)	(0.23)	(0.10)	(0.25)
	IHS net financial wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	8.76***		9.05***		10.66***		11.73***		12.51***	
	(0.42)		(0.27)		(0.20)		(0.17)		(0.17)	
Women	8.06***		8.11***		9.81***		10.84***		11.81***	
	(0.42)		(0.31)		(0.20)		(0.16)		(0.18)	
Total difference	0.70		0.94**		0.85***		0.89***		0.70***	
	(0.60)		(0.41)		(0.28)		(0.23)		(0.25)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	1.55***	-0.85	0.96**	-0.03	0.70**	0.15	0.66***	0.23	0.34	0.36
	(0.59)	(0.87)	(0.38)	(0.53)	(0.27)	(0.35)	(0.23)	(0.29)	(0.25)	(0.31)
Financial literacy:										
Interest rate	0.12	2.25	0.17	3.39**	0.05	1.61*	-0.00	-0.15	-0.02	-0.54
	(0.13)	(2.21)	(0.12)	(1.52)	(0.06)	(0.87)	(0.04)	(0.68)	(0.05)	(0.85)
Inflation	0.19	0.21	0.07	-0.62	0.11	0.17	0.10*	0.74	0.07	0.75
	(0.18)	(1.69)	(0.13)	(1.22)	(0.09)	(0.70)	(0.06)	(0.48)	(0.05)	(0.57)
Risk diversification	0.72**	0.88	0.26	0.03	0.18	-0.31	0.26**	0.23	0.11	-0.03
	(0.31)	(0.69)	(0.17)	(0.43)	(0.12)	(0.30)	(0.10)	(0.24)	(0.10)	(0.26)
Observations	384		384		384		384		384	

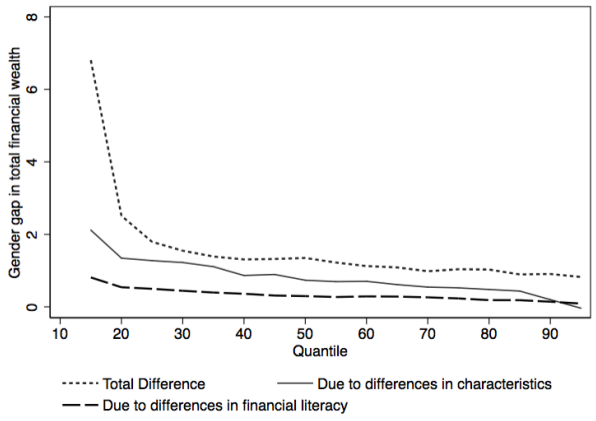
Note: The table reports the results of the detailed Blinder-Oaxaca decomposition of IHS transformation of total and net financial wealth at means and across wealth distribution by gender Total household financial wealth is calculated as a sum of financial assets of all family members (Panel A) and as a sum of financial assets of each respondent (Panels B and C). Net financial wealth is obtained similarly by subtracting short-term debts. The individual characteristics as well as gender and financial literacy indices are defined for household's FKP (Panel A) and for each individual respondent (Panels B and C). Panel A is estimated at a household level on the selected DNB Household Survey waves 2005 and 2010. Panel B and C are estimated at individual level using the selected sample of the wave 2010 for all family types and omitting those who are married under the common property regime respectively. *E* means explained differences, i.e. differences in covariates between the genders. *U* means unexplained differences, i.e. differences in returns (coefficients) between the two groups. Other characteristics included in the decomposition contributing to the explained differences and not shown in the table are the following. Age: age and age squared; household size: number of household members; education: indicators for high educational attainment, low educational attainment and other types of education (omitted group is low educational attainment); employment status: indicators for self-employment, unemployment and retirement and other occupation (omitted group is employees); income: IHS transformation of gross income of all household's members (Panel A) and of individual gross income (Panels B and C); marital status: indicators for single, widowed and divorced. Panel A includes year fixed effect. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.



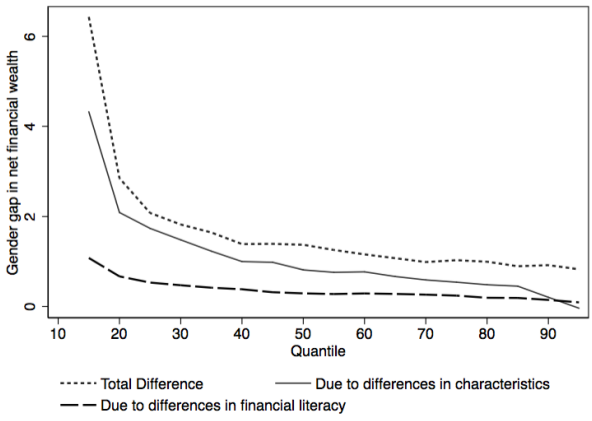
Panel A. Household Total Financial Wealth



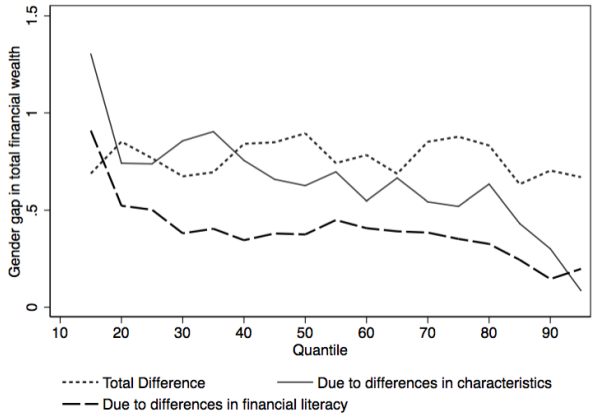
Panel B. Household Net Financial Wealth



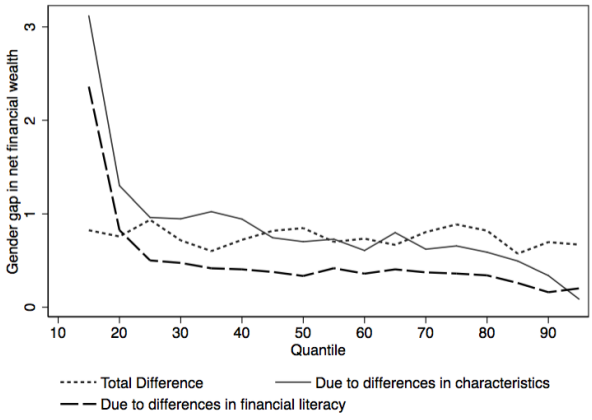
Panel C. Individual Total Financial Wealth



Panel D. Individual Net Financial Wealth



Panel E. Individual Total Financial Wealth (Common Property Regime Excluded)



Panel F. Individual Net Financial Wealth (Common Property Regime Excluded)

FIGURE 3.7: **RIF-decomposition Results of IHS Transformations of Total and Net Financial Wealth by Gender**

Note: The graphs show the results of the Blinder-Oaxaca decomposition of differences in household and individual gross and net financial wealth between women and men across the distribution: the total gender differential in wealth, the explained part of the difference, i.e. the one that can be attributed to the differences in observed characteristics, and the contribution of differences in financial knowledge overall. Gender and financial literacy are defined as that of a household's FKP (Panels A and B) and for individual respondents (Panels C through F). The RIF-regressions and the decomposition results are obtained for quantiles starting from the 10th percentile and each 5th percentile onwards.
Source: Data from panels 2005 and 2010 of DNB Household Survey.

The results also hold if per capita measure of financial wealth is considered (Table 3.5), which in this paper is defined as equivalized financial wealth of a household using square root equivalence scale.[76]

TABLE 3.5: **Decomposition of IHS Transformation of Households Equivalized Total Financial Wealth**

	IHS Financial Wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	9.76***		9.21***		10.51***		11.52***		12.27***	
	(0.11)		(0.08)		(0.07)		(0.06)		(0.07)	
Women	8.98***		8.54***		9.84***		10.76***		11.74***	
	(0.15)		(0.11)		(0.08)		(0.07)		(0.11)	
Total difference	0.78***		0.68***		0.68***		0.76***		0.53***	
	(0.18)		(0.14)		(0.11)		(0.09)		(0.13)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	1.15***	-0.37	0.89***	-0.21	0.64***	0.04	0.37***	0.39***	0.34***	0.19
	(0.20)	(0.28)	(0.13)	(0.18)	(0.10)	(0.13)	(0.08)	(0.11)	(0.09)	(0.13)
Financial literacy:	**0.41*** **	**1.59***	**0.28*** **	**1.18****	**0.23*** **	**0.73****	**0.18*** **	**0.18**	**0.18*** **	**-0.13**
	(0.09)	**(0.91)**	**(0.06)**	**(0.53)**	**(0.04)**	**(0.36)**	**(0.04)**	**(0.28)**	**(0.04)**	**(0.34)**
Among which:										
Interest Rate	0.07*	0.90	0.05*	0.65	0.01	0.10	0.01	-0.27	-0.00	-0.21
	(0.04)	(0.84)	(0.02)	(0.56)	(0.01)	(0.37)	(0.01)	(0.30)	(0.01)	(0.40)
Inflation	0.10*	0.41	0.10**	0.46	0.07***	0.51**	0.03	0.32	0.02	-0.02
	(0.05)	(0.54)	(0.04)	(0.38)	(0.03)	(0.25)	(0.02)	(0.20)	(0.02)	(0.25)
Risk Diversification	0.24***	0.28*	0.13**	0.07	0.15***	0.12	0.14***	0.13	0.16***	0.10
	(0.07)	(0.17)	(0.05)	(0.12)	(0.04)	(0.09)	(0.04)	(0.08)	(0.04)	(0.11)
Other attributes:	**0.73*** **	**-2.67**	**0.61*** **	**-2.38**	**0.40*** **	**-0.72**	**0.18****	**1.04**	**0.16***	**-1.12**
	(0.18)	**(2.79)**	**(0.12)**	**(2.02)**	**(0.09)**	**(1.47)**	**(0.08)**	**(1.23)**	**(0.08)**	**(1.68)**
Among which:										
Age	0.26***	-0.63	0.14***	-2.47	0.21***	0.01	0.16***	1.04	0.15***	0.24
	(0.07)	(2.36)	(0.05)	(1.66)	(0.04)	(1.19)	(0.03)	(1.01)	(0.04)	(1.50)
Household Size	-0.04	-0.32	-0.03	0.05	-0.03*	-0.14	-0.02	0.06	-0.01	-0.16
	(0.02)	(0.48)	(0.02)	(0.36)	(0.02)	(0.27)	(0.01)	(0.22)	(0.01)	(0.27)
Education	0.03	-2.21*	0.04*	0.05	0.05**	-0.44	0.05***	-0.66	0.04**	-0.91
	(0.03)	(1.26)	(0.02)	(0.74)	(0.02)	(0.50)	(0.02)	(0.43)	(0.02)	(0.65)
Employment Status	0.26*	-0.03	0.31***	-0.12	0.09	-0.01	-0.04	0.08	0.02	-0.01
	(0.16)	(0.26)	(0.11)	(0.18)	(0.08)	(0.13)	(0.07)	(0.11)	(0.07)	(0.13)
IHS Income	0.07	0.45	0.04	-0.03	0.02	-0.29	0.04*	0.33	0.00	-0.39
	(0.05)	(1.12)	(0.04)	(0.79)	(0.02)	(0.53)	(0.02)	(0.44)	(0.03)	(0.57)
Marital Status	0.16**	0.07	0.11**	0.15	0.07*	0.16	-0.00	0.18*	-0.04	0.11
	(0.07)	(0.20)	(0.05)	(0.14)	(0.03)	(0.11)	(0.03)	(0.10)	(0.04)	(0.14)
Year fixed effect	Yes		Yes		Yes		Yes		Yes	
Observations	1718		1718		1718		1718		1718	

Note: The table reports the results of the detailed Blinder-Oaxaca decomposition of IHS transformation of equivalized total financial wealth of a household at means and across wealth distribution by gender using the selected DNB Household Survey sample waves 2005 and 2010. Total household financial wealth is calculated as a sum of total gross household financial wealth of each family member. It is equivalized using the square root equivalence scale. All the individual characteristics as well as financial literacy indices are defined for household's FKP. *E* means explained differences, i.e. differences in covariates between the genders. *U* means unexplained differences, i.e. differences in returns (coefficients) between the two groups. The variables are aggregated as follows. Age group comprises age and age squared. Household size - number of household members. Education - indicators for high educational attainment, low educational attainment and other types of education (omitted group is low educational attainment). Employment status group includes indicators for self-employment, unemployment and retirement and other occupation (omitted group is employees). Income is an IHS transformation of gross income of all household's members. Marital status includes indicators for single, widowed and divorced. The contribution of the year is omitted from the table, thus explained part does not sum up to the total explained difference. The differences in constants are omitted from the table, which is why contributions of reported unexplained components do not sum up to the overall difference due to differences in coefficients. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

[76]For more details on equivalence scales see OECD note on Equivalence Scales available at http://www.oecd.org/eco/growth/OECD-Note-EquivalenceScales.pdf.

To address the issue that household composition might affect wealth accumulation through differential incentives to invest in financial literacy, I repeat the analysis for the samples of singles and couples. As can be seen from Table 3.6, women have both lower financial wealth and financial literacy across all the marital statuses (except for those married under marriage settlement) and the results of the decomposition confirm that difference in financial literacy between the genders help to explain lower financial wealth of women (Table 3.7) both among couples and singles.

TABLE 3.6: **Descriptive Statistics by Gender and Marital Status from DNB Household Survey, Panels 2005 and 2010**

Panel A. Household Financial Wealth, Income and Financial Literacy of Couples and Singles

	In partnership		**Single**	
	Men	**Women**	**Men**	**Women**
Financial Wealth (€)	67,181.34	37,644.52	50,869.18	26,448.92
Net Financial Wealth (€)	63,722.09	34,124.52	47,209.02	25,614.37
Income (€)	46,358.56	35,142.68	38,006.32	28,080.83
Financial literacy, % answered correctly				
Interest Rate	0.95	0.91	0.95	0.89
Inflation	0.90	0.81	0.92	0.80
Risk Diversification	0.70	0.45	0.65	0.40
Number of observations	**768**	**431**	**244**	**275**

Panel B. Household Financial Wealth, Income and Financial Literacy of Couples by Marital Status

	Married with common property regime		**Married with marriage settlement**		**Living with a partner (not married)**	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
Financial Wealth (€)	69,355.96	33,319.70	80,293.08	91,238.38	36,448.74	18,263.89
Net Financial Wealth (€)	66,845.60	29,663.10	68,736.82	89,115.35	34,779.53	14,375.68
Income (€)	45,620.89	32,836.39	54,980.04	51,847.23	42,407.49	34,599.58
Financial literacy, % answered correctly						
Interest Rate	0.95	0.91	0.94	0.94	0.94	0.91
Inflation	0.89	0.80	0.95	0.87	0.91	0.81
Risk Diversification	0.70	0.42	0.73	0.57	0.69	0.47
Number of observations	**600**	**327**	**88**	**47**	**80**	**57**

Panel C. Household Financial Wealth, Income and Financial Literacy of Singles by Marital Status

	Divorced		**Widowed**		**Never married**	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
Financial Wealth (€)	42,320.61	26,686.14	92,491.71	31,749.44	43,746.20	24,083.31
Net Financial Wealth (€)	35,929.35	25,456.43	92,283.06	31,745.60	40,073.15	23,152.25
Income (€)	38,237.04	26,340.11	35,276.97	24,918.98	38,567.65	30,506.39
Financial literacy, % answered correctly						
Interest Rate	0.87	0.89	0.95	0.86	0.97	0.90
Inflation	0.96	0.79	0.86	0.79	0.93	0.81
Risk Diversification	0.54	0.38	0.68	0.41	0.68	0.41
Number of observations	**46**	**85**	**37**	**56**	**161**	**134**

Note: The table reports descriptive statistics by marital status for the selected DNB Household Survey sample for waves 2005 and 2010. Gross and net financial wealth and income are defined at the household level. Financial literacy is that of the household's FKP.

TABLE 3.7: **Decomposition of Households' Total Financial Wealth by Marital Status**

Panel A. Decomposition of IHS Transformation of Total Financial Wealth at Household Level for Couples

	IHS Financial Wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	10.28***		9.78***		10.98***		11.90***		12.63***	
	(0.13)		(0.09)		(0.07)		(0.07)		(0.07)	
Women	9.50***		9.19***		10.36***		11.16***		12.05***	
	(0.19)		(0.14)		(0.09)		(0.08)		(0.13)	
Total difference	0.78***		0.58***		0.62***		0.75***		0.57***	
	(0.23)		(0.16)		(0.12)		(0.11)		(0.15)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	1.37***	-0.59	0.98***	-0.39*	0.75***	-0.12	0.45***	0.30**	0.50***	0.07
	(0.29)	(0.39)	(0.17)	(0.23)	(0.13)	(0.16)	(0.11)	(0.13)	(0.10)	(0.15)
Financial literacy:	**0.36*** **	**0.39**	**0.24*** **	**0.58**	**0.18*** **	**0.69***	**0.13*** **	**0.13**	**0.15*** **	**-0.05**
	(0.09)	**(1.25)**	**(0.07)**	**(0.65)**	**(0.05)**	**(0.39)**	**(0.04)**	**(0.34)**	**(0.04)**	**(0.42)**
Among which:										
Interest Rate	0.04	0.01	0.03	0.15	0.01	0.25	0.00	-0.25	-0.01	-0.29
	(0.04)	(1.12)	(0.02)	(0.65)	(0.01)	(0.40)	(0.01)	(0.35)	(0.01)	(0.46)
Inflation	0.09	-0.12	0.09**	0.41	0.06**	0.32	0.02	0.31	0.00	0.18
	(0.06)	(0.67)	(0.04)	(0.44)	(0.03)	(0.26)	(0.02)	(0.23)	(0.02)	(0.32)
Risk Diversification	0.22***	0.49**	0.12**	0.01	0.12***	0.12	0.11***	0.08	0.15***	0.07
	(0.08)	(0.22)	(0.06)	(0.15)	(0.04)	(0.11)	(0.04)	(0.10)	(0.04)	(0.13)
Other attributes:	**1.00*** **	**-2.24**	**0.73*** **	**-4.80***	**0.55*** **	**-0.27**	**0.30*** **	**2.13**	**0.33*** **	**0.28**
	(0.27)	**(3.94)**	**(0.16)**	**(2.52)**	**(0.12)**	**(1.70)**	**(0.10)**	**(1.56)**	**(0.09)**	**(2.28)**
Among which:										
Age	0.28***	-0.91	0.21**	-5.34**	0.27***	0.30	0.20***	2.28*	0.16***	1.47
	(0.11)	(3.52)	(0.08)	(2.12)	(0.07)	(1.40)	(0.05)	(1.27)	(0.05)	(2.04)
Household Size	0.03	-0.34	0.00	0.38	0.02	-0.28	0.01	-0.42	0.00	-0.11
	(0.03)	(0.76)	(0.01)	(0.52)	(0.01)	(0.36)	(0.01)	(0.33)	(0.01)	(0.48)
Education	0.01	-1.91	0.04	0.28	0.06**	-0.27	0.08***	-0.40	0.06**	-0.74
	(0.04)	(1.53)	(0.03)	(0.90)	(0.03)	(0.54)	(0.03)	(0.45)	(0.03)	(0.73)
Employment Status	0.50**	-0.25	0.38***	-0.28	0.14	-0.13	-0.06	0.17	0.07	-0.15
	(0.24)	(0.38)	(0.15)	(0.24)	(0.10)	(0.16)	(0.09)	(0.15)	(0.08)	(0.18)
IHS Income	0.17*	1.14	0.09	0.22	0.05	0.09	0.06*	0.46	0.04	-0.12
	(0.10)	(1.29)	(0.06)	(0.83)	(0.04)	(0.52)	(0.04)	(0.46)	(0.04)	(0.56)
Marital Status	0.00	0.04	0.00	-0.06	0.01	0.01	0.00	0.05	0.00	-0.07
	(0.01)	(0.16)	(0.01)	(0.10)	(0.01)	(0.07)	(0.01)	(0.06)	(0.01)	(0.10)
Year fixed effect	Yes		Yes		Yes		Yes		Yes	
Observations	1199		1199		1199		1199		1199	

Panel B. Decomposition of IHS Transformation of Total Financial Wealth at Household Level for Singles

	IHS Financial Wealth									
	Mean		**25th percentile**		**Median**		**75th percentile**		**90th percentile**	
Men	9.53***		8.83***		10.50***		11.59***		12.45***	
	(0.26)		(0.24)		(0.17)		(0.15)		(0.16)	
Women	8.92***		8.57***		9.81***		10.85***		11.84***	
	(0.25)		(0.16)		(0.16)		(0.13)		(0.16)	
Total difference	0.61*		0.26		0.70***		0.73***		0.61***	
	(0.36)		(0.29)		(0.23)		(0.20)		(0.23)	
	Decomposition									
	E	U	E	U	E	U	E	U	E	U
Overall due to:	0.75*	-0.15	0.70**	-0.45	0.32	0.38	0.32*	0.41*	0.25	0.36
	(0.40)	(0.54)	(0.34)	(0.43)	(0.21)	(0.29)	(0.16)	(0.21)	(0.18)	(0.24)
Financial literacy:	**0.56****	**3.70****	**0.43****	**2.40****	**0.37*****	**1.48****	**0.34*****	**0.66**	**0.21****	**0.03**
	(0.24)	**(1.62)**	**(0.18)**	**(1.18)**	**(0.12)**	**(0.71)**	**(0.09)**	**(0.43)**	**(0.08)**	**(0.47)**
Among which:										
Interest Rate	0.12	2.33	0.11	1.93	0.08*	0.93	0.03	-0.18	0.01	-0.23
	(0.10)	(1.58)	(0.08)	(1.23)	(0.05)	(0.72)	(0.02)	(0.42)	(0.02)	(0.48)
Inflation	0.18	1.35	0.09	0.30	0.02	0.37	0.10**	0.57*	0.05	0.14
	(0.17)	(1.22)	(0.13)	(0.92)	(0.08)	(0.62)	(0.05)	(0.34)	(0.06)	(0.44)
Risk Diversification	0.26*	0.03	0.24*	0.18	0.26***	0.18	0.21***	0.26*	0.16*	0.13
	(0.15)	(0.29)	(0.15)	(0.26)	(0.10)	(0.19)	(0.08)	(0.15)	(0.08)	(0.17)
Other attributes:	**0.24**	**-7.78**	**0.30**	**1.51**	**-0.04**	**-2.45**	**-0.01**	**-4.55***	**0.04**	**-2.83**
	(0.33)	**(6.27)**	**(0.28)**	**(4.82)**	**(0.17)**	**(3.80)**	**(0.13)**	**(2.72)**	**(0.14)**	**(2.74)**
Among which:										
Age	0.01	1.47	0.05	4.70	0.04	0.42	0.01	-0.28	-0.01	-1.80
	(0.11)	(4.39)	(0.05)	(3.71)	(0.04)	(2.46)	(0.06)	(2.01)	(0.08)	(2.45)
Household Size	-0.04	0.57	0.02	-0.23	-0.05	0.51	-0.04	0.42	-0.05	0.52
	(0.07)	(0.89)	(0.08)	(0.78)	(0.05)	(0.51)	(0.05)	(0.49)	(0.07)	(0.68)
Education	-0.02	-4.31**	-0.01	-0.47	0.02	-1.54*	-0.02	-1.32	0.07	1.19
	(0.05)	(2.01)	(0.06)	(1.47)	(0.05)	(0.93)	(0.04)	(1.23)	(0.05)	(1.11)
Employment Status	0.06	0.03	0.22	-0.11	-0.02	0.11	0.04	-0.14	-0.02	-0.10
	(0.24)	(0.45)	(0.22)	(0.37)	(0.12)	(0.24)	(0.09)	(0.19)	(0.09)	(0.21)
IHS Income	0.00	-4.62	-0.00	-2.27	-0.00	-2.00	-0.00	-3.14*	0.00	-2.61
	(0.00)	(4.39)	(0.00)	(2.99)	(0.00)	(3.11)	(0.00)	(1.85)	(0.02)	(1.78)
Marital Status	0.23	-0.91	0.02	-0.10	-0.03	0.05	-0.00	-0.08	0.04	-0.03
	(0.17)	(0.61)	(0.12)	(0.43)	(0.09)	(0.34)	(0.08)	(0.29)	(0.07)	(0.33)
Year fixed effect	Yes		Yes		Yes		Yes		Yes	
Observations	519		519		519		519		519	

Note: The table reports the results of the detailed Blinder-Oaxaca decomposition of IHS transformation of total financial wealth of a household at means and across wealth distribution for couples and singles by gender using the selected DNB Household Survey sample waves 2005 and 2010. Total household financial wealth is calculated as a sum of total gross household financial wealth of each family member. All the individual characteristics as well as financial literacy indices are defined for household's FKP. *E* means explained differences, i.e. differences in covariates between the genders. *U* means unexplained differences, i.e. differences in returns (coefficients) between the two groups. The variables are aggregated as follows. Age group comprises age and age squared. Household size - number of household members. Education - indicators for high educational attainment, low educational attainment and other types of education (omitted group is low educational attainment). Employment status group includes indicators for self-employment, unemployment and retirement and other occupation (omitted group is employees). Income is an IHS transformation of gross income of all household's members. Marital status includes: Panel A: indicators for married under marriage settlement or not married living with a partner (omitted group married under common property regime); and Panel B: indicators for widowed and divorced (omitted group never married). The contribution of the year is omitted from the table, thus explained part does not sum up to the total explained difference. The differences in constants are omitted from the table, which is why contributions of reported unexplained components do not sum up to the overall difference due to differences in coefficients. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Finally, I extend the analysis to a range of poverty indicators. While it is not trivial to define the optimal level of accumulated financial wealth because it might depend on, for example preferences for saving, it is rather safe to assume that it cannot be optimal to live in poverty. To perform this exercise I define four poverty indicators which assume unity if: total financial wealth of a household is less than

three-months gross income; total financial wealth of the household is less than 60% of the median financial wealth; total gross income of the household is less than 60% of the median gross income; and total households' net income is less the self-assessed sufficient level of income. In accordance with previous findings, women are more likely than men to live below the poverty line as defined by all four indicators (Table 3.8). Moreover, while differences in financial literacy play a role in explaining the difference in the proportion of "poor" women and "poor" men when indicators related to financial wealth are considered, they have no effect once measures of poverty are defined based on income. This finding further confirms the hypothesis that financial literacy plays an important role in the process of financial wealth accumulation.

TABLE 3.8: **Decomposition of Poverty Indicators by Gender**

	Poverty measures							
	Related to financial wealth:				**Related to income:**			
	Financial wealth < 3 months gross income		**Financial wealth < 60% median financial wealth**		**Gross income < 60% median gross income**		**Subjective: net income is less than sufficient**	
Men	0.29***		0.34***		0.15***		0.35***	
	(0.01)		(0.01)		(0.01)		(0.02)	
Women	0.34***		0.46***		0.31***		0.41***	
	(0.02)		(0.02)		(0.02)		(0.02)	
Total difference	-0.05**		-0.12***		-0.16***		-0.07***	
	(0.02)		(0.02)		(0.02)		(0.02)	
	Decomposition							
	E	U	E	U	E	U	E	U
Overall due to:	-0.12***	0.07**	-0.16***	0.04	-0.10***	-0.06**	-0.01	-0.05
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)
Financial literacy:	**-0.05*** **	**-0.13**	**-0.05*** **	**-0.23*** **	**-0.02** **	**-0.10**	**-0.00**	**-0.06**
	(0.01)	**(0.08)**	**(0.01)**	**(0.08)**	**(0.01)**	**(0.08)**	**(0.01)**	**(0.09)**
Among which:								
Interest Rate	-0.00	-0.02	-0.01**	-0.12	-0.01*	-0.09	-0.00	-0.06
	(0.00)	(0.08)	(0.00)	(0.09)	(0.00)	(0.08)	(0.00)	(0.09)
Inflation	-0.02***	-0.10*	-0.01**	-0.10*	-0.00	-0.01	0.00	-0.03
	(0.01)	(0.06)	(0.01)	(0.06)	(0.00)	(0.05)	(0.01)	(0.06)
Risk Diversification	-0.02***	-0.01	-0.02***	-0.00	-0.01	0.01	-0.00	0.02
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Other attributes:	**-0.08*** **	**-0.11**	**-0.11*** **	**0.35**	**-0.09*** **	**-0.03**	**-0.02**	**0.22**
	(0.02)	**(0.33)**	**(0.02)**	**(0.34)**	**(0.02)**	**(0.27)**	**(0.02)**	**(0.34)**
Among which:								
Age	-0.04***	-0.14	-0.04***	0.22	0.01	0.20	0.02**	0.08
	(0.01)	(0.28)	(0.01)	(0.28)	(0.01)	(0.24)	(0.01)	(0.30)
Household Size	0.00	0.03	0.00	0.05	0.00	-0.01	0.00	0.11*
	(0.00)	(0.06)	(0.00)	(0.06)	(0.00)	(0.05)	(0.00)	(0.06)
Education	-0.01	0.04	-0.01***	0.04	-0.01***	-0.23**	0.00	-0.09
	(0.00)	(0.12)	(0.00)	(0.12)	(0.00)	(0.12)	(0.00)	(0.12)
Employment Status	-0.04**	0.02	-0.04**	0.01	-0.08***	0.03	-0.05***	0.05
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)
IHS Income	0.02***	-0.03	-0.00	0.05				
	(0.00)	(0.07)	(0.01)	(0.13)				
Marital Status	-0.02**	-0.03	-0.02***	-0.02	-0.00	-0.01	0.01	0.07***
	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.03)
Year fixed effect	Yes		Yes		Yes		Yes	
Observations	1718		1718		1718		1625	

Note: The table reports the results of the detailed Blinder-Oaxaca decomposition of poverty measures at means by gender using the selected DNB Household Survey sample waves 2005 and 2010. Total household financial wealth is calculated as a sum of total gross household financial wealth of each family member. Total households' gross income is a sum of all income components of all household's members. The poverty indicators are binary variables taking value 1 if: total financial wealth of a household is less than three-months gross income; total financial wealth of the household is less than 60% of the median financial wealth; total gross income of the household is less than 60% of the median gross income; total households' net income is less the self-assessed sufficient level of income. The medians are defined over all population for each specific year. All the individual characteristics as well as financial literacy indices are defined for household's FKP. *E* means explained difference, i.e. differences in covariates between the genders. *U* means unexplained differences, i.e. differences in returns (coefficients) between the two groups. The variables are aggregated as follows. Age group comprises age and age squared. Household size - number of household members. Education - indicators for high educational attainment, low educational attainment and other types of education (omitted group is low educational attainment). Employment status group includes indicators for self-employment, unemployment and retirement and other occupation (omitted group is employees). Income is an IHS transformation of gross income of all household's members. Income is omitted from the set of covariates of poverty measures related to income. Marital status includes indicators for single, widowed and divorced. The contribution of the year is omitted from the table, thus explained part does not sum up to the total explained difference. The differences in constants are omitted from the table, which is why contributions of reported unexplained components do not sum up to the overall difference due to differences in coefficients. The difference in the number of observations is due to missing values for the subjective level of sufficient income. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Thus, the result that the lack of financial literacy among women contributes to the explanation of their relatively disadvantageous wealth position is robust to a variety of alternative specifications.

3.5 Conclusion

This paper investigates the relation between the gender gap in financial wealth and the fact the women are, on average, less financially literate the men. The results confirm that women have less financial wealth throughout the distribution and that they score lower on all analysed financial literacy questions, with this difference being particularly striking in the domain of risk diversification.
The results of the decomposition indicate that differences in financial literacy contribute greatly to the differences in women's and men's financial holdings and that what drives this result is, again, knowledge about how to diversify risk and portfolio. The results of the counterfactual analysis show, however, that the wealth gap does not disappear by simply increasing women's financial literacy to the level of men's and that more education might be needed in order to improve women's ability to use their knowledge and to transfer their skills into wealth accumulation.
Although the decomposition results clearly point to the direction that the lack of financial knowledge of women is strongly related to their relatively low wealth, the conclusions drawn upon the analysis are not causal. In fact, it has been shown that financial literacy suffers from a variety of endogeneity issues, such as reverse causality and omitted variable bias. However, if the causal relationship were to be confirmed, the conclusions of this study offer the first evidence that shows the necessity of creating solid educational agenda which would provide both women and men with knowledge about basic financial concepts at the early stage of their life-cycle. Moreover, as the results show that not only differences in the financial literacy *per se*, but also how this knowledge is used lead to the differential wealth accumulation between women and men, it is important to take measures to build up interest among women in taking basic finance courses at high school, during their college years or on the online platforms, as well as in gaining more information on financial opportunities available in the media or with financial advisor. In particular, building confidence among women that financial knowledge and dealing with financial matters is not exclusively the male prerogative might be an important step towards narrowing financial literacy gender gap. Thus, more empirical evidence is needed to quantify the causal effect of financial literacy on differential wealth accumulation between women and men.

3.6 Appendix

TABLE 3.A: **Fully Interacted OLS and Unconditional Quantile (RIF) Regressions of IHS Households Total Financial Wealth**

	IHS total financial wealth: OLS and RIF regressions				
	Mean	**25th**	**Median**	**75th**	**90th**
Female indicator	-0.74	-1.48	-0.28	2.63**	0.91
	(2.97)	(2.22)	(1.42)	(1.23)	(1.53)
*Female**					
Interest Rate	-0.99	-0.55	-0.32	0.06	-0.03
	(0.97)	(0.67)	(0.39)	(0.33)	(0.42)
Inflation	-0.45	-0.93*	-0.59**	-0.51**	-0.12
	(0.70)	(0.51)	(0.30)	(0.25)	(0.29)
Risk Diversification	-0.68*	-0.10	-0.09	-0.31	-0.41*
	(0.40)	(0.31)	(0.21)	(0.19)	(0.21)
Age	0.02	0.10	-0.01	-0.12***	-0.02
	(0.10)	(0.07)	(0.05)	(0.04)	(0.05)
Age Squared	-0.00	-0.00	0.00	0.00**	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household Size	0.16	0.02	0.14	0.13	0.01
	(0.22)	(0.17)	(0.11)	(0.10)	(0.12)
Middle Education	2.16	-0.77	0.09	0.48	0.40
	(1.35)	(0.84)	(0.49)	(0.47)	(0.61)
High Education	2.73**	-0.09	0.44	0.43	0.17
	(1.37)	(0.87)	(0.51)	(0.50)	(0.65)
Other Education	1.92	-0.24	0.88	-0.29	-0.87
	(1.75)	(1.65)	(1.07)	(0.77)	(1.17)
Self - employed	0.86	0.56	0.28	0.63	0.06
	(1.29)	(0.78)	(0.53)	(0.56)	(0.71)
Unemployed	-1.01	-0.95	-0.13	-0.36	-1.02
	(1.58)	(0.95)	(0.64)	(0.63)	(0.63)
Retired	0.00	-0.43	0.22	-0.03	0.88
	(0.72)	(0.55)	(0.42)	(0.44)	(0.53)
Other Employment Status	0.09	0.39	0.09	-0.16	0.02
	(0.68)	(0.49)	(0.31)	(0.28)	(0.30)
IHS Income	-0.05	0.01	0.04	-0.02	0.03
	(0.11)	(0.08)	(0.05)	(0.04)	(0.06)
Single	-0.54	-0.74	-0.30	0.09	-0.15
	(0.63)	(0.52)	(0.35)	(0.31)	(0.38)
Widowed	-0.06	-0.77	-0.88*	-0.45	-0.50
	(0.97)	(0.67)	(0.47)	(0.49)	(0.64)
Divorced	0.41	-0.63	0.23	0.15	0.04
	(0.88)	(0.61)	(0.39)	(0.39)	(0.43)
Year 2010	0.07	0.12	-0.10	-0.03	-0.42*
	(0.41)	(0.33)	(0.22)	(0.21)	(0.25)
F-statistic of test on joint significance of interaction terms	0.75	1.54	1.33	1.43	1.50
P-value	*0.761*	*0.069*	*0.161*	*0.107*	*0.079*
Observations	1718	1718	1718	1718	1718
R-squared	0.13	0.17	0.18	0.14	0.08

Note: The table reports the results of the fully interacted with female dummy OLS and RIF, or unconditional quantile, regressions of IHS transformation of total households financial wealth using the selected DNB Household Survey sample waves 2005 and 2010 to test whether slope parameters are gender specific. Financial wealth is calculated as a sum of household's financial assets. All the individual characteristics as well as financial literacy indices are defined for household's FKP. Omitted group for education is low educational attainment, for employment - employee, and for marital status- married FKPs. Income is an IHS transformation of gross household's income, which is defined as a sum of incomes of all households members. Main effects, except for the indicator for a female FKP, are not reported. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Conclusions

The field of Household Finance and its main research objectives were defined for the first time by Campbell (2006) in the Presidential Address to the American Finance Association. In his address he stated that explaining the difference between observed and optimal individuals' financial behavior is central to the field and suggested two avenues of doing it. The first is to make the existing models fit the data by modifying underlying individuals' preferences or by accounting for the institutional environment, particularly the tax system. The second is to consider a framework in which households do not make optimal choices maximizing their wealth, that is that households make *financial mistakes*. By considering both incentives created by non-neutralities of the tax code and various degrees of financial sophistication it is possible to build a better understanding of household financial choices.
From a policy perspective, both explanations provide policy-makers with a range of tools to design effective interventions aimed at helping households shaping their portfolios. This thesis analyzed the role of tax incentives and financial knowledge, including awareness about investment opportunities, household asset allocation choices and wealth accumulation. The thesis is organized in three chapters. The first chapter analysed the effect of tax incentives to home-buyers on households' tenure decisions. By considering mortgage interest deduction (MID) policy in the United States, the study found that households are sensitive to tax breaks associated to home ownership and that in states where tax provisions to housing became more generous overall home ownership rates went up relative to the control states. The result suggests that households are responsive to fiscal incentives and that MID has a positive effect on home ownership rates. This finding is especially important in light of the latest research showing the wide spread economic benefits of homeownership (Sodini et al., 2016). In particular, it provides policy makers with evidence in favor of the effectiveness of MID as a tool of incentivizing housing purchase and creates a benchmark for the evaluation of alternative interventions. The tasks of analyzing the effect of MID on the overall structure of household balance sheets and its potential role in the 2008 sub-prime mortgage crisis through greater affordability of mortgage loans, as well as the assessment of the effectiveness of alternative policy designs aimed at supporting home ownership are left for future research.
The second chapter dealt with the question of how financial decision of one's peers to invest in risky assets affect one's own investment choices. There are two main channels through which peers financial behavior may affect individual's portfolio allocation: *social learning* and *social utility*. Both mechanisms can increase households participation in stock markets by reducing fixed information costs of investment and by enhancing certain beliefs about financial markets. In particular, through *social learning* individuals may get aware about opportunity to invest in risky assets in general, and about means of doing so in particular. *Social utility*, on the other hand, can increase households' psychological comfort of equity ownership and enhance their utility by following financial practices shared by their peers. The results show that the more of one's peers invest in risky assets the more one is likely

to invest herself and that both *social learning* and *social utility* matter. The results are crucial for policy makers since they shed light on the role of peers in one's financial decision making. In particular, the fact the *social learning* matters provides empirical evidence supporting the hypothesis that financial market participation can be increased by reducing information costs. This result leaves scope for policy intervention in financial education expansion and indicates that it has positive spillover effects. Raising financial awareness among households, in its turn, has a potential to improve their skills of managing their assets allocation, increase returns on their savings, and, ultimately, achieve greater economic well-being. However, the results are also indicative that not only the transmission of financial knowledge and information matter for households' investment choices, but also that herding incentives play a role. The consequences of the herding behavior are of utmost importance, especially in times of crisis and massive assets sales. Combined with findings that more financially sophisticated individuals are less sensitive to social utility motives (Bursztyn et al., 2014), this stresses the need for more accessible and extensive financial education. To design effective financial education programs, it is important to assess the welfare benefits by taking into account its positive externalities. To do so, future research should focus on quantifying the contributions of *social learning* and *social utility* channels to the overall peer effect. Moreover, to estimate the overall importance of peers in shaping one's financial behavior, it is essential to also study the impact of financial attitudes among colleagues and family members, which might play an even bigger role.

The third chapter concludes by uncovering the paramount importance of financial literacy for financial wealth accumulation and its role in wealth inequality. In particular, it studies the implications of unequal financial sophistication between women and men for the gender wealth gap. This study confirms previous results that financial literacy is positively correlated with financial wealth. It further finds that, even accounting for differences in income, education and occupation, differences in financial literacy between women and men can explain roughly half of the difference in their financial wealth. Although this evidence is arguably descriptive, if proven causally, the fact that differences in financial knowledge lead to wealth inequality has an important implication for policies related to financial education. In combination with studies that have found that poorer and less educated households are more likely to commit financial mistakes and that financially naïve households seem to cross-subsidise the sophisticated ones via complex financial products (Calvet et al., 2007, 2009a,b), the results of this chapter urge wide-scaled policy interventions to equalize the access to financial knowledge. The assessment of the welfare benefits and the reduction in overall wealth inequality due to more accessible financial education is left to the future research.

To conclude, the findings of this thesis boil down to three main complementary results. First, households are sensitive to non-neutralities of tax code and, despite its complexities, on average, allocate their assets accordingly. Second, lower information costs associated to financial markets participation due to knowledge about peers' investment choices increase the probability that one invests in these markets, which are likely to provide higher long term risk adjusted returns than other asset classes. Third, financial literacy seem to be of paramount importance in explaining inequality in financial wealth. Under the perspective that non-participation in financial markets, and in particular in risky assets, is an investment mistake, and that households who have higher participation costs are more likely to make them, the results indicate that more financial education is needed and that it should not be a privilege of certain socio-demographic groups. This policy intervention has a potential to reduce financial mistakes, decrease wealth inequality, and mitigate adverse consequences of economic shocks through limiting herding behaviour, since it is the least financially sophisticated individuals who are more prone to it.

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Estratto per riassunto della tesi di dottorato

L'estratto (max. 1000 battute) deve essere redatto sia in lingua italiana che in lingua inglese e nella lingua straniera eventualmente indicata dal Collegio dei docenti.

L'estratto va firmato e rilegato come ultimo foglio della tesi.

Studente: Anastasia Girshina matricola: 956103

Dottorato: in Economics

Ciclo: 29

Titolo della tesi: **Household portfolios: the role of fiscal policy, peer behaviour, and financial literacy.**

Abstract: This thesis is a collection of three distinct essays that study the impact of fiscal policy, peer behaviour and financial literacy on household portfolio choices.

Chapter 1 analyses the effects of fiscal incentives to homeowners on the decision to acquire main residence rather than renting it. Although many of the world's wealthy countries provide such incentives, their impact on housing tenure choice is unclear. Using difference-in-differences approach, this chapter estimates the effect of mortgage interest deduction on homeownership in the United States. The identification relies on the large changes in income tax rates and standard deduction. The largest of these changes increased income tax rate by as much as 23.9% and decreased standard deduction by 7.2% between 2002 and 2004. The baseline estimates suggest that increase in income tax rate in a state that allows mortgage interest deduction is associated to 3 percentage points increase in homeownership relative to states that didn't change their fiscal policy and to 5 percentage points - relative to states that do not allow mortgage interest deduction but had a comparable increase in tax rates. Increase in the proportion of itemizers through lower standard deductions also leads to higher homeownership rates in the treated states. The results are robust to a range of alternative specifications.

Chapter 2 studies the role of peers' behaviour on investment choices. In particular, this essay analyses the influence of immigrant investment behaviour on stock market participation of natives. To identify the peer effect this study exploits the fact that roughly half of Luxembourg residents are foreign born and that immigrant groups are heterogeneous in terms of their financial attitudes. The reflection problem is addressed by instrumenting immigrant stock ownership rates with the participation rates in their countries of origin. Contextual and correlated effects are separated from the endogenous peer effect by controlling for neighbourhood-specific characteristics and individual risk preferences and financial knowledge. The results show that peers' investment attitudes have sizable effect on households' portfolio composition. Furthermore, this effect operates through both social learning, transmitted through more financially literate individuals, and social utility channels.

Finally, chapter 3 seeks to understand how differences in financial literacy between women and men are related to the differences in their financial wealth. By using Dutch Central Bank Household Survey, this study shows that women are, on average, less knowledgeable about basic financial concepts and that households whose financial decisions are taken by women tend to have less financial wealth. The results of the decomposition of the gender wealth differential suggest that

30% to 40% of the explained difference in women's and men's financial wealth can be attributed to differences in their financial literacy and that this portion increases along the wealth distribution.

The results of this thesis contribute to designing evidence-based policy interventions. On the one hand, they show that households portfolio choices are sensitive to fiscal incentives. On the other, they uncover the importance of financial literacy for long-term financial wealth accumulation and the presence of social multiplier of financial knowledge, which has implications for the implementation of financial education programmes.

Estratto: Nella presente tesi sono studiati diversi aspetti delle scelte d'investimento prese da parte dei nuclei familiari. La presente analisi si divide in tre distinti capitoli in cui è analizzato come le politiche fiscali, il comportamento di nuclei familiari presenti nel territorio circostante e l'alfabetizzazione finanziaria impattino le decisioni economiche di tali soggetti.

Il primo capitolo analizza l'impatto degli incentivi fiscali sui proprietari di immobili ad uso abitativo, in particolare sulla scelta di acquisto di un'abitazione piuttosto che il suo affitto. Sebbene la maggior parte dei paesi sviluppati offra questo tipo di incentivi, non è chiaro l'impatto che tali sgravi fiscali effettivamente hanno sulla decisione di acquistare un immobile abitativo. L'obiettivo di questo capitolo è di studiare con maggiore precisione l'effetto di questi incentivi. L'analisi, incentrata sugli Stati Uniti, consiste nell'applicazione del metodo econometrico *difference-in-difference* volto a stimare l'impatto delle detrazioni fiscali degli interessi pagati sui mutui per l'acquisto di un'abitazione. La metodologia implementata nell'analisi sfrutta la variazione delle tasse sul reddito e delle *standard deduction* verificatasi in alcuni stati. I cambiamenti piu' grandi si sono verificati tra il 2002 e il 2004 con un aumento del 23.9% della tassa patrimoniale e una riduzione del 7.2% delle deduzioni fiscali. Complessivamente, le stime ottenute dimostrano che l'aumento delle tasse sul reddito in uno stato che ha introdotto la detrazione degli interessi sui mutui è associato a una maggiore probabilità di acquistare un'abitazione. In particolare, la probabilità aumenta di 3 punti percentuali se si confrontano gli stati in cui è stata approvata la modifica e gli stati in cui non vi è stato alcun cambiamento delle politiche fiscali. La differenza è invece di 5 punti percentuali se la comparazione è fatta rispetto agli stati in cui non vi sono detrazioni sugli interessi pagati sui mutui, ma che hanno approvato un aumento delle tasse sul reddito con effetti comparabili. Inoltre, l'analisi evidenzia che l'aumento nella proporzione di *itemizers* attraverso una riduzione nelle *standard deduction* porta ad un maggiore tasso di proprietà di immobili abitativi negli stati soggetti alle politiche fiscali analizzate. Questi risultati sono corroborati dall'utilizzo di metodi econometrici alternativi.

La seconda parte della tesi esplora come le scelte finanziarie dei nuclei familiari siano condizionate dalle caratteristiche degli altri nuclei presenti nel territorio di residenza. In particolare, questo capitolo analizza se e come le scelte d'investimento degli immigrati influenzano la decisione dei nativi di partecipare al mercato azionario. Il territorio di riferimento è il Lussemburgo. La strategia identificativa dell'effetto studiato sfrutta la diversità delle nazionalità degli abitanti del Lussemburgo, dove i residenti sono per metà stranieri. Inoltre, questo gruppo di immigrati è eterogeneo in termini di scelte di investimento. Il *reflection problem*, cioè il fatto che il comportamento dei nativi può a sua volta condizionare il modo di agire degli immigrati, è risolto grazie all'applicazione del metodo delle variabili strumentali In particolare, il tasso di partecipazione nel mercato azionario lussemburghese è instrumentato con il tasso di partecipazione nel paese di origine. Il *contextual effect* e il *correlated effect* sono isolati dall'impatto endogeno tramite l'inclusione nel modello econometrico di variabili che misurano rispettivamente le caratteristiche specifiche io ogni circondario, l'avversione al rischio e le competenze finanziarie di ogni individuo. I risultati evidenziano la presenza di un impatto significativo del comportamento degli immigrati sulle scelte di investimento dei nativi. I canali attraverso i quali gli investimenti degli immigrati influenzano quelli dei nativi sembrano essere il *social learning*, dove le competenze di finanza sono trasmesse dagli individui con maggiore familiarità in materia, e il *social utility*.

Infine, il terzo capitolo ha lo scopo di analizzare in che modo la differenza nelle conoscenze finanziarie tra uomini e donne sia legata a differenze in termini di livello medio di ricchezza. I dati utilizzati in quest'ultima analisi provengono dalla *Dutch Central Bank Household Survey*, uno

studio che dimostra che in media le donne hanno una conoscenza più limitata dei concetti finanziari e che i nuclei familiari in cui le decisioni finanziarie sono prese da parte della donna tendono ad avere un livello di ricchezza inferiore. La presente analisi consiste nella decomposizione di questa differenza tra uomini e donne, che può essere definita come *gender wealth differential*. I risultati suggeriscono che il 30-40% di questa differenza può essere attribuita a differenze in alfabetizzazione finanziaria; questa percentuale aumenta con l'aumentare della ricchezza.

Nel complesso, i risultati esposti in questa tesi possono contribuire all'ideazione e alla realizzazione di politiche pubbliche. Da un lato queste analisi dimostrano che le scelte finanziarie dei nuclei familiari dipendono dagli incentivi fiscali che tali nuclei ricevono; dall'altro lato questi studi non solo dimostrano come la conoscenza in materia finanziaria influenzi l'accumulo di ricchezza nel lungo periodo, ma sottolineano anche la presenza di meccanismi attraverso i quali le competenze finanziarie vengono trasmesse attraverso canali sociali. Quest'ultima conclusione ha potenzialmente un ruolo rilevante nella progettazione e implementazione di programmi e politiche per lo sviluppo e la diffusione dell'alfabetizzazione finanziaria.

Firma dello studente

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DEPOSITO ELETTRONICO DELLA TESI DI DOTTORATO

DICHIARAZIONE SOSTITUTIVA DELL'ATTO DI NOTORIETA'

(Art. 47 D.P.R. 445 del 28/12/2000 e relative modifiche)

Io sottoscritto …Anastasia Girshina……

nat a a ……Omsk, Russia…… (prov. ……) il ……5 January 1988……

residente a Bertrange, Luxembourg. in .An Ditert…… n. .6B..

Matricola (se posseduta) ……956103…… Autore della tesi di dottorato dal titolo:

…Household portfolios: the role of fiscal policy, peer behaviour, and financial literacy……

……

……

Dottorato di ricerca in ……Economics……

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Ciclo ……29°……

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