Why Do Portfolios of the Elderly Differ Internationally?[#]

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Abstract

This paper documents international differences in asset holdings among the elderly populations (50+) in the US, UK, and 11 continental European countries, using newly available and internationally comparable household-level data. It then uses econometric techniques to study international variation in the direction of influence, quantitative, and statistical significance of determinants of participation in four categories of assets: stocks (held directly and indirectly), principal residence, private businesses, and real estate other than the primary residence. Effects of the following characteristics are compared across different asset categories and across different countries: education, bequest motives, position in the (non-capital) income and net wealth distribution, self-reported bad health, ability to recall information, and occupational status. The paper also finds significant and asset-specific variation across countries, likely to reflect supply-side differences in asset markets. Finally, the paper documents international differences in levels of asset holdings, using the US as the benchmark, and decomposes observed differences into a part due to differences in configuration of characteristics of asset holder pools, and into another due to differences in influence of household characteristics on these levels.

Keywords: Stockholding, homeownership, private businesses, real estate, portfolios of the elderly

1. Introduction

The demographic transition and the resulting inability of social security systems to continue providing customary benefit levels are forcing households to accumulate for retirement on their own, and governments to provide tax incentives and launch education campaigns to promote individual retirement accounts. This process has already started in several major European and North American countries, but it was neither started simultaneously nor is it progressing at an even pace across countries.

It is natural to expect that the structure of portfolios of households around retirement age will differ substantially across countries, both as a result of their different demographic composition and as a result of their different institutional and market environment, including the state of government policies relating to saving for retirement. Documenting these differences and understanding their sources is likely to be of great importance, both for academic research and for financial practice.

Researchers in the young but rapidly growing area of household finance are interested in uncovering the key determinants of household asset accumulation choices, and in understanding which part is attributable to household characteristics and attitudes and which has resulted from institutional features and government policies. Focusing on a single country, typically in a cross section, cannot provide institutional variation and is thus not informative on how different institutions, policies, and asset menus interact with household characteristics to produce portfolio outcomes. By contrast, use of internationally comparable data allows serious study of these questions.

Observing and understanding international differences in the range and levels of asset holdings of households close to and beyond retirement age are also relevant for

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equilibrium outcomes in asset markets, now and in the future. For example, they facilitate evaluation of the prospects of an 'asset meltdown', in that they point to countries and asset markets most likely to be influenced by future efforts of the elderly to finance retirement through asset liquidation, set against limited demand for such assets by the young in the respective countries.

The uneven pace at which new financial products are being introduced in various countries also allows practitioners, in the government and financial sectors, to benefit from the experiences of countries that have pioneered adoption of retirement and other financial products. However, this cannot be done simply by looking at publicly available aggregate statistics of retirement and other assets. For one thing, aggregate statistics confound differences in participation rates with differences in accumulations conditional on participation. But beyond this, it is important not to ignore international differences in configuration of household characteristics relevant for investment choices, as well as differences in how household characteristics interact with the 'supply side' to produce investment choices in different countries.

Up to now, large-scale international comparisons of the structure of household portfolios at retirement were not possible, because internationally comparable data on portfolios and on household characteristics and attitudes of the elderly did not exist. Moreover, the range of characteristics that could be studied did not include variables likely to be crucial for household financial behavior around retirement age, such as self-reported and objective measures of health status. It is only recently that such data have become available, and the major breakthrough has just happened with the pending release of internationally comparable data for 11 European countries under the SHARE project.

Our study is the first to document international differences on determinants of participation and of asset holding levels by use of *all* internationally comparable household-level data on portfolios of the elderly that are currently becoming available to researchers; and to apply advanced econometric techniques to decompose the role of differences in configuration of characteristics from the role of differences in the interaction of characteristics with the institutional and market environment in producing these investment outcomes.

Specifically, we document, compare, and analyze determinants of participation in important asset holdings of the elderly (housing, other real estate, private businesses, and stocks held directly and indirectly) in the United States using data from the Health and Retirement Study (HRS), in the UK using data from the English Longitudinal Study of Aging (ELSA), and in 11 additional European countries using newly available and internationally comparable household-level data in the Survey of Health, Aging and Retirement in Europe (SHARE) database.

In Section 2, after describing the datasets, we document international differences in participation and in portfolio shares conditional on participation for households aged 50 or above. The asset classes we consider are the following: housing, other real estate, private businesses, and stocks held directly and indirectly.

In Section 3, we undertake econometric investigation of determinants of asset participation of the elderly, and assess their quantitative importance by computing average marginal effects for each country. Our basic econometric approach to the issue of uncovering international differences in determinants of observed behavior is regression of pooled data by use of a rich set of country dummies and interaction terms. This allows us

to test empirically for the presence of systematic differences across countries, both in terms of intercepts and in terms of coefficients on various characteristics. Are participation probabilities greater in some countries rather than others, even controlling for a number of household characteristics? Is the effect of a given characteristic larger in some countries rather than others? Our findings indicate statistically significant and quantitatively important international differences in the effects of several variables, as well as a rich pattern of country effects (shift parameters).

In Section 4, we decompose observed international differences in levels of asset holdings at various percentiles of the distribution of such holdings into two parts: (i) those that result from the fact that populations differ in terms of configuration of household characteristics; and (ii) those that arise from possible international differences in the influence of each characteristic on asset holdings. Such latter differences could arise, for example, from different features of asset markets and institutions in each country. Our methodological approach to these decompositions is based on an adaptation of recently proposed econometric techniques for constructing counterfactual distributions of asset holdings across the population in a given country (Machado and Mata, 2003). Section 5 offers some concluding remarks.

2. The Data

2.1. Data Features

We use the three most comprehensive data sets on portfolios of the elderly that are currently available: HRS, ELSA, and SHARE. The Health and Retirement Study (HRS) is a panel survey of Americans aged 50 and above, which has been conducted every two

years since 1992. The English Longitudinal Study of Aging (ELSA) is also a panel survey of those 50 and above in England. There have been two waves conducted, one in 2002 and the other in 2004. Finally the Survey of Health, Aging and Retirement in Europe (SHARE), which is modeled after the HRS and ELSA, also surveys those aged 50 and above in several European countries. The first wave of SHARE took place in 2004 in Sweden, Denmark, Germany, the Netherlands, France, Switzerland, Austria, Italy, Spain, and Greece; and in 2005 in Belgium. It is currently taking place in Israel while the second wave will start in autumn 2006 and will include the aforementioned countries and in addition Ireland, the Czech Republic, and Poland.

All three surveys have several modules, which focus on the following areas: demographic background, family structure, physical and mental health, cognitive abilities, health expenses and insurance, employment status, retirement perspectives, job history, incomes, financial transfers, housing, assets, social activities and expectations. Special emphasis has been placed on eliciting information about the health status of participants, who are asked detailed questions about their health history, current health problems and their experiences with the health system of their countries. In addition, the respondents are subjected to various tests administered by health professionals (e.g. grip strength and walking speed) that are very informative on their health status. On the economic side, the modules on employment, income and assets provide detailed information about their various income sources and about a wide array of financial and real assets that they may possess.

The purpose of all three surveys is to give a well-rounded picture of the implications of aging in modern western societies. Their panel nature provides information on the

evolution of household health status, the onset of sickness and disability, and changes in employment status, incomes and assets. Moreover, the interdisciplinary nature of the design of the surveys allows the study of the interrelationships between different aspects of the lives of the aged. For example, what is the effect of health status on the decumulation of wealth? What is the effect of cognitive abilities on portfolio selection? How do health problems affect the timing of retirement? How do financial transfers from and to children evolve, as people age and children leave the parents' house and form their own families?

Finally, the international scope of SHARE allows comparisons of the situation of the elderly across countries that differ considerably in the institutional features of health and pension systems, and of capital markets. These differences are closely related to, among other things, international differences in asset accumulation and portfolio composition, as well as retirement choices.

2.2. Participation Rates and Conditional Portfolio Shares

Figure 1 reports participation rates of the elderly population in four classes of assets: stockholding, principal residence, private business, and other real estate (such as vacation homes, rental property, plots of land, etc.). Ownership of stocks, either direct or indirect through mutual funds and retirement accounts, is greatest in Sweden, Denmark, and in the US. It is smallest in Austria, Italy, Spain, and Greece. Homeownership is highest in Spain, and lowest in Germany, Netherlands, Switzerland, and Austria. Ownership of other real estate is at much lower levels, with Sweden and Greece being the big positive outliers. Notably, the US and the UK are among the countries with the most limited participation in other real estate among the elderly. The highest rates of business

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ownership are observed in Sweden and Switzerland, with the US and Denmark a short distance behind them. The lowest rates of business ownership are observed among the elderly of Austria and the UK.

We turn next to portfolio shares of the four types of assets, conditional on participation in the asset (Figure 2). The US and Sweden are positive outliers in terms of conditional portfolio shares of stocks, directly or indirectly held, with the UK a distant third. At the bottom of the list come Greece and Austria. Conditional shares of home value are much more uniform, the lowest being observed for the US. Greater variation is observed in conditional portfolio shares for other real estate, with largest shares being observed for Austria, Greece, and Spain. Finally, conditional shares of business values are fairly uniform among the elderly of different countries, around 15%, with two significant positive outliers: the US and Austria, where conditional shares are of the order of 25%.

3. Determinants of Asset Participation

This section reports marginal effects of various factors, i.e. resulting changes in the probability of participation in an asset in response to a 'unit' change in the case of a continuous independent variable, and to a change in status in the case of a dummy variable.[1] We calculate marginal effects for each household separately and then report average marginal effects over all elderly households in a country. 'Total' effects of a factor, averaging across the entire set of pooled data, can also be computed. Particular care has been taken with interaction terms that are very important for uncovering country variation in this paper. When a variable is interacted with others in the probit regression,

the reported marginal effects take into account all effects of changing the variable, wherever it appears. Standard errors for estimated marginal effects are derived through simulation. Details are given in an Appendix.

For the time being, and because not all sets of country weights have been released, we have chosen to use un-weighted data for all countries in this section. This is particularly damaging for computing 'total' effects in the pooled sample, as the relative sizes of the countries are not respected. We, therefore, do not yet report results on total effects. Results on average marginal effects within a country are less sensitive to the lack of weights, but it is prudent to regard them as preliminary and to interpret them with caution.

We first run participation probits for each asset category (risky financial assets, home equity, private business, and other real estate), allowing for a full set of interactions with country dummies. In other words, we allow for country effects not only with respect to the shift parameter (the regression constant) but also with respect to the coefficient on each independent variable. We then perform F-tests for significance and drop interaction terms that fail the test. We rerun the participation probits using the more parsimonious specification, and we use the resulting coefficient estimates to compute average marginal effects as discussed in the Appendix.

The output of this procedure is too long to be presented in tabular form (although it is available from the authors in such form, on request). We construct instead Figures, one for each major factor, with countries on the horizontal axis and marginal effects on the vertical axis. For each country, we plot four estimated marginal effects (and their confidence intervals), one for each asset category. Estimated marginal effects are shown

by the height of the corresponding bar, while confidence intervals around this estimate are also shown around it. For example, we consider the marginal effect of having a household head with a degree from an institution of higher education in Figure 3. For each country, say the US, we plot the effects that college education has on the probability of participating in risky financial assets, in home equity, in private businesses, and in other real estate. Next to it, we show the corresponding set of four marginal effects for each European country. We can thus compare the relative intensity with which a given factor influences participation in different assets within a country, and across countries. Note that equal height of bars across all countries means that all interaction terms have been found to be insignificant in the initial participation regressions and have been dropped. The clearest such case is the 'self-reported bad health' variable, where all 4 effects are uninteracted and results for all countries have been collapsed in just one set of bars. In what follows, we present results for variables reflecting educational attainment of the household head, expectation to leave a bequest, position in the income and in the wealth distribution, health, ability to recall information, occupational status, and country effects controlling for household characteristics (shift parameters).

3.1. Education

Existing literature on participation in stockholding typically finds strongly significant effects of educational attainment of the household head, especially with regard to having a college degree or more. Our estimates for the role of higher education degree on direct and indirect participation in stocks (through mutual funds and individual retirement accounts) are shown in Figure 3. All estimates are positive, and almost all are significant.

Estimates are also large, with six of them exceeding 10 percentage points. By far the largest estimate is obtained for the US, where a college degree raises the probability of participation by the elderly in stockholding by about 22 percentage points, controlling for other characteristics. There is no simple relationship between high participation rates and the size of these effects: Sweden has even higher stockholding participation rate than the US and yet exhibits a very small and insignificant estimate. By contrast, Italy – a country with very low participation rates in stockholding – exhibits a sizeable, significant effect of the order of 10 percentage points. Estimated effects of a high-school degree (shown in Figure 4) are still positive across all countries, but smaller and insignificant in a greater number of countries.

These results on the role of education are even more favorable than in existing stockholding participation studies, because they refer to the elderly population, i.e. to a group more distant to the time of completion of formal education. Thus, they imply that the effects of higher education on participation in stockholding go well beyond formal knowledge into the realm of information processing abilities and ability to make the best of available opportunities. To the extent that our regressors do not fully control for cognitive skills and innate ability, education variables may be also proxying for such factors.

In contrast to results on stockholding, education does not seem to play an important role in participation in home equity, controlling for other factors. Estimates of marginal effects are not of the same sign across countries, and most are statistically insignificant. In Europe, we obtain significant positive effects for higher education only for the Netherlands and for Switzerland. In the US, the effect is significant and with a negative

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sign. This sign reversal may reflect a greater desire for geographical mobility among college graduates (e.g. moving between jobs or moving to Florida) than among their counterparts of lower educational attainment. A high-school certificate does not affect homeownership among the elderly, except for a positive significant effect in the UK.

Perhaps more strikingly, a college degree has no effect on business ownership among the elderly. Exceptions are Austria (where the effect is positive) and the UK, where we find a small positive marginal effect just significant at the 10% level.[2] Since we also control for retirement status in these regressions, it does not seem that these findings are merely a result of the fact that a large part of the elderly are retired and therefore unlikely to still own a business. However, a high-school certificate does appear to increase the tendency of elderly households to own a business, compared to their counterparts who have not managed to complete their high-school education.

Despite its mixed and weak effects on ownership of the primary residence, a higher education degree does encourage participation in 'other real estate'. The same is true even of a high-school certificate in Denmark, Italy, and Spain. It is unlikely that this role of education is simply proxying for household resources, as we control for the position of the household in the income and wealth distribution of its country (where wealth excludes other real estate). It is also unlikely to be capturing simply bequest motives, as we are also controlling for the self-reported probability that the household will leave a bequest. This greater tendency of college graduates (and in some countries, of high-school graduates) to accumulate other real estate as part of their retirement planning may be linked to factors that we do not fully control for, such as financial alertness and investment ability throughout the life cycle.

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3.2. Bequest Motives

We next turn to bequest motives. The elderly are a particularly interesting group for studying the relevance and intensity of bequest motives, as they are closer to the time of bequest than their younger counterparts, they have more information on the actual configuration of descendants and of their needs, and they have had more time to think and plan regarding this issue. We measure the intensity of the bequest motive using the self-reported probability of leaving a positive bequest, which is a continuous variable ranging from 0 to 100. Marginal effects refer to the effects on asset participation of reporting a probability that is higher by 10 percentage points than the base case. Results are shown in Figure 5.

Controlling for other factors, including the position of the household in the income and net wealth distribution (where wealth always excludes the asset in question), the Figure shows a pattern of positive, significant, modest marginal effects of the bequest motive, but one that varies across countries and even across assets within each country. The main residence is the asset most heavily influenced by bequest motives, in all countries considered. Denmark, Germany, the Netherlands, and Austria are the countries with the largest estimated effects, of the order of 4 percentage points for a 10 point increase in the reported probability, despite the generally low homeownership rates in Germany and Austria. The US is second from the bottom (with Spain at the bottom) in terms of the size of effect of bequest motives on homeownership, consistent with the rather limited importance of bequest motives found in existing studies. Italy is not in the

top category, suggesting that the strong tendency of Italians to hold real assets cannot be mainly attributed to strong bequest motives.

Although bequest motives contribute also to participation in other real estate, the size of effects is smaller and not necessarily greater than the importance of the bequest motive for stockholding. Indeed, in Denmark, Netherlands, Switzerland, and the UK, the estimated marginal effect of bequest motives on owning other real estate is dominated by its estimated effect on owning stocks directly or indirectly.[3] Participation in stocks does not necessarily imply that households are planning to leave stocks as bequests (although tax provisions in some countries favor bequests of assets with accumulated capital gains). Stockholding may take place in the context of tax-deferred retirement accounts, with a view to securing larger retirement income, making it possible to bequeath liquid or even real assets. But it seems interesting that bequest considerations have managed to enter the decision to hold stocks in some European countries but not in others: Italy, Austria, Germany, and Greece show no statistically significant effect of bequests on stockholding. This is probably related to the sluggishness with which individual retirement accounts with stockholding options have been introduced in these countries.

Finally, the effects of bequest motives on business ownership are small and positive, but they do not display statistically significant cross-country variation. This finding is probably relevant to recent attempts to justify large business equity holdings on the basis of bequest motives. Although such effects are not prevalent controlling for position in the net wealth distribution, it is still possible that they may be relevant for the very rich (see Carroll, 2001, for arguments on the relevance of bequests at the upper end of the wealth distribution).

3.3. Household Resources

We consider next the influence of being 'well-to-do' in terms of wealth or income. Specifically, we study the effect of being in the top quartile of the respective distribution.[4] In order to avoid endogeneity problems, we exclude from the income measure capital income, and from the net wealth measure the asset in question.

We focus first on wealth (Figure 6). Being in the top quartile has the largest marginal effects on stockholding, direct or indirect. In the US, the estimate of this effect exceeds 40 percentage points, while it falls just short of that in the UK. Estimates for France, Germany, and Belgium all exceed 30 percentage points, despite the relatively low participation rates in stockholding in these countries.

High net wealth tends to be important also for ownership of private business and of other real estate, but effects are smaller than on stockholding and their relative strengths exhibit international variation. For the UK and Belgium, being in the top quartile of the net wealth distribution increases the probability of having other real estate by about 25 percentage points, and of owning a business by less than 10 percentage points. For the US, Sweden, and France the ranking of effects is reversed.

Belonging to the top quartile of 'remaining net wealth' after taking out the asset in question does have estimated effects between 10 and 15 percentage points on the probability of homeownership in the US and in the UK. In Germany and Austria, where homeownership rates are generally small, these effects are not statistically different from zero. However, insignificant effects (with negative estimates) are observed even for some countries with moderate or high homeownership rates, such as Denmark, France, and

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especially Spain – which exhibits the highest measure homeownership rate among the elderly. These findings may be partly reflecting a limited role of high wealth in homeownership: a home is not the privilege of a few wealthy households in those countries. However, erratic patterns may also be partly due to the fact that we always consider 'remaining' net wealth to avoid endogeneity: if the house is the biggest item in most households' portfolios, removing it from net wealth may result in a rather noisy proxy for overall position in the net wealth distribution in some countries, and this may contribute to the insignificance of the estimates.

Turning to the effect of belonging to the top quartile of the income distribution (Figure 7), an analogous complication arises. As we remove capital income from the income measure, we essentially remove (a large part of) employment income for private business owners. This accounts for the negative estimates: belonging to the top of the 'remaining income' distribution implies that the household is less likely to have employment income from an own business. This is unlikely to be an issue for home equity and for stockholding. It can affect other real estate only to the extent that owners actually rent out this real estate and receive a sizeable part of their overall income from it.

Estimated marginal effects of belonging to the top quartile of the non-capital income distribution are usually largest for home ownership, with the largest estimate (exceeding 30 percentage points) in the low homeownership country of Germany. Exceptions to this rule are the US and the UK: both exhibit estimated effects on stocks in excess of 10 percentage points, while the corresponding effect on home ownership is less than 5 points. The finding that belonging to the top quartile of the income distribution does not alter substantially the probability of homeownership in these two countries could be due

to greater variety of housing to match individual budgets or to easier access to mortgages with low monthly payments. We revisit these issues when we examine determinants of the level of net home equity below. Marginal effects on other real estate are not always statistically significant, but they are of the order of 10 percentage points when they are, with the largest estimate referring to the US.

3.4. Other Household Characteristics

We also look at the effect of having a household head that is working or retired, both relative to being out of the labor force. For the elderly population, these differences are likely to be reflecting mainly the death (or other departure) of the main bread winner: assets accumulated when the head was working or after entry into retirement are now owned by the spouse that is neither currently working nor in retirement from work.

Figure 8 shows that the incidence of stockholding is somewhat affected by having a working head, but that there is no significant international variation in this effect. There is also no effect on ownership of other real estate. By contrast, this difference has significant effects on homeownership, with the Netherlands and Italy exhibiting negative effects in excess of 5 percentage points, and France in excess of 10 percentage points. If our interpretation for the source of this difference is correct, this finding may suggest that loss of a working spouse significantly reduces the probability that the household will be able to hold on to its own home, let alone moving into homeownership.

Turning to the case of household heads that are retired as opposed to being out of the labor force (Figure 9), we see that effects on stockholding are largely insignificant, with the importance exception of the US and the UK where households headed with retirees

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are somewhat more likely to own stocks, controlling for other factors. Effects on homeownership are generally insignificant, with significant negative effects registered only for Germany and Austria. The only statistically significant negative effect for other real estate is in Belgium.[5]

Figure 10 shows effects of self-reported bad health. Interestingly, there is no significant international variation in the role of this variable. Reporting bad health has the largest negative effect on ownership of stocks (consistent with such adverse effects documented for the whole US population by Rosen et al, 2005), somewhat smaller effects on business ownership, even smaller for homeownership, and no effect on ownership of other real estate, controlling for other factors. In the context of the elderly population, these findings are consistent with an intuitively plausible pattern of response to the onset of bad health conditions: risky financial assets are more likely to be given up, both because they are liquid and because managing them requires energy and personal attention; then come private businesses, since household heads sometimes have the option to pass management on to others; and then the principal residence, if bad health conditions persist and resources are needed.

Results on the importance of recorded ability to recall information are shown in Figure 11. While we find virtually no statistically significant effect of improved ability on ownership of 3 out of the 4 assets, we do find a quantitatively small but significant effect on the probability of stockholding among the elderly population, and one that does not exhibit significant international variation. The importance of this cognitive factor for stockholding is consistent with some recent work on the importance of cognitive factors for financial and retirement choices, but they also suggest that their separate role – at

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least in the elderly population – may be limited to risky financial assets rather than real assets.

3.5. Country Effects after Controlling for Characteristics

Figure 12 shows estimated effects of the elderly living in a particular country relative to living in the US, after controlling for the array of household characteristics and for any international differences in the influence of each characteristic. These shift parameters are likely to reflect mostly institutional, policy or other supply-side factors that tend to favor ownership of a particular asset in one country versus another regardless of characteristics of the elderly population. Country effects are generally statistically significant, suggesting that such factors are important and that household characteristics and their differential influence are not in a position to fully explain international differences in the incidence of ownership of the 4 types of assets.

Sweden and Denmark exhibit significant positive effects on the ownership rate for stockholding relative to the US. Notable also are the sizeable negative effects of being in Austria, Italy, or Spain. Both findings imply that the observed international differences in stockholding participation rates in these countries are mainly a result of institutional factors and market conditions, rather than differences in the configuration of household characteristics and in their influences.

With the exception of Spain (and possibly Greece), all countries exhibit negative country effects relative to the US when it comes to homeownership. These effects are large, exceeding 20 percentage points for Germany and Switzerland, and 10 percentage points for Austria and the Netherlands. US conditions in the housing market seem to

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approach more closely those in the UK and Belgium, where country effects on homeownership vanish once household characteristics and their influences are accounted for.

With the exception of Sweden and Denmark, institutional and market conditions are estimated to be less favorable for private business ownership than in the US, controlling for the configuration of household characteristics among the elderly, including retirement status. The sweeping nature of this result seems to call for some policy attention, in order to uncover the precise deficiencies in European structures that account for this difference. By contrast, we do not find consistently negative or significant European country effects on ownership of other real estate: it seems that most of the observed international differences in participation can be accounted for by differences in configuration of household characteristics and in their influence on such ownership.

4. Asset Holdings Compared: Counterfactuals

Having studied determinants of asset participation and their differential impact on participation across countries, we present in this section international comparisons of levels of asset holdings across their entire distribution. First, we compare levels of asset holdings at given percentiles of the distribution of such holdings among holders. This allows us to see where holdings of a particular asset category tend to be higher and where lower. We then go a step further and ask to what extent observed international differences in asset holdings arise from differences in the demographic characteristics of asset holders in various countries and to what extent they arise from differences in the influence of characteristics on observed levels of holdings.

For this second task, we employ a variant of a technique proposed by Machado and Mata (2003), described in an Appendix. As part of this approach, we first estimate quantile regressions for asset holdings in the United States as a reference country, for the sample of owners of such assets.[6] These yield sets of estimates of coefficients on covariates that include household characteristics and other influences on asset holdings, with each set referring to a given percentile of the distribution of holdings. This allows factors to have greater or smaller influence on asset holdings, depending on the percentile in question.

Utilizing these quantile regression results, we then decompose international differences in asset holdings (i.e. between the US and each European country or the pooled European population) into (i) a component due to differences in the distribution of *covariates*, i.e. in the configuration of characteristics of asset holder pools across countries; and (ii) a component due to differences in the *coefficients* on these covariates for various quantiles of the country distribution. Coefficient differences capture differential effects on asset holdings of changing a particular factor. For example, an increase in income by 1000 euro (PPP-adjusted) may have different effects on median holdings of a particular asset in the US and in a European country, because of differences in market conditions and institutions.

These decompositions are presented in the form of counterfactual densities. For example, differences in holdings of a particular asset (by percentile) between the US and a European country i (where i can also represent the pooled European sample) can be decomposed in the following manner:

$$f\left(y^{US}\right) - f\left(y^i\right) = \left\{f\left(y^{US}\right) - f^*\left(y; X^i b^{US}\right)\right\} + \left\{f^*\left(y; X^i b^{US}\right) - f\left(y^i\right)\right\} \quad (1)$$

The densities without asterisk represent the actual levels of the asset in question at different percentiles of the distribution of holdings. The starred density is the counterfactual we construct. It represents the density that would have been observed if we were to combine the configuration of characteristics of asset holders in country i with the coefficients on those characteristics estimated for the US.

In interpreting this decomposition, we can think of starting with the distribution of asset holdings in European country i and comparing it to what would have been observed in that country if the influence of each of these characteristics were the same as in the US. The resulting difference (in the second bracket) represents these coefficient effects. Then, as a second step, we compare this counterfactual to the actual density in the US, which obviously results from combining US coefficients with the configuration of characteristics among US holders of this asset. The difference (in the first bracket) then represents covariate effects, i.e. those attributable to differences in configuration of household characteristics between holders of this asset in European country i and in the US.

Going beyond this rather mechanical interpretation to an economic interpretation requires some caution. On the face of it, combining coefficients from the US with characteristics of the asset holder pool from another country might seem to represent an experiment of removing all US holders of the asset, replacing them with the holders of the same asset from European country i and observing the resulting density of asset holdings. Such an interpretation, however, might be subject to a version of the 'Lucas critique': presumably, replacing US with European holders of this asset would be expected to lead to a transformation of market conditions and institutions in the receiving

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country, and it cannot be taken for granted that the previously estimated US coefficients on characteristics would still apply.

An interpretation we view as more reasonable is a smaller-scale immigration experiment: suppose that a representative sample is drawn from the pool of asset holders in European country i and is implanted into the US, alongside the existing US population. Since the European 'immigrants' are too few relative to the indigenous population, they cannot influence the way US markets and institutions operate. Thus, they experience the same relationship between household characteristics and asset holdings as their US counterparts. Under this interpretation, coefficient effects represent the change in asset holdings that this group of immigrant asset holders could accomplish by moving to the US and being faced with US market conditions and institutions. Alternatively, these can be thought also as approximating the effects of greater integration in asset markets, allowing foreign asset holders easier access to US asset markets. Covariate effects represent the difference between holdings of the asset among US holders of the asset and holdings among this immigrant pool. We examine, in turn, coefficient and covariate effects for risky financial assets, safe financial assets, primary residence, and private businesses.

4.1. Risky Financial Assets

Risky financial assets refer to directly and indirectly held stocks. Our data come from the period following the stock market downturn at the turn of the century.[7] Figure 13 shows coefficient and covariate effects for a comparison between the US and pooled European country data, as a summary measure.[8] We see that US stockholders hold

greater amounts of stock wealth across the distribution of stock holdings. Counterfactual decomposition shows that most of this difference across the board comes from coefficient effects: EUROPEAN stockholders would achieve considerably higher levels of stock holdings if they were to be confronted with US market conditions and institutions. This is slightly more so for the top of the distribution. Covariate effects are smaller and uniform across percentiles: the US stockholder pool is able to achieve somewhat larger levels of stock holdings than what the European pool of stockholders would achieve if they were to be faced with US conditions.

Given the substantial variation in participation rates across European countries, we expect to find considerable heterogeneity in covariate and coefficient effects among different European countries when paired with the US. Interestingly, coefficient and covariate effects are positive in each European country we compare to the US. Heterogeneity is present, but it refers to the ranking in importance between coefficient and covariate effects.

Coefficient effects dominate covariate effects in a number of countries. Coefficient effects are particularly strong in Germany, Austria, and Italy, and more so among higher percentiles of the distribution. This suggests that an important reason behind relatively low stockholding levels in these countries is market conditions and institutions relative to the US. The same is true of the Netherlands and Switzerland, though effects are less strong at the top of the distribution in these countries. Coefficient effects are somewhat less strong in France and Greece, but they still dominate covariate effects. Dominance of coefficient over covariate effects in all of these countries suggests that the state of stock markets, rather than an unfavorable composition of the stockholder pool, is the key factor

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in explaining lower stockholding levels relative to the US. Indeed, for the Netherlands, Switzerland, and Austria, covariate effects are negligible, implying that the configuration of the stockholder pool in these countries is every bit as conducive to high stockholding levels as that in the US.

Indeed, covariate effects dominate coefficient effects only in Sweden. They are also sizeable, though not dominant, in the UK and in Denmark. This implies that the configuration of the stockholder pool (among the elderly population) is not as conducive to high stockholding levels in these countries as it is in the US. With participation rates at 71% and 55%, respectively, Sweden and Denmark exhibit more widespread stockholding compared to the US, while the UK is slightly below the US (42%). Taken together, participation rates and our findings imply that stockholder pools in these three European countries are less conducive to high stock holding levels, because they contain a larger proportion of 'marginal stockholders' with characteristics that warrant limited exposure to the stock market.

4.2. Safe Financial Assets

Figure 14 shows counterfactual distributions for safe assets. The first panel shows a comparison between the US and pooled data from the European countries we consider. Again, US holders of safe assets hold greater amounts of such assets virtually across the distribution of holdings, but differences exhibit a hump-shaped pattern, being small at the two ends but sizeable for the most part of the distribution of holdings.

The sign of coefficient effects is not uniformly positive, unlike what we found for stockholding. In the bottom half of the distribution of safe asset holdings, Europeans

would actually invest less in safe assets if they were faced with US market conditions and institutions. The situation would be reversed in the top half (with the exception of the richest few percentiles). Covariate effects, however, are positive throughout, suggesting that characteristics of US holders of safe assets (close to 90% of the population of households) are more conducive to large holdings of safe financial assets than those of safe asset holders in the EUROPEAN as a whole, when both are faced with US market conditions and institutions.

The other panels of Figure 14 show, however, that these results regarding pooled European data do not fully reflect the situation of all individual European countries. Swedish holders of safe assets that are in the bottom 25% of the distribution of such assets actually hold larger amounts of safe assets than their US counterparts in the bottom of the distribution. Although differences switch sign at higher percentiles, they keep increasing – as opposed to vanishing – as we move to the top end of the distribution. Coefficient and covariate effects exhibit the same pattern as the pooled European data, with somewhat greater relative importance for the former relative to the latter. When compared to Italy, US holdings of safe financial assets are uniformly higher at all parts of the distribution, reflecting the known tendency of Italian households to invest heavily in real assets. Covariate effects are more important at the bottom end, but become weaker as we move to the upper end. Exactly the opposite holds for coefficient effects. Still, covariate effects dominate almost throughout. Taken together, these findings imply that characteristics of Italian safe financial asset holders are not as conducive to large holdings as those of their US counterparts, but market conditions become an important factor deterring large holdings in Italy as we move to the upper end of the distribution.

4.3. Home Equity

Home equity is defined as the difference between gross housing wealth in primary residence and the amount of mortgage outstanding on the primary residence (if any).[9] With the exception of Sweden and the UK, the overall picture is one of higher net home values among elderly owners in Europe than in the US, across the entire distribution of home values (see Figure 14). Does this reflect market conditions or a more select group of homeowners in Europe?

The first panel shows counterfactuals for net home equity for the US and for the pooled EUROPEAN data. We see that coefficient effects are negative, and this is true for virtually all European countries taken individually. This means that, if European homeowners were to migrate to the US and face US home market conditions, they would end up having smaller amounts of net home equity.

By contrast, covariate effects are positive regardless of the European country that is matched with the US, implying that the pool of US homeowners is more conducive to high net home equity values than the 'immigrant' pool of EUROPEAN homeowners. So, the observed lower values of net home equity in the US do not result from a poor configuration of characteristics of the homeowner pool but from different influences of these characteristics on net home values in the US housing and mortgage markets.

Clearly, lower net home equity could result from either lower home values or higher mortgages outstanding (or both). So, we construct counterfactuals for these two elements separately, in order to go a bit deeper. We first look at gross real home values (see Figure 15), reporting only results for the pooled European sample, as we did not find any

interesting pattern of cross-country variation. Home values in the US are uniformly lower, regardless of the percentile of the distribution of such home values among owners. Coefficient effects are uniformly negative themselves, but larger (in absolute value) than actual differences. The difference is, of course, made up by uniformly positive covariate effects. This exercise shows that the pattern of home values is fully consistent with the pattern we observed for net home equity, and thus our findings on net home equity are not a mere artifact of higher outstanding mortgages in the US. Moreover, lower home values in the US are not the product of a poor configuration of characteristics of US homeowners, but are to be traced to housing market conditions facing homeowners.

Lower home values in the US than in Europe, for given characteristics, do not necessarily imply more limited housing services: it could be that housing for households of given characteristics and needs is more affordable in the US than in Europe. We are in the process of standardizing for number of rooms, as a proxy for housing services and seeing if results are robust to this standardization.

Turning to mortgages still outstanding (Figure 16), we find larger real values in the US than in any European country and, of course, than in the pooled European data. With small exceptions (over small ranges of the distribution of mortgage holdings), both coefficient and covariate effects are positive: Europeans moving to the US would have bigger outstanding mortgages, and the pool of US homeowners would have bigger mortgages than European homeowners who moved. In all countries shown, with the exception of Denmark, covariate effects are more important than coefficient effects. So, the main source of the difference in mortgage holdings is the composition of the pool of

those elderly in the US who still have mortgages outstanding rather than the state of mortgage markets.

One might suspect that this is due to a much greater proportion of households with outstanding mortgages in the US than in European countries, leading to a 'dilution' of the pool and resulting in higher mortgages outstanding, but this is not the case. Although weights are not available for all countries yet, we estimate the proportion of the elderly with still outstanding mortgages in the US at 32%, somewhere in the middle of the range; estimates are above 40% in Switzerland, the Netherlands, Sweden, and Denmark, and below 10% in Spain, Austria, Italy, and Greece. A final point to note is that the incidence of outstanding mortgages among the elderly is the joint product of getting a mortgage in the first place and of not paying it off before the time of the interview. Still, easier access to mortgages might lead to a lower quality pool in terms of repayment potential, resulting in greater incidence of outstanding mortgages.

4.4. Private Businesses

For private business wealth, we report only the summary figure comparing the US to the European aggregate, as the pattern of results is quite similar across US-European country pairs. Figure 17 shows observed differences and counterfactual decompositions for owning a share in a private business. The US elderly hold larger real amounts in private businesses across the entire distribution of such holdings. Differences tend to be larger in absolute magnitudes at the bottom half of the distribution of holdings than at the upper half, suggesting a greater importance of small and medium-sized shares in private businesses in Europe.

Most of this difference can be accounted for by market conditions and institutional factors. If Europeans were to migrate to the US markets, they would be holding much larger amounts in private businesses, though not quite as high as their US counterparts. These market factors make more of a difference at the lower end of the distribution of private business holdings, and less so at the upper end. Not only are absolute differences greater at the lower part, but they obviously represent larger proportional differences, as well. On top of better market conditions, the US elderly holders of private businesses also have characteristics more conducive to larger business holdings, although this factor accounts for a much smaller part of observed differences in holdings.

4.5. Other Real Estate

As for private businesses, comparisons of holdings of real estate other than the primary residence between the elderly of the US and European countries seem to be quite consistent across European countries. We, therefore, present only the US-European aggregate picture (Figure 18). Note that results refer to gross amounts, without netting out any mortgages for financing other real estate, such as vacation homes, plots of land, etc. It is quite likely, however, that the incidence and quantitative importance of these mortgages are much smaller compared to mortgages for primary residence.

Except for the top part of the distribution of holdings of other real estate, actual real holdings at all other percentiles are higher in Europe than in the US. Coefficient effects are so powerful as to be larger (in absolute value) than the observed differences themselves. Were Europeans to move to the US, they would not only reduce their holdings of other real estate, but they would actually hold less than what their US

counterparts hold. This is because characteristics of US holders of other real estate are conducive to larger holdings than the characteristics of the European pool of elderly households possessing other real estate. This is perhaps not too surprising, given the much more limited participation of US households in other real estate. The more widespread incidence of ownership of vacation homes and of plots of land in Europe means that the group of holders is less of a 'select' group, compared to their counterparts in the US.

5. Concluding Remarks

In this paper, we have documented international differences in asset holdings among the elderly populations in the US, UK, and 11 continental European countries, using newly available and internationally comparable household-level data. We have used econometric techniques to understand the determinants of participation in four categories of assets: stocks (held directly and indirectly), principal residence, private businesses, and real estate other than the primary residence. Computing average marginal effects across elderly populations that take into account interaction terms, we provided estimates of the quantitative impact of each characteristic and of country effects. Simulating standard errors, we also tested for the statistical significance of the effects. We compared effects of a number of factors across different asset categories and across different countries. Household characteristics included: education, bequest motives, position in the (non-capital) income and net wealth distribution, self-reported bad health, ability to recall information, and occupational status.

With few exceptions, we find that the quantitative importance, statistical significance, and sometimes even the sign of effects of a given determinant exhibit considerable variation, both across countries and across assets. Still, variation in household characteristics and in their influences do not fully account for international differences in participation patterns: we also find significant and asset-specific variation across countries, likely to reflect supply-side differences in asset markets.

We then turn to the study of international differences in the levels of asset holdings, using the US as the benchmark country, across the entire distribution of such holdings among elderly participants. Using recent counterfactual decomposition techniques, we decompose observed differences into the part that arises from international differences in the configuration of characteristics of asset holder pools, and to the part that is due to international differences in the role of each factor relevant for these levels. This exercise reveals a rich and varied pattern, as we move across countries and across assets. International variation refers less often to the sign of coefficient and covariate effects and more often to their relative importance.

Hopefully, our analysis provides a useful first step towards understanding the sources of international differences in participation rates and in levels of asset holdings. This is useful not only for academic research, but also for government policy and financial practice. Such understanding can aid the design of policies to boost participation in certain classes of assets, by indicating the most important factors that determine participation and conditional shares. Findings can also indicate to financial practitioners where the most promising customers for particular financial products or services are most likely to be found, both in terms of country and in terms of demographic group, and also

what changes are likely to make the biggest contribution to boosting participation and asset holdings in specific categories. All in all, our findings indicate strongly that the world of asset market participation is very far from the notion that one explanation fits all patterns, and that there is a lot of international variation to document, explore, and understand.

References

(to be completed)

Appendix: Simulated Marginal Effects

Standard econometric packages automatically report marginal effects for each variable evaluated at mean remaining characteristics. Although it is standard practice to report such automatically generated marginal effects, this is often not economically relevant and sometimes even misleading, when it fails to distinguish among single dummy variables and groups of dummy variables that represent a given attribute, or properly evaluate effects of continuous variables entering with particular functional forms or interacted with other regressors.[10]. Such interactions are particularly relevant for our international comparisons in this paper.

In this paper, we compute reported marginal effects in the following way. We start by estimating participation probits. We then simulate the model parameters by making 1000 independent draws from the multivariate normal distribution, subject to the restrictions that the average of simulated values be equal to the respective estimated parameter and that the structure of the estimated variance covariance matrix be preserved. For each such set of simulated parameters, we calculate marginal effects for each individual household and then derive the average marginal effect for the relevant population. We repeat the process for every set of simulated parameters, thus computing a series of average marginal effects. The mean of this series is the estimated marginal effect and the standard error is the simulated standard error of the marginal effect.

Figures
Figure 1: Participation Rates in Assets among the Elderly Population

Ownership of Other Real Estate

Business Ownership
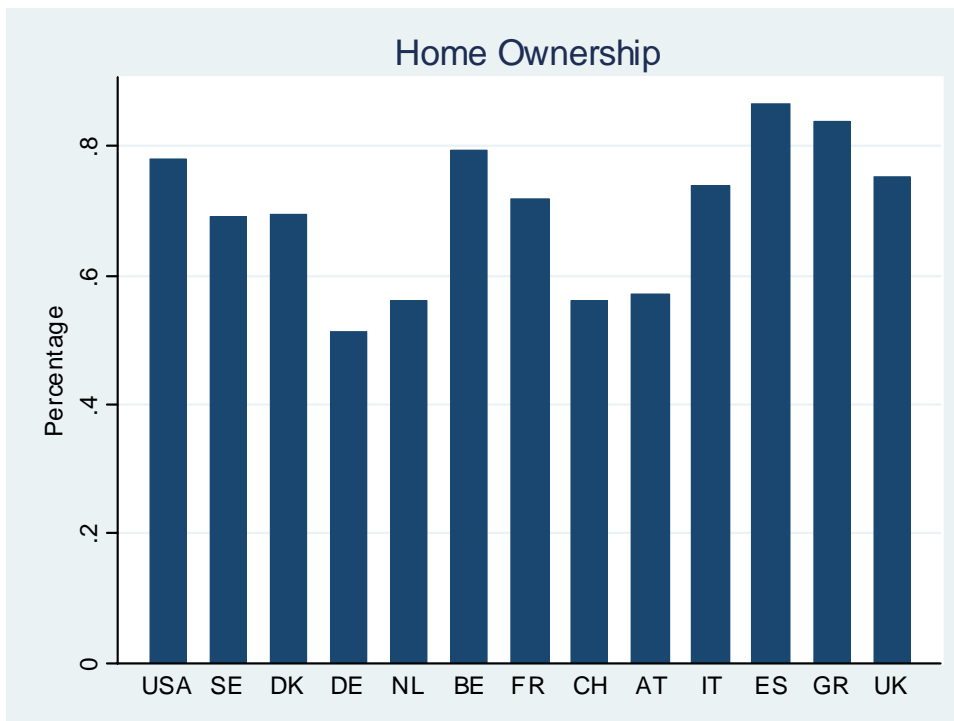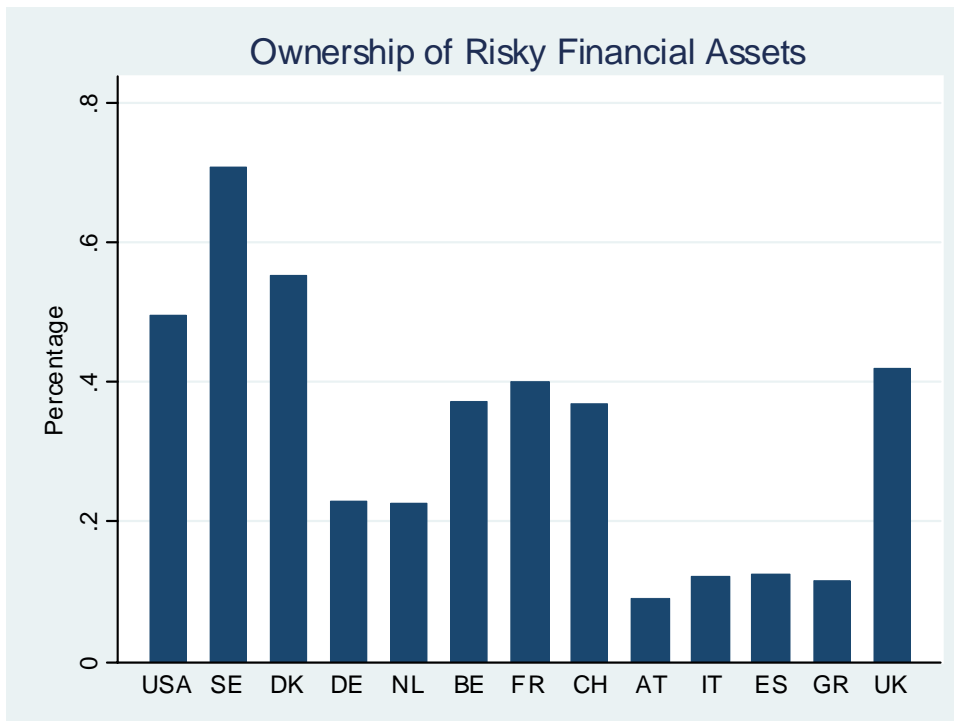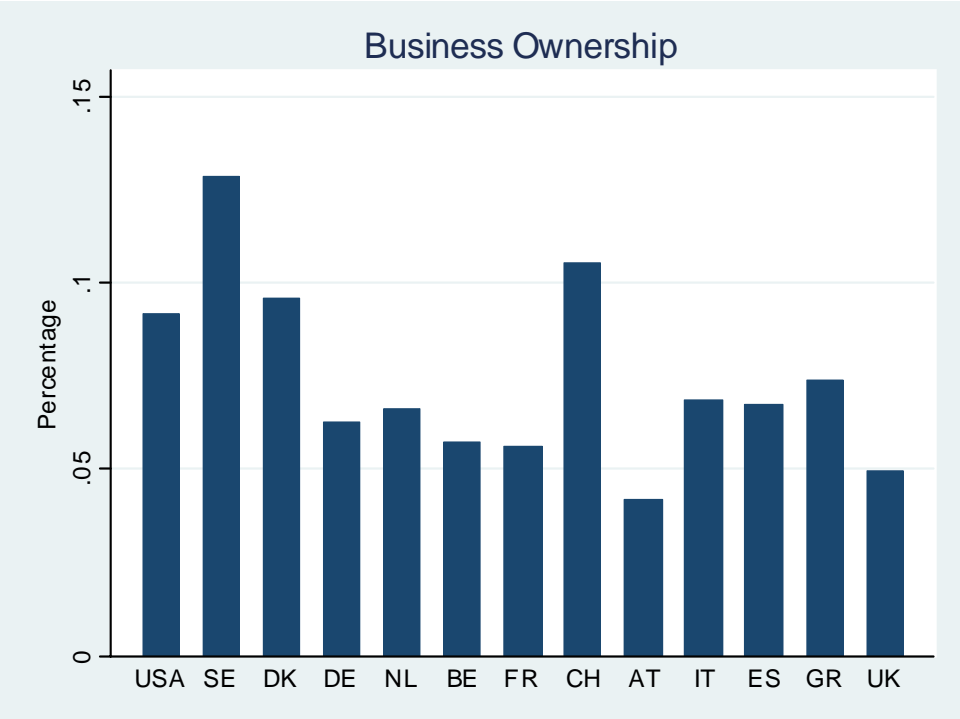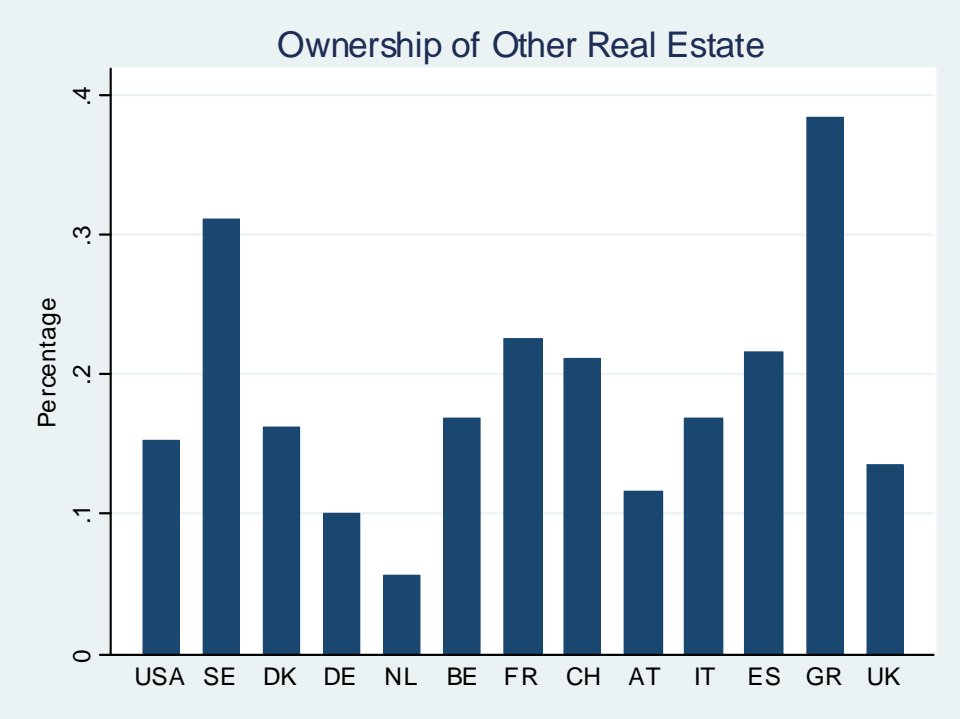
Figure 2: Portfolio Shares Conditional on Participation

Conditional Shares of Risky Financial Assets

Conditional Shares of Home Value
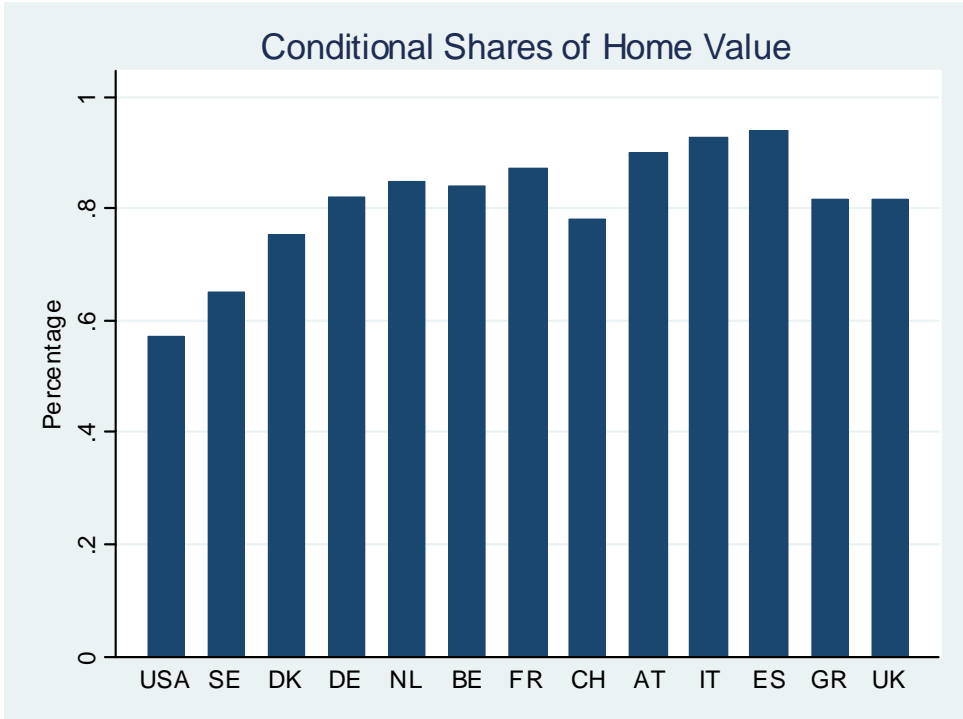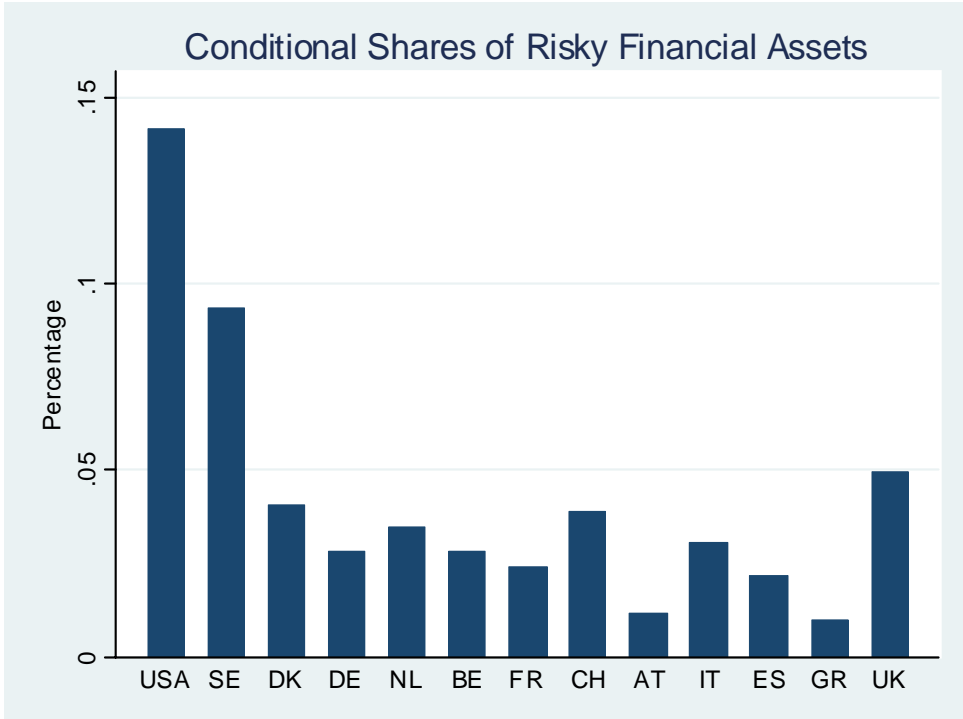
Conditional Shares of Other Real Estate
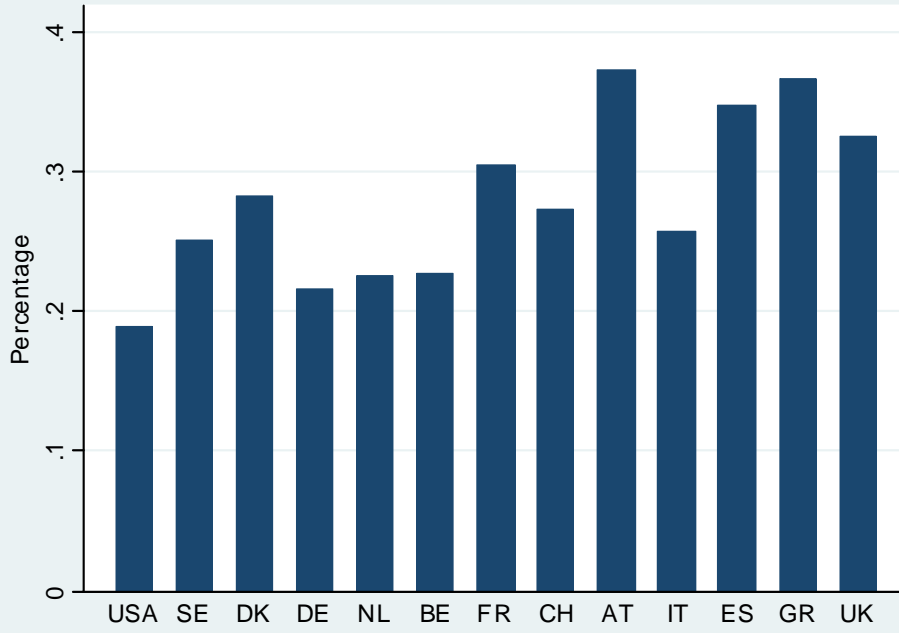
Conditional Shares of Business Value
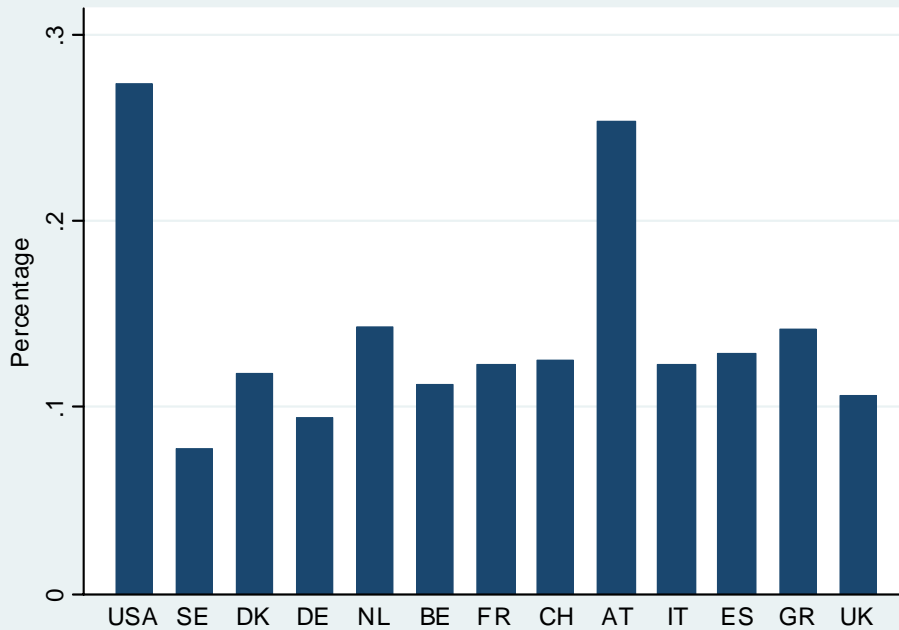
Figure 3: Marginal Effects of Higher Education Degree
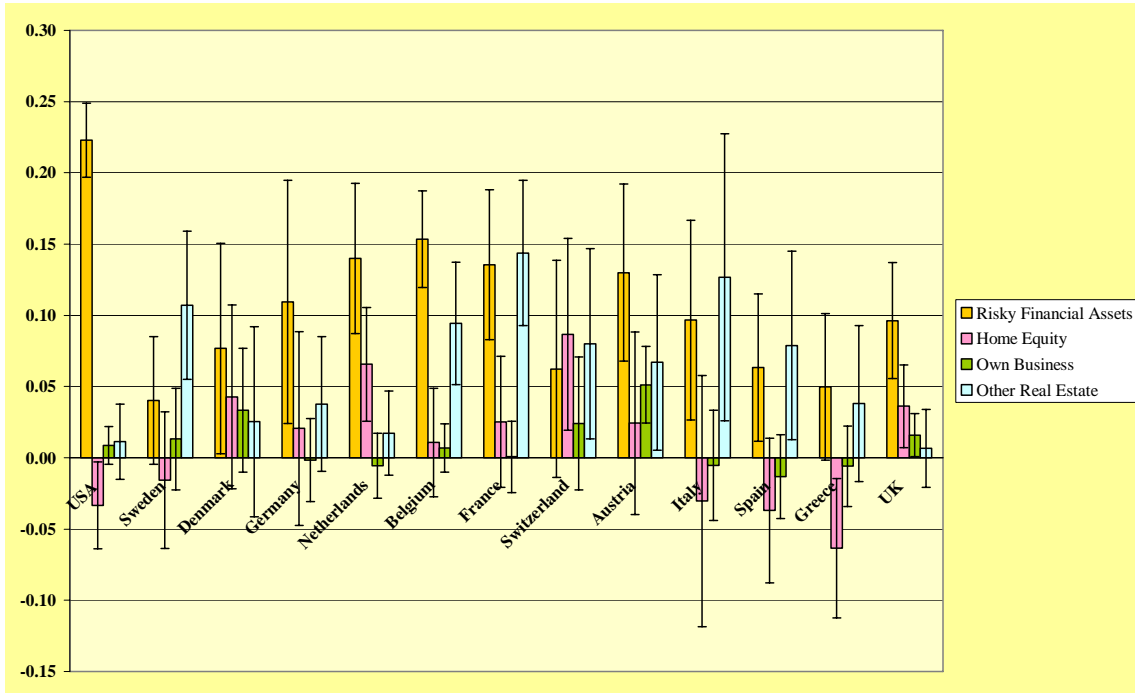
Notes: Marginal effects shown in this and in subsequent figures refer to effects that changing the relevant factor has on the probability of participation in each of the four asset categories. Effects are computed for each household and then averaged across all elderly households in the country. Estimates are represented by bar heights. Standard errors are computed by simulation. Special care has been taken to reflect interactions. For details, see Appendix.

Figure 4: Marginal Effects of High-School Certificate
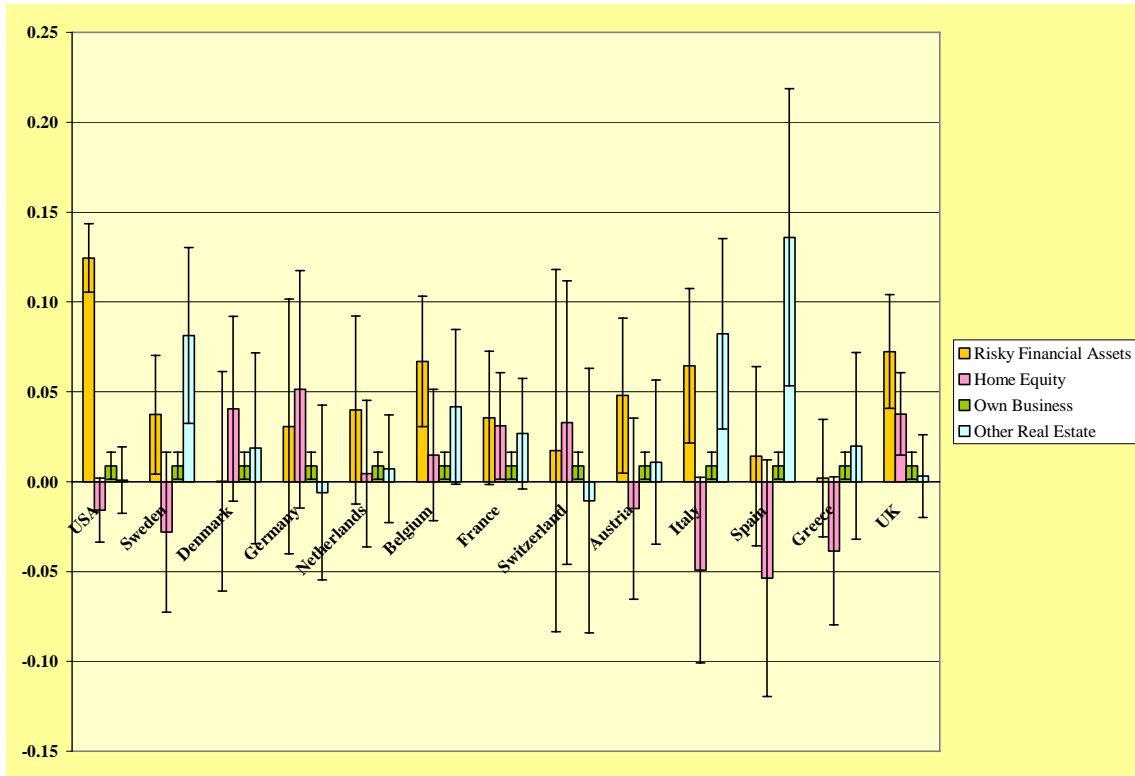
Notes: See notes to Figure 3.

Figure 5: Marginal Effects of Bequest Motive
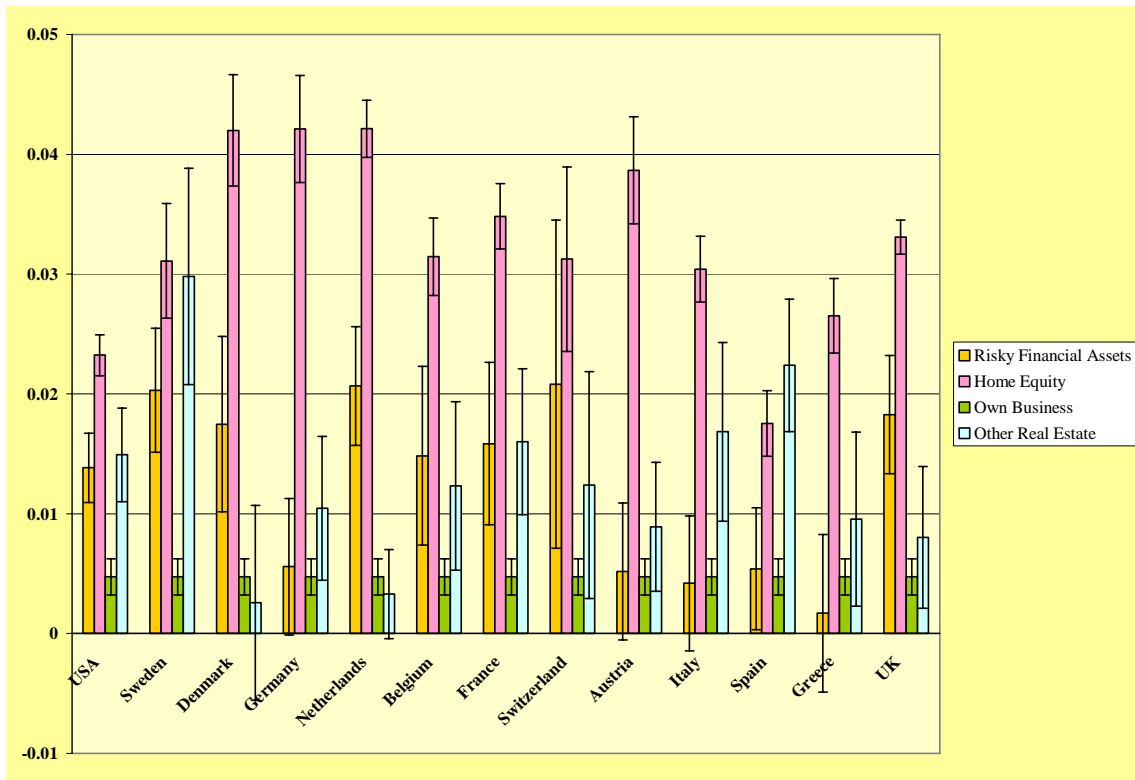
Notes: See notes to Figure 3.

Figure 6: Marginal Effects of Being in the Top Net Wealth Quartile
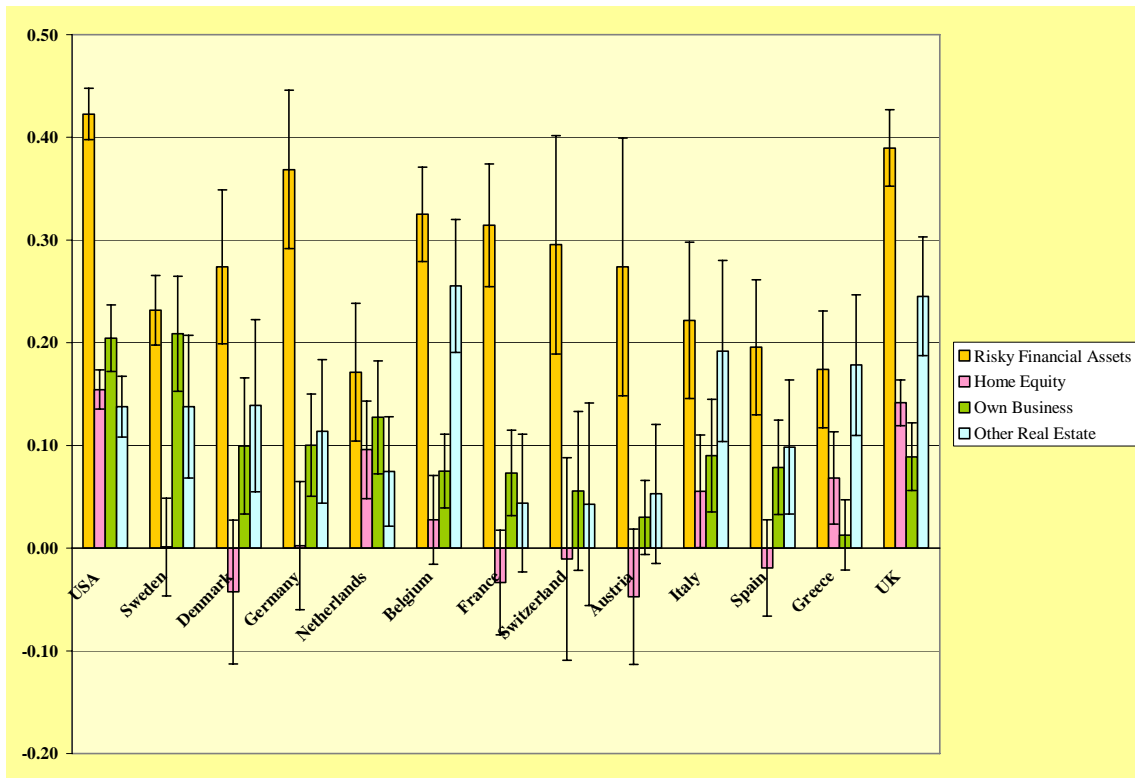
Notes: See notes to Figure 3.

Figure 7: Marginal Effects of Being in the Top Income Quartile
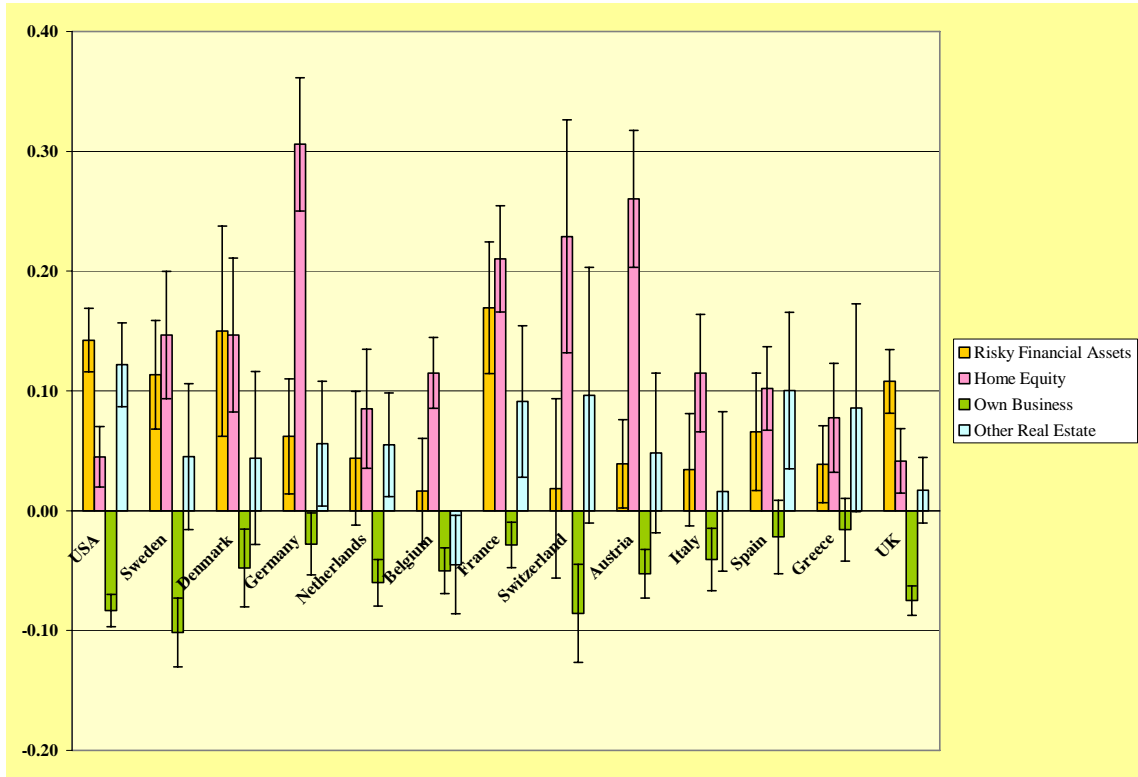
Notes: See notes to Figure 3.

Figure 8: Marginal Effects of Working Household Head
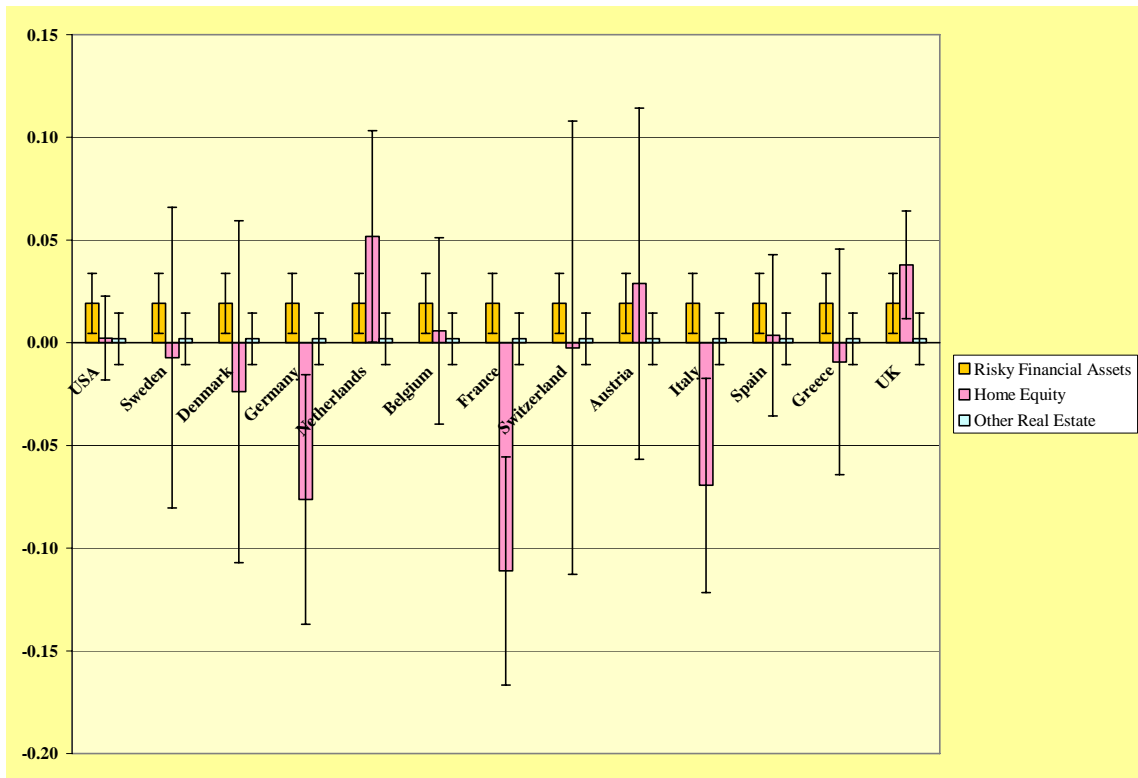
Notes: See notes to Figure 3.

Figure 9: Marginal Effects of Retired Household Head
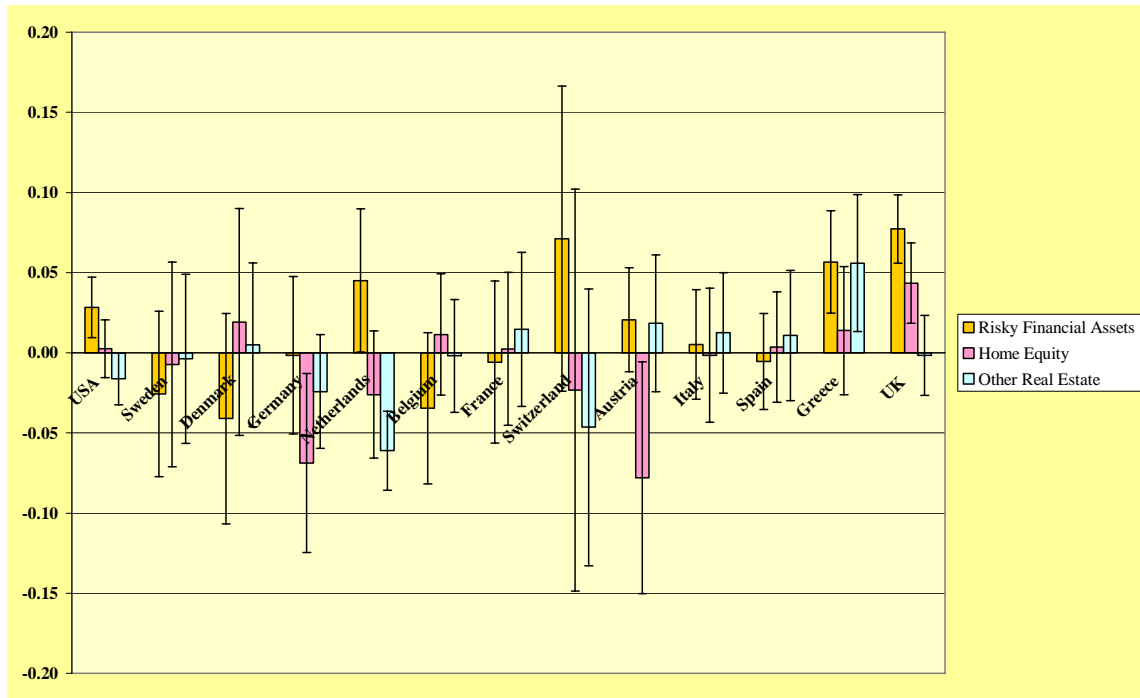
Notes: See notes to Figure 3.

Figure 10: Marginal Effects of Self-Reported Bad Health
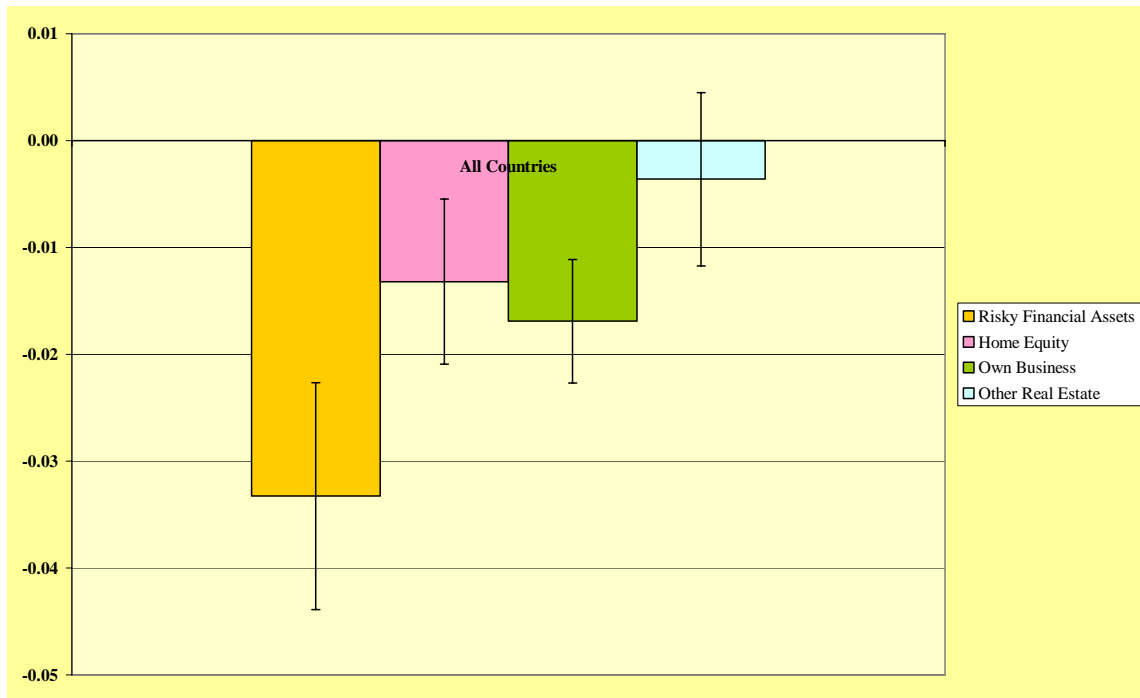
Notes: See notes to Figure 3.

Figure 11: Marginal Effects of Test Score on Recall Ability
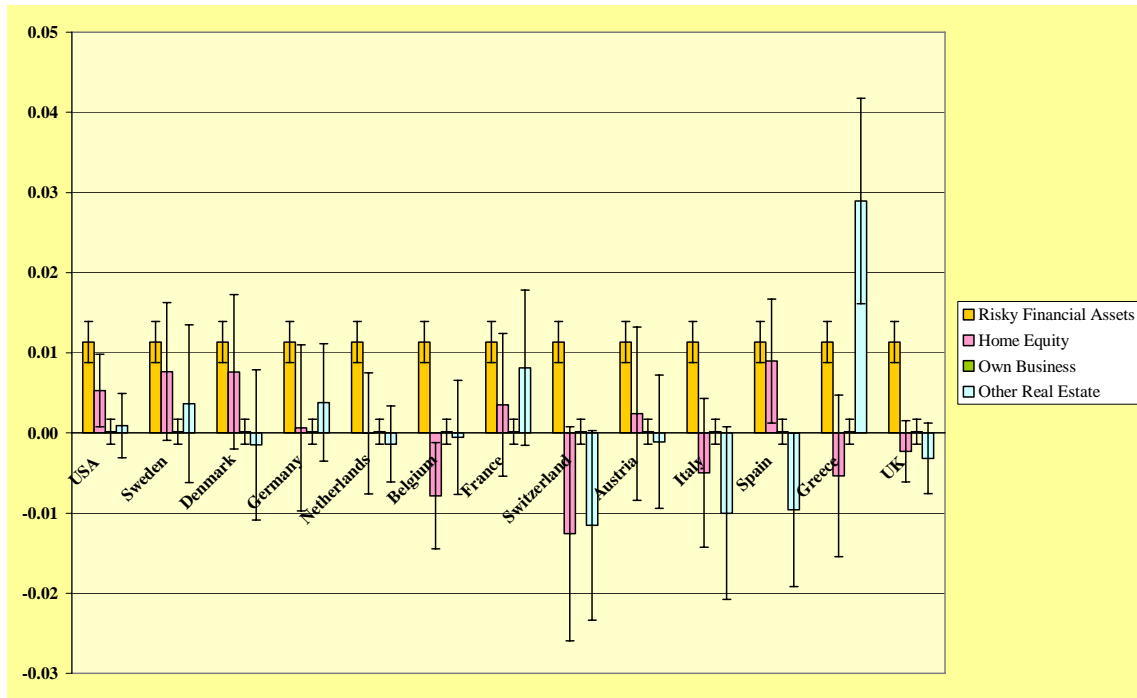
Notes: See notes to Figure 3.

Figure 12: Country Effects on Participation (Relative to the US)
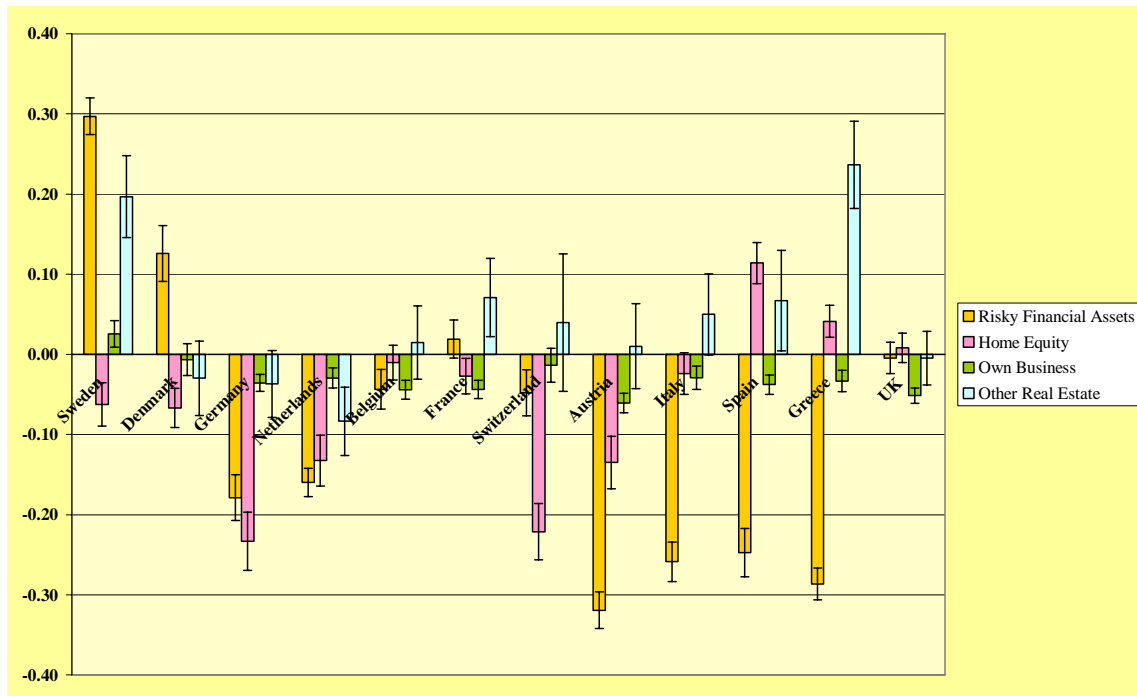
Notes: See notes to Figure 3.

Figure 13: Counterfactuals on Risky Financial Wealth

US - DK

US - DE

US - NL

FR-Unweighted!

US - FR

US - CH

US - AT

US - IT

- — — coefficient effects
- —··— covariate effects
- ——— actual difference
- ········ zero line

US - ES

- — — coefficient effects
- —··— covariate effects
- ——— actual difference
- ········ zero line

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GR-Unweighted!

US - GR

US - UK
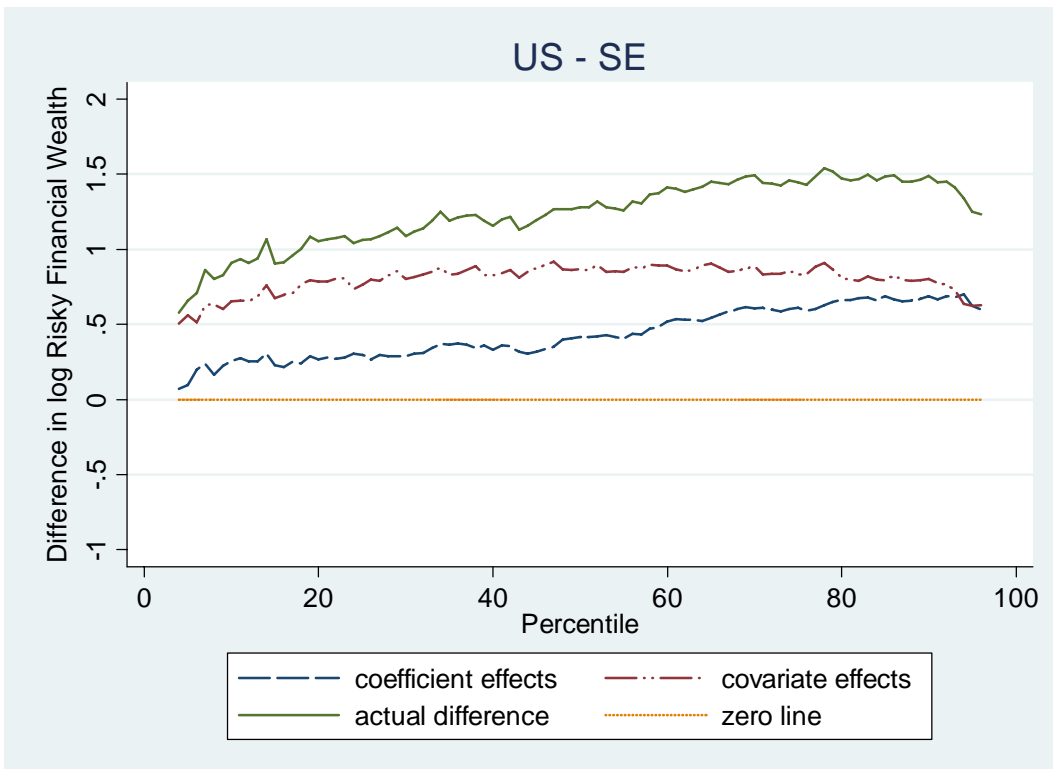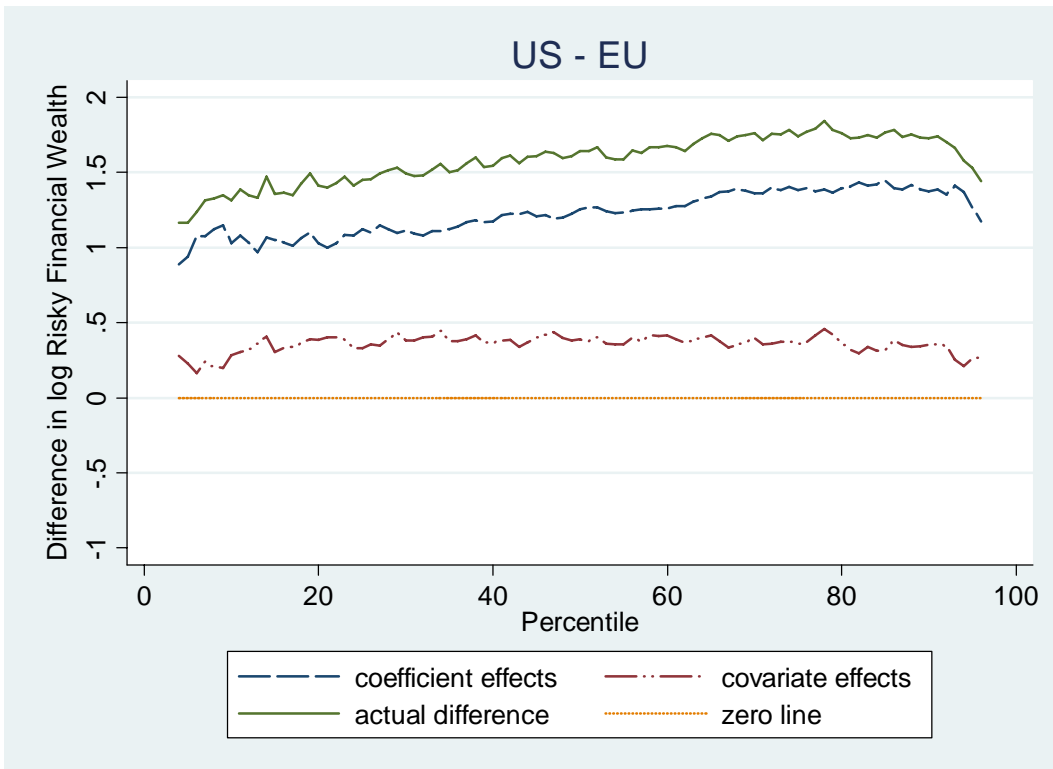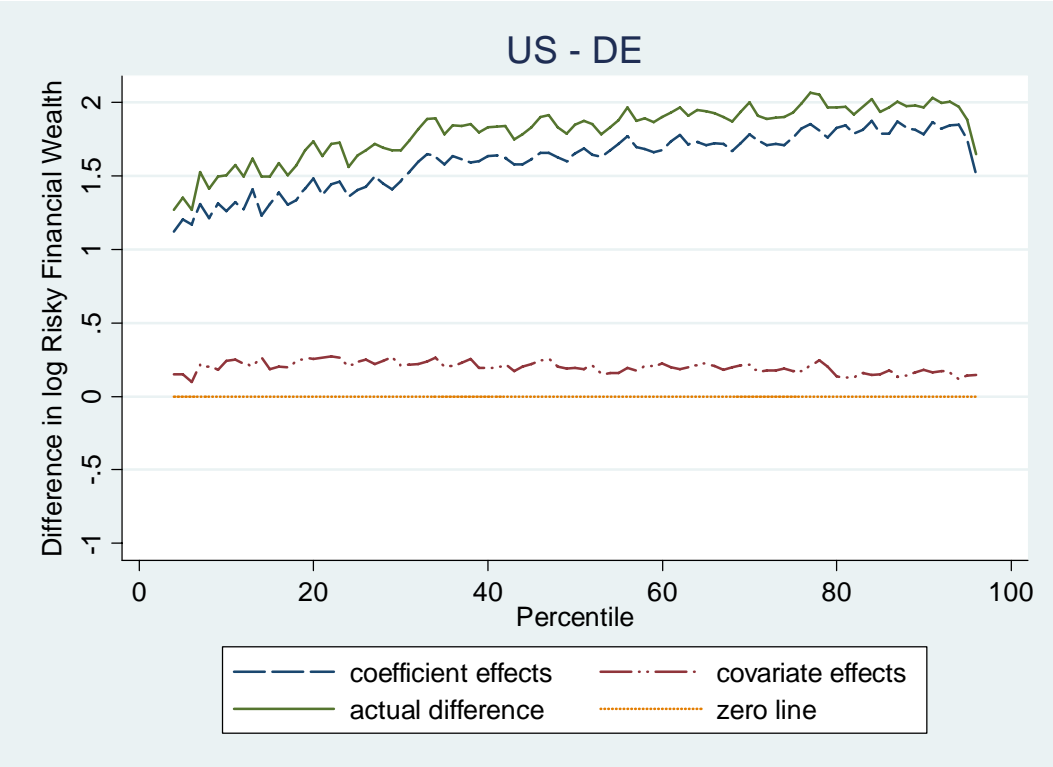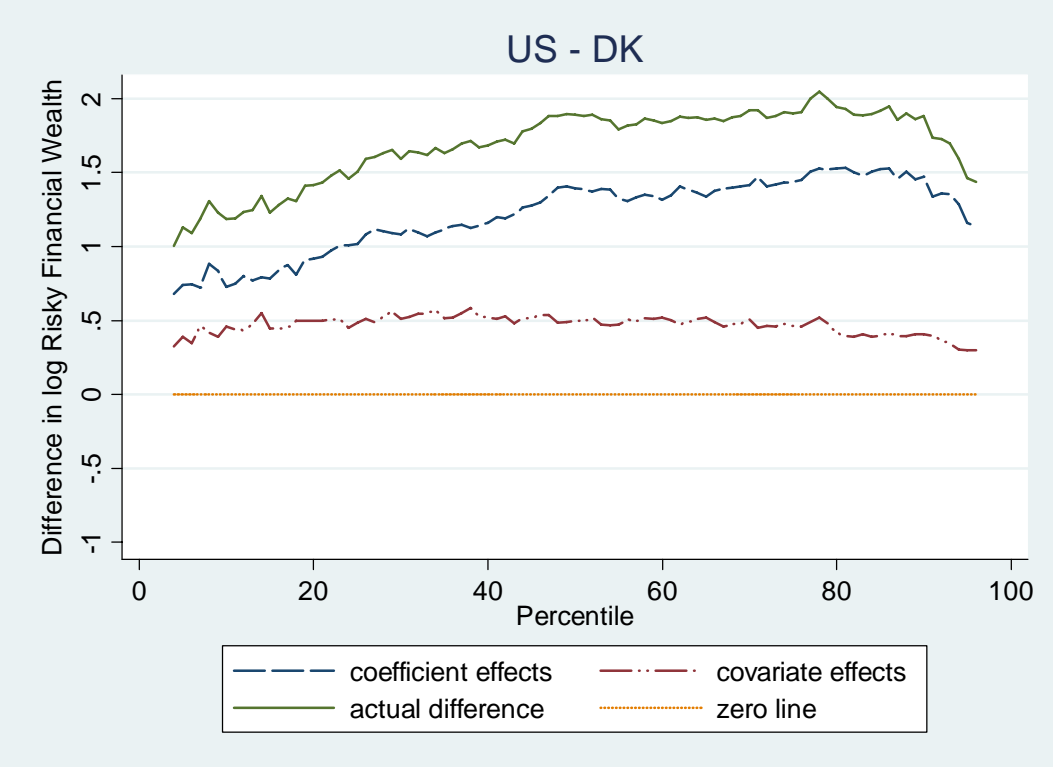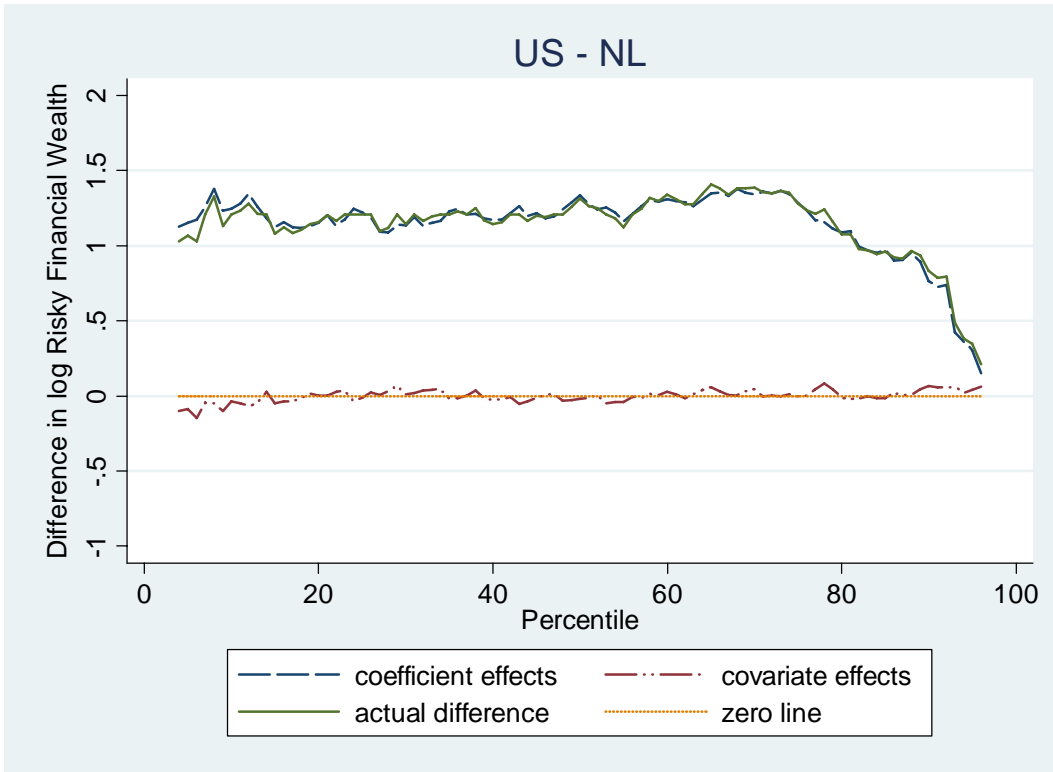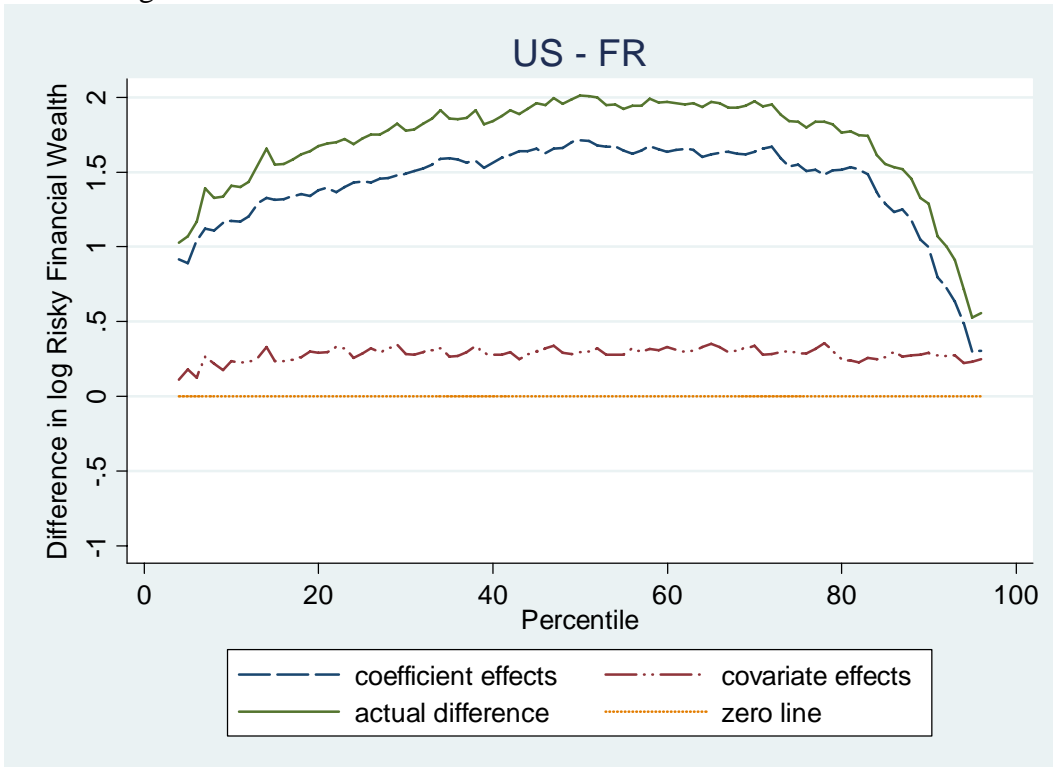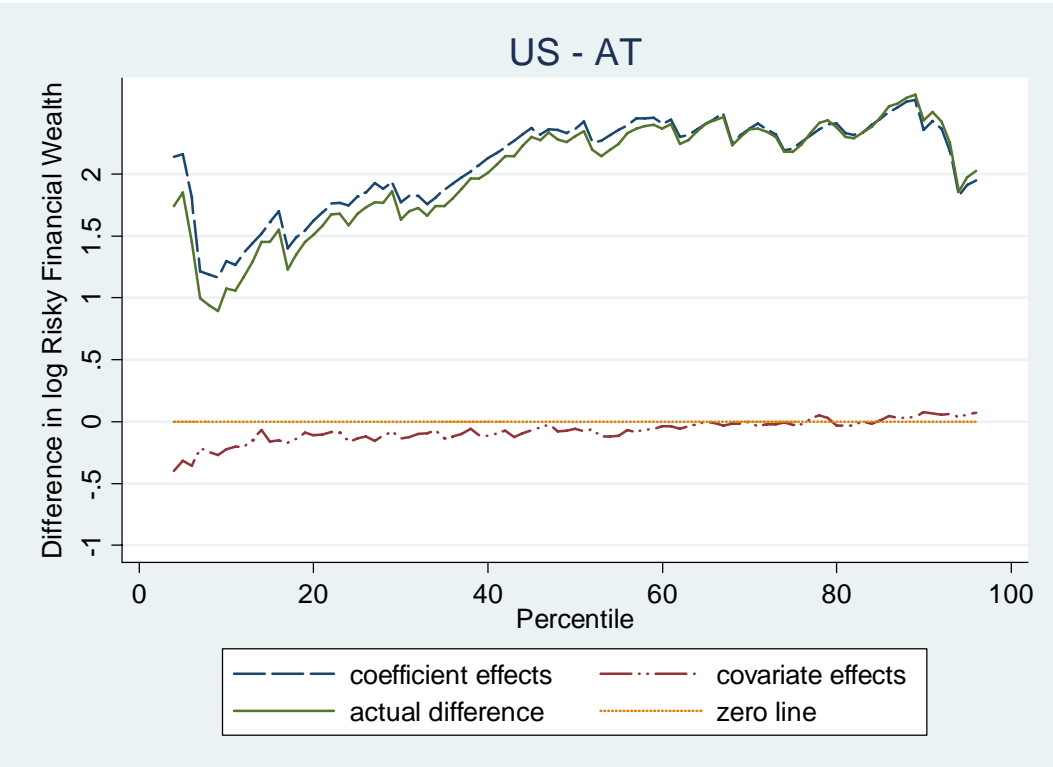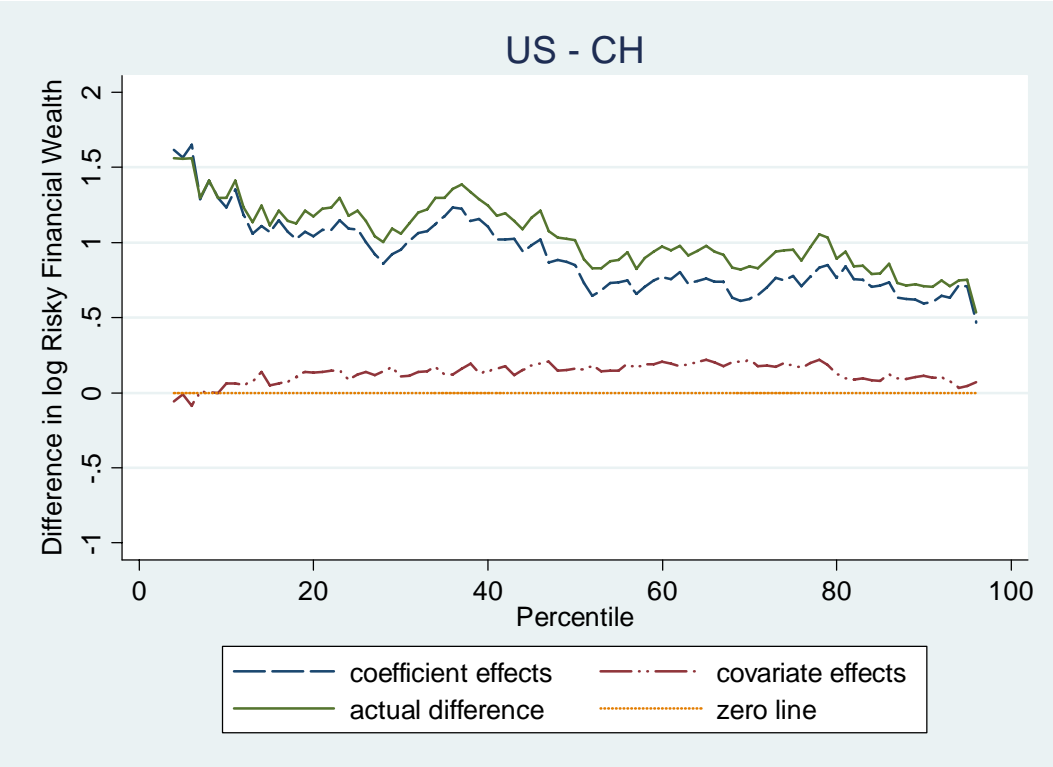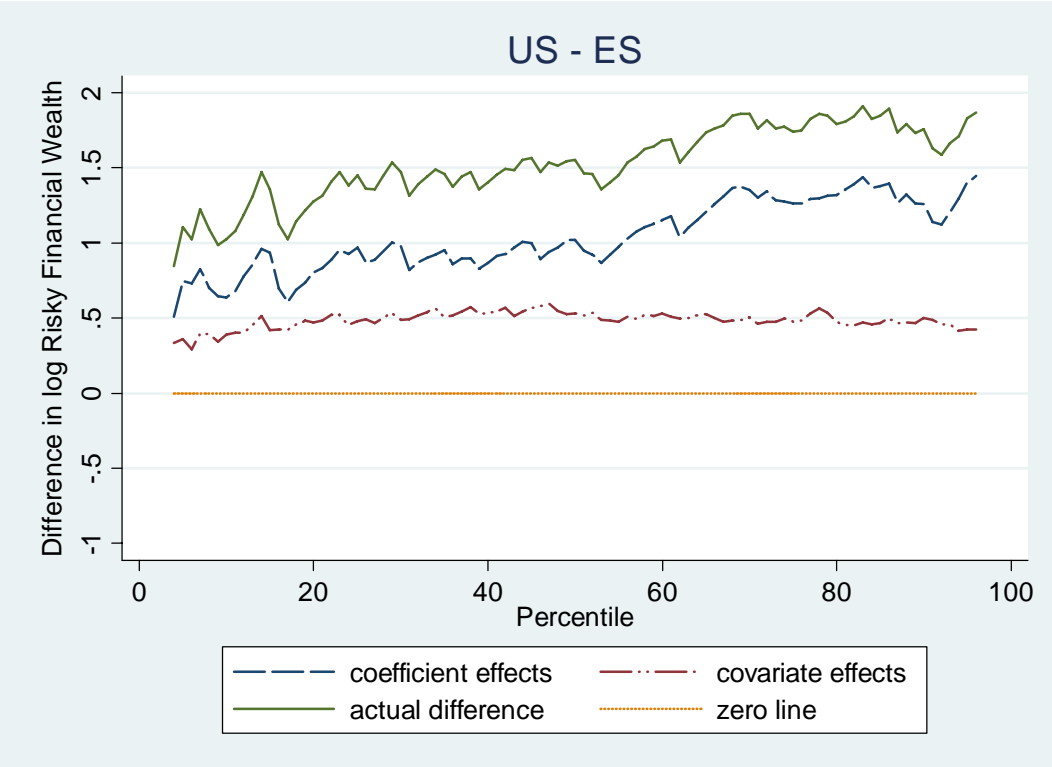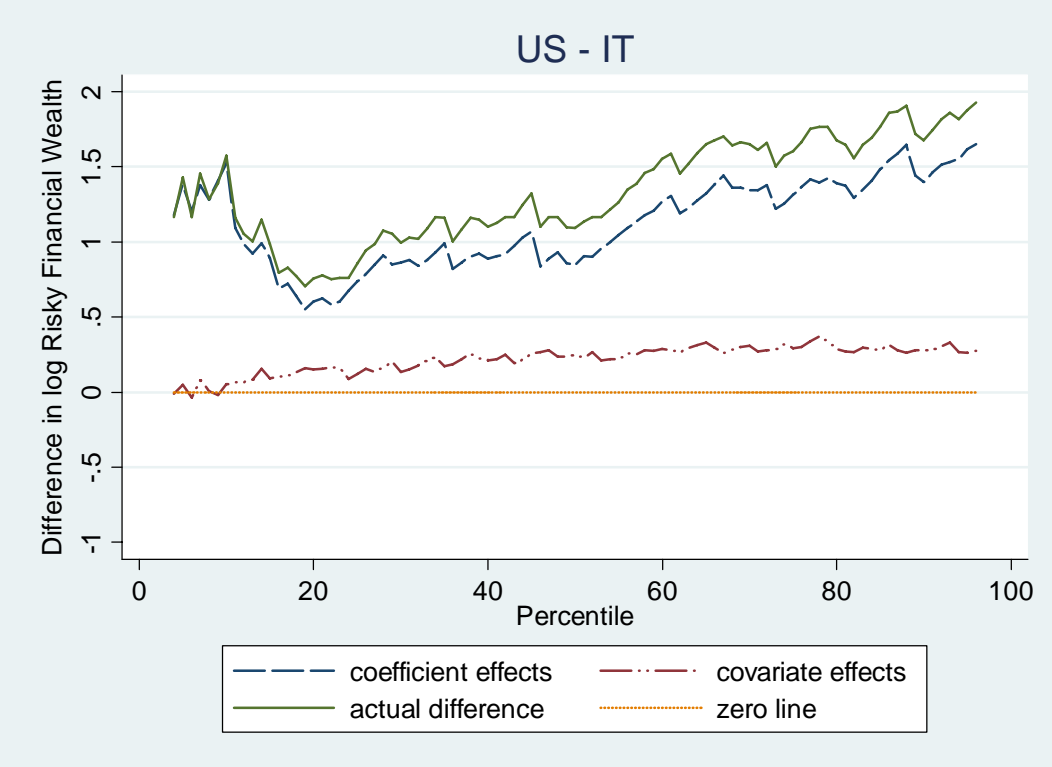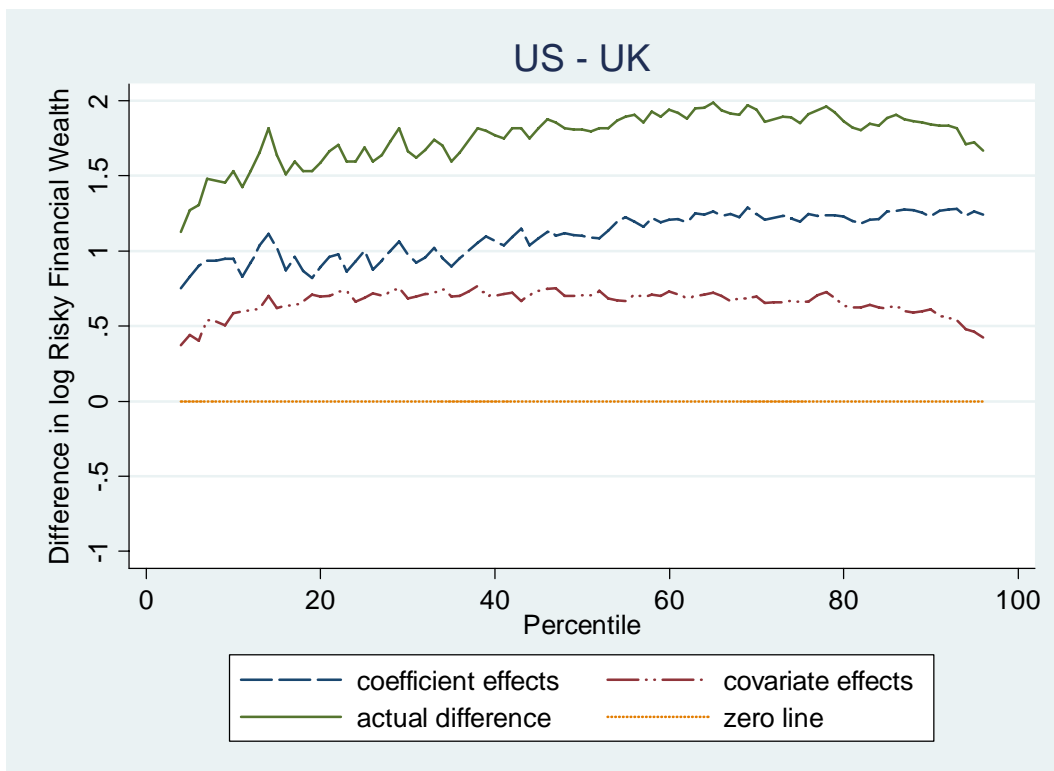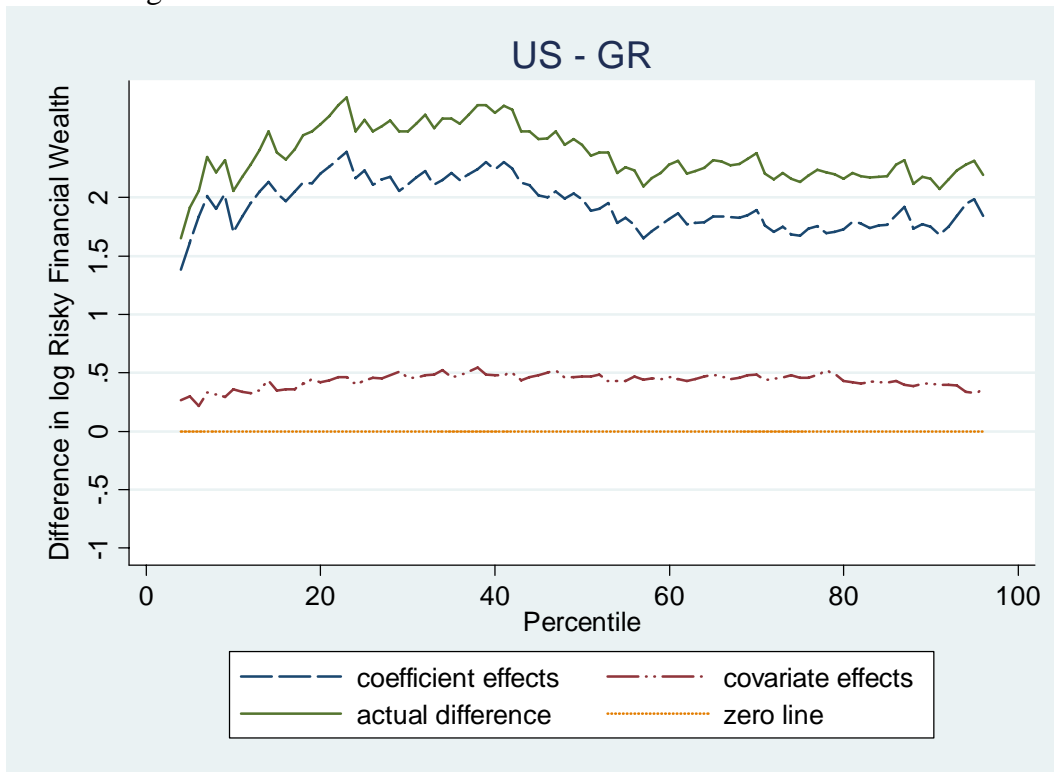
Figure 14: Counterfactuals on Home Equity (Net of Mortgages)

US - DK

US - DE

US - NL

BE-Unweighted!

US - BE

FR-Unweighted!

US - FR

US - CH

US - AT

US - IT

US - ES

GR-Unweighted!

US - GR
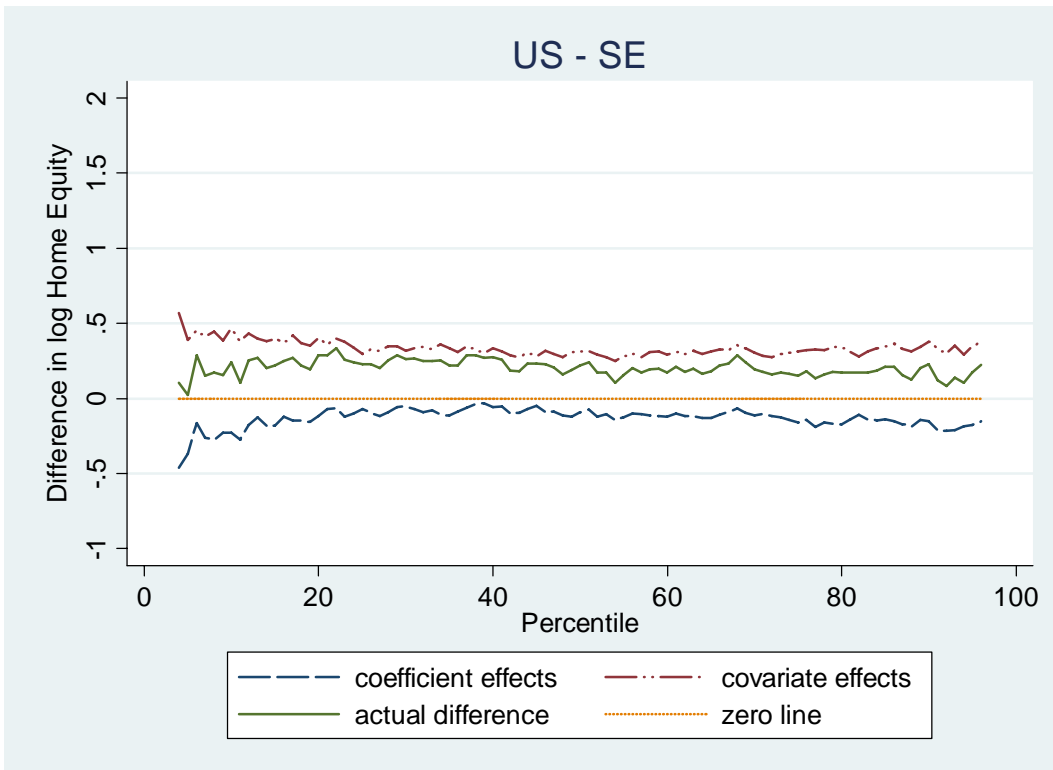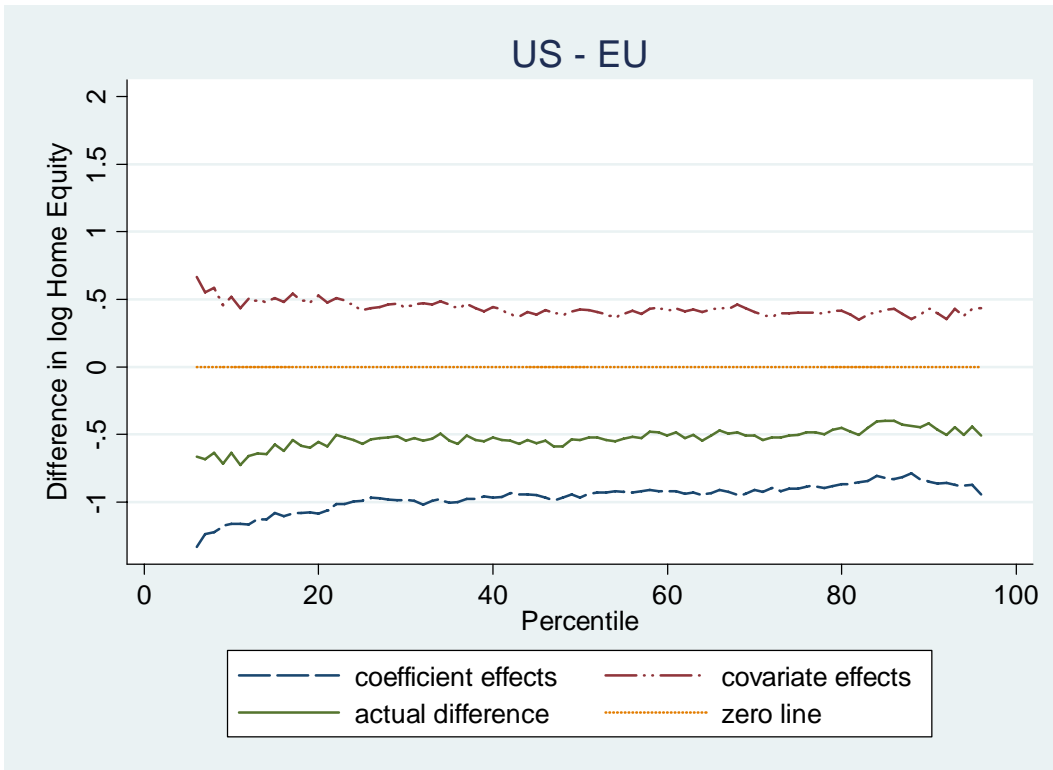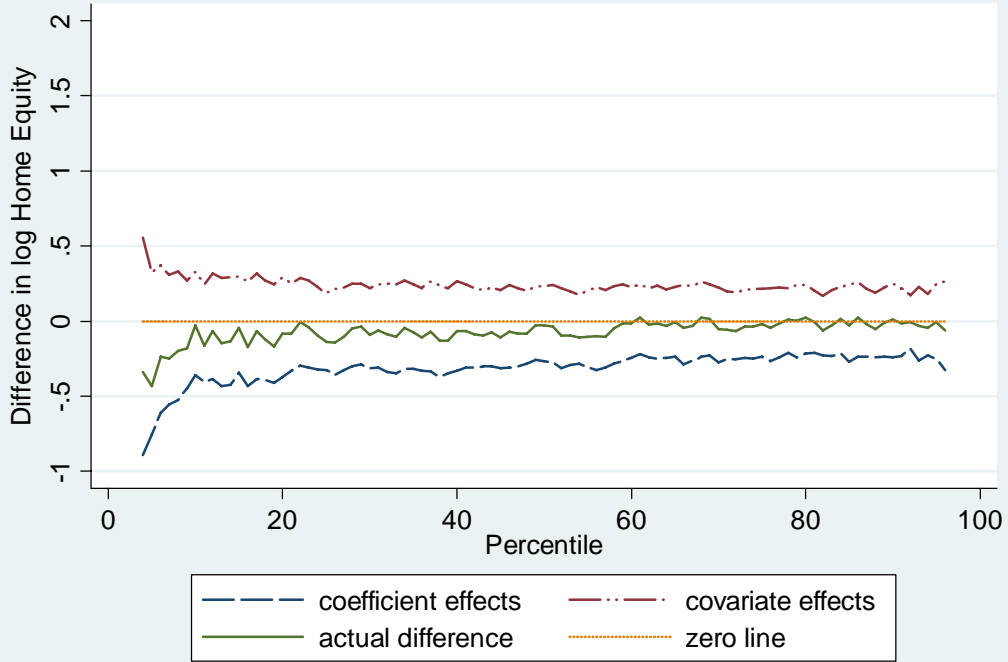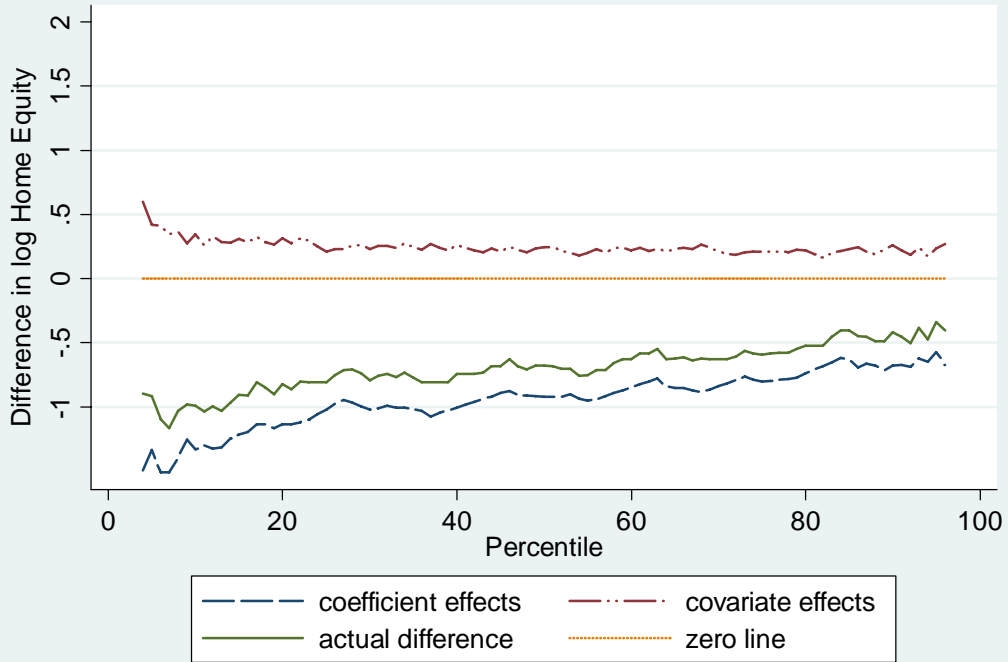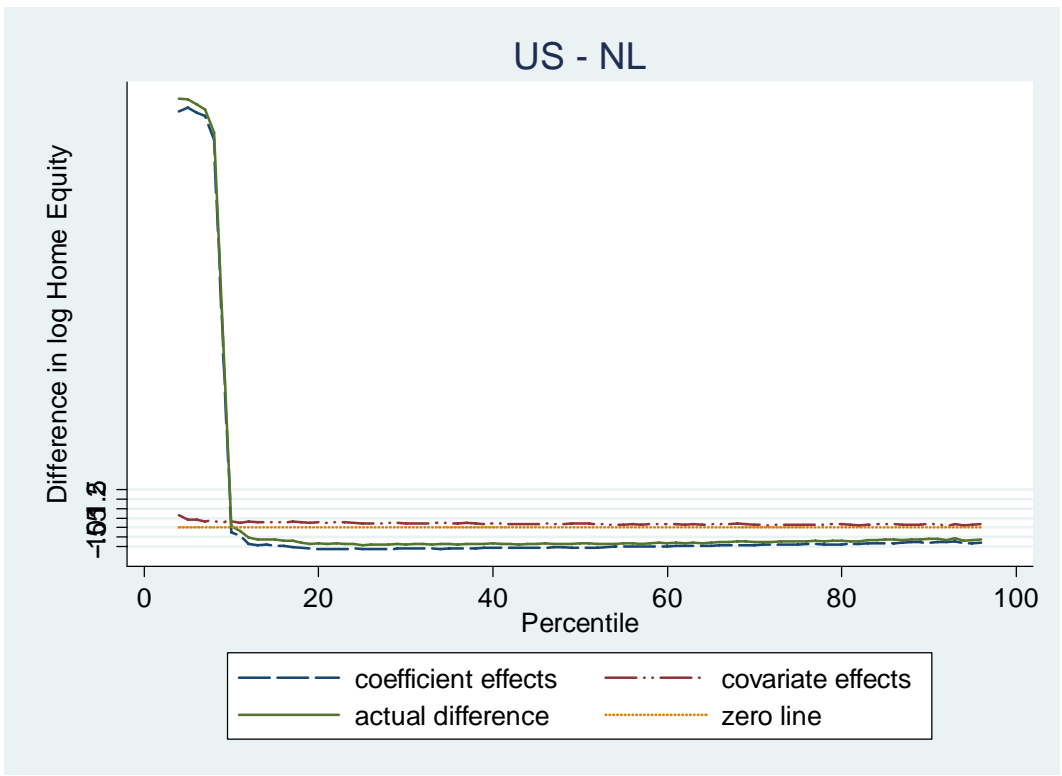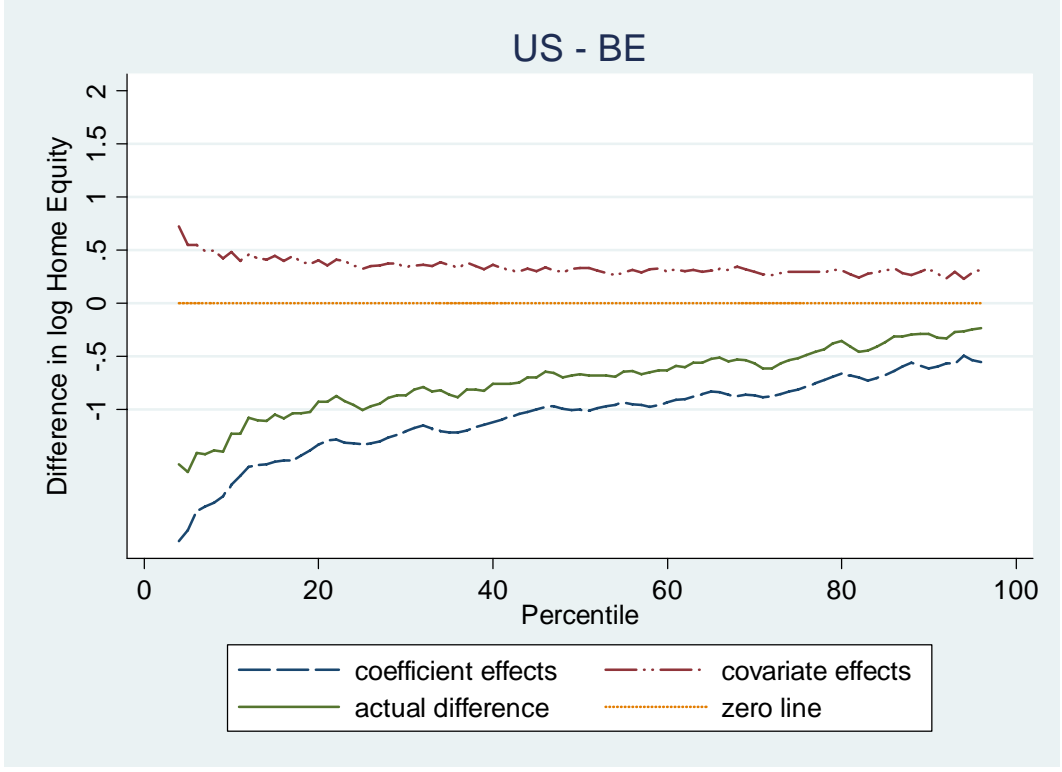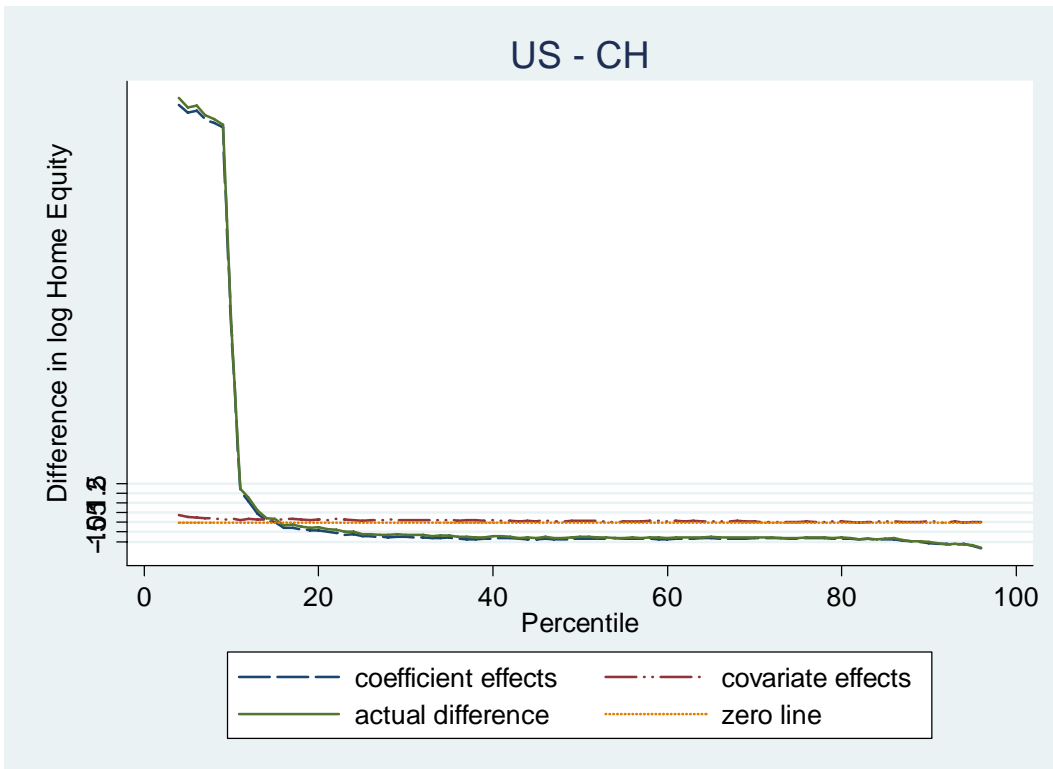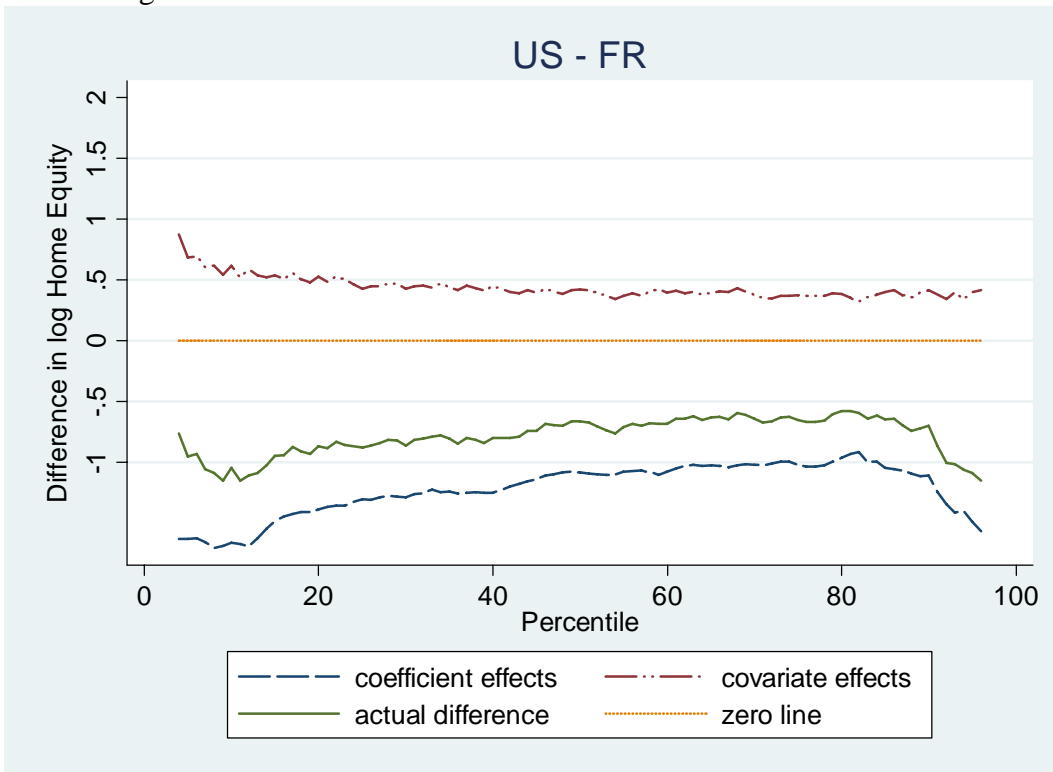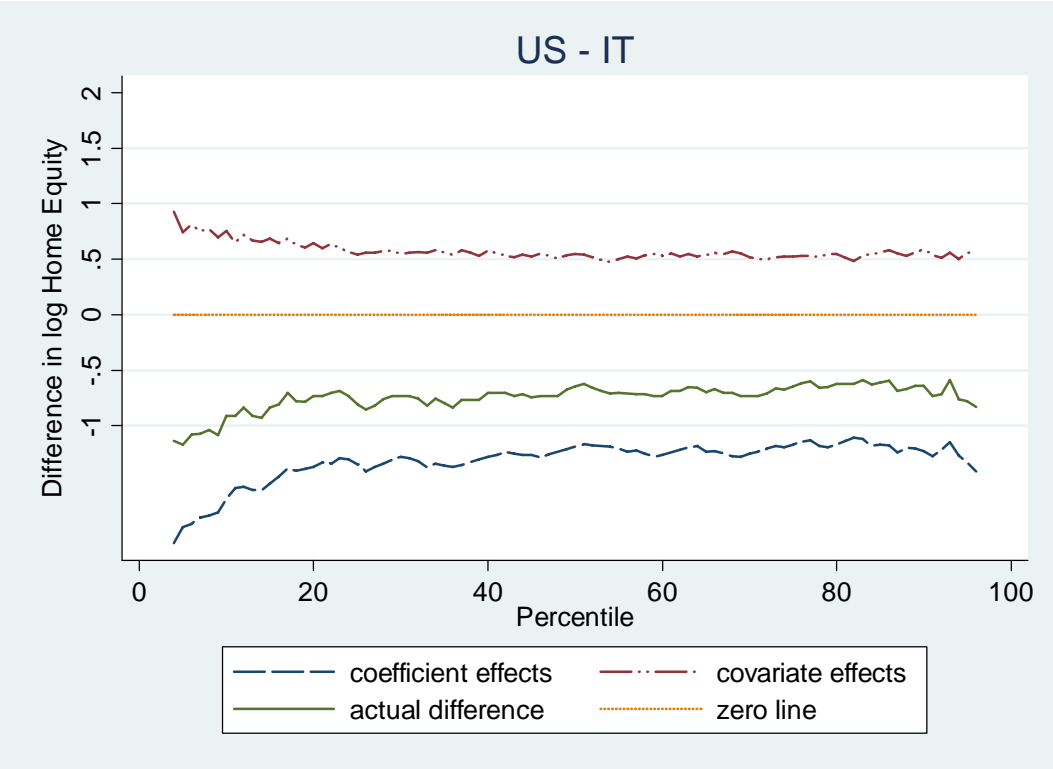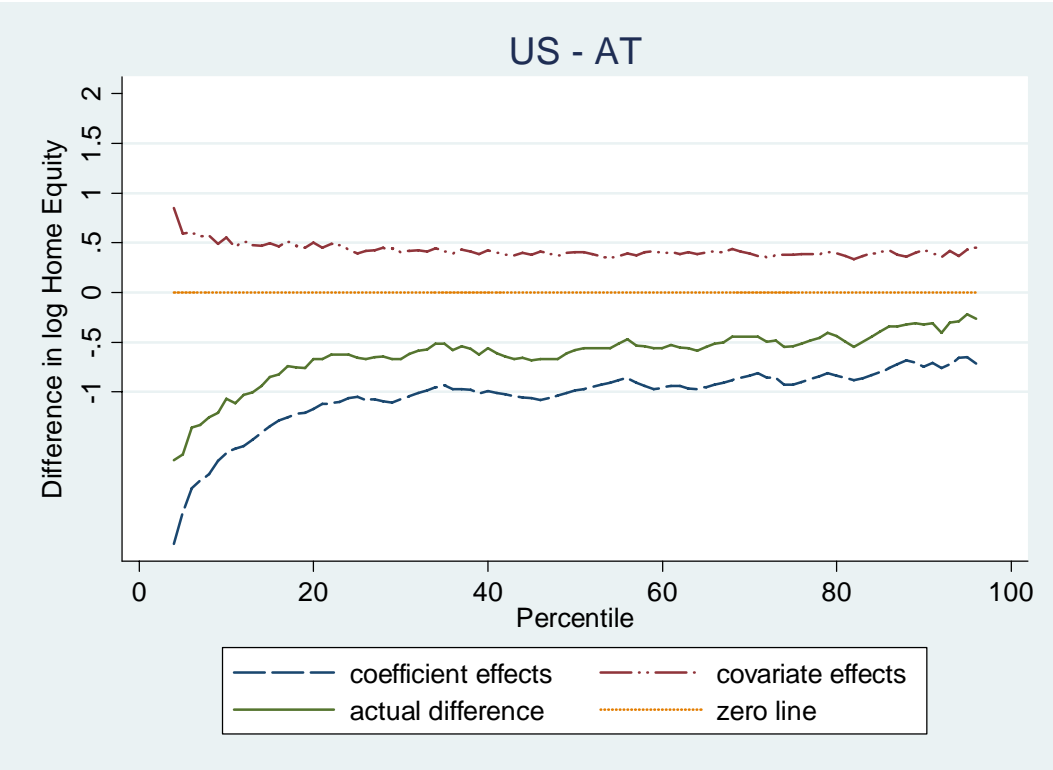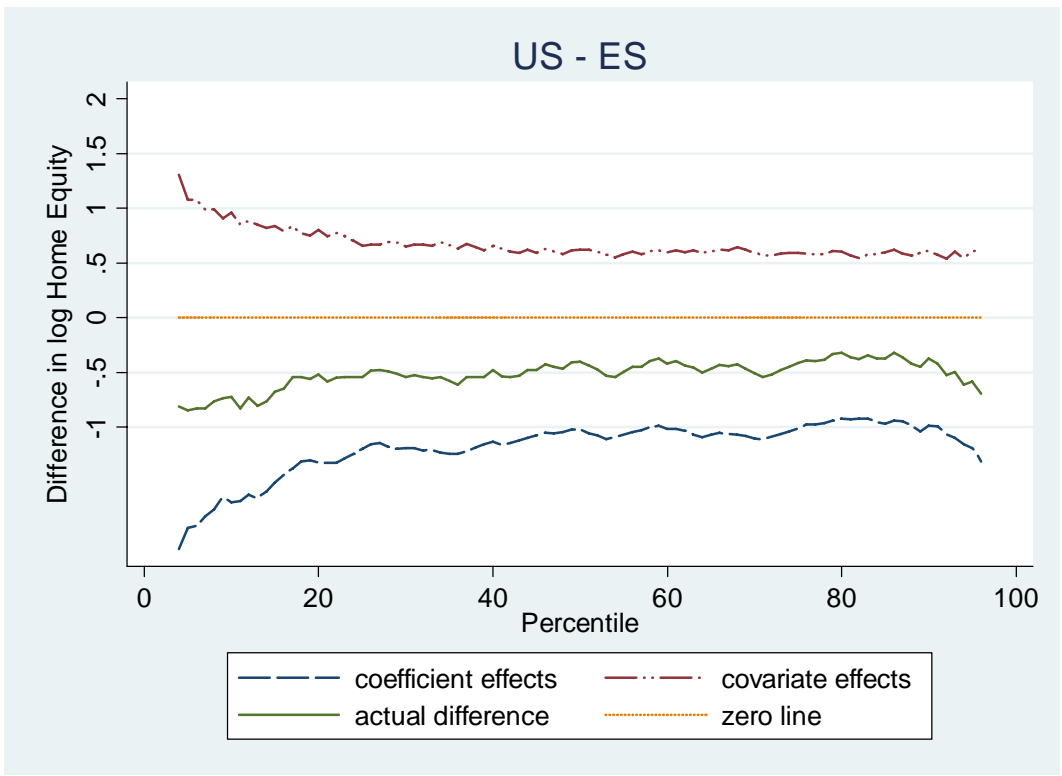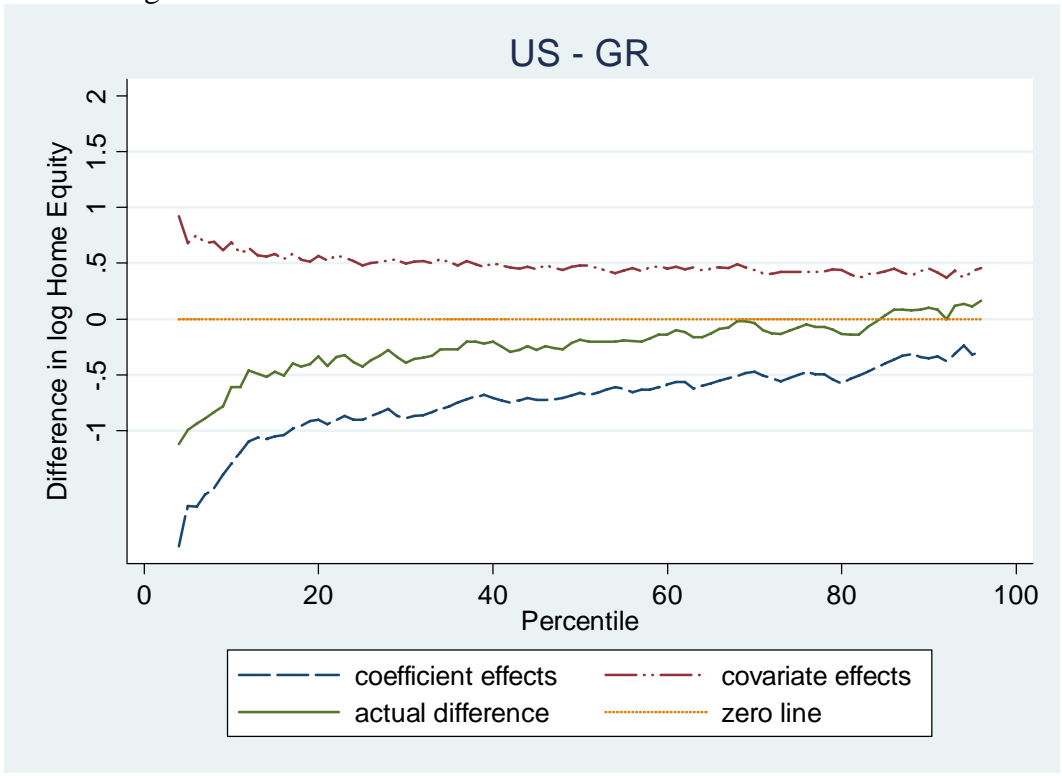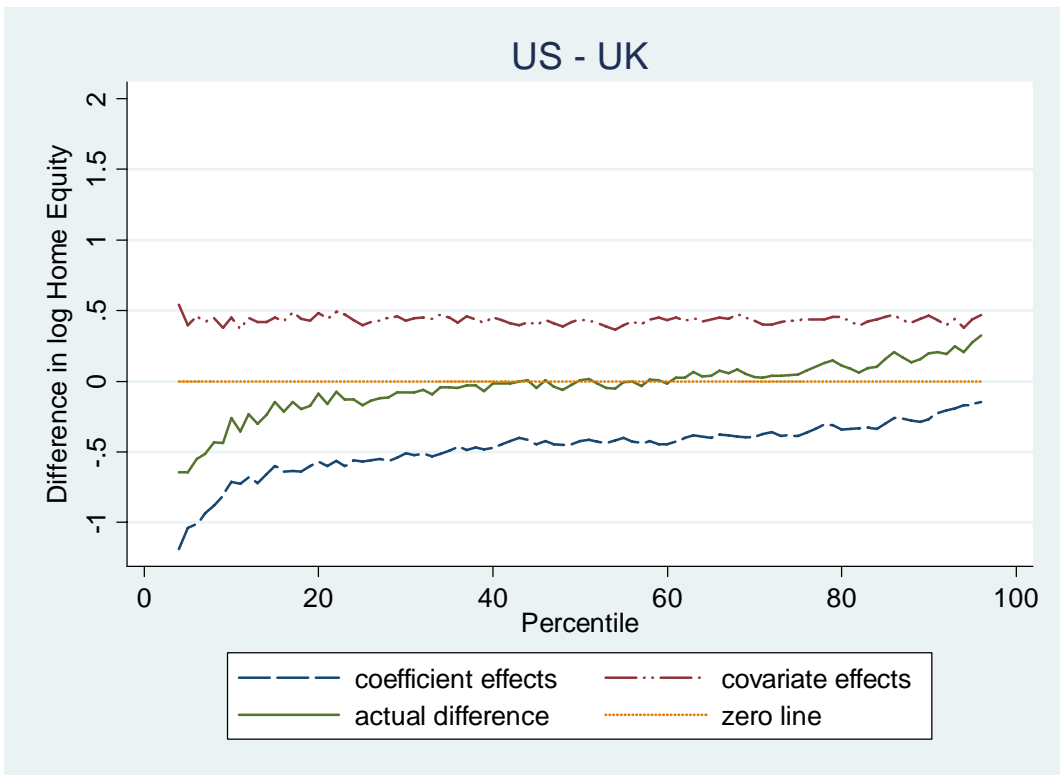
Figure 15: Counterfactuals on Gross Home Value
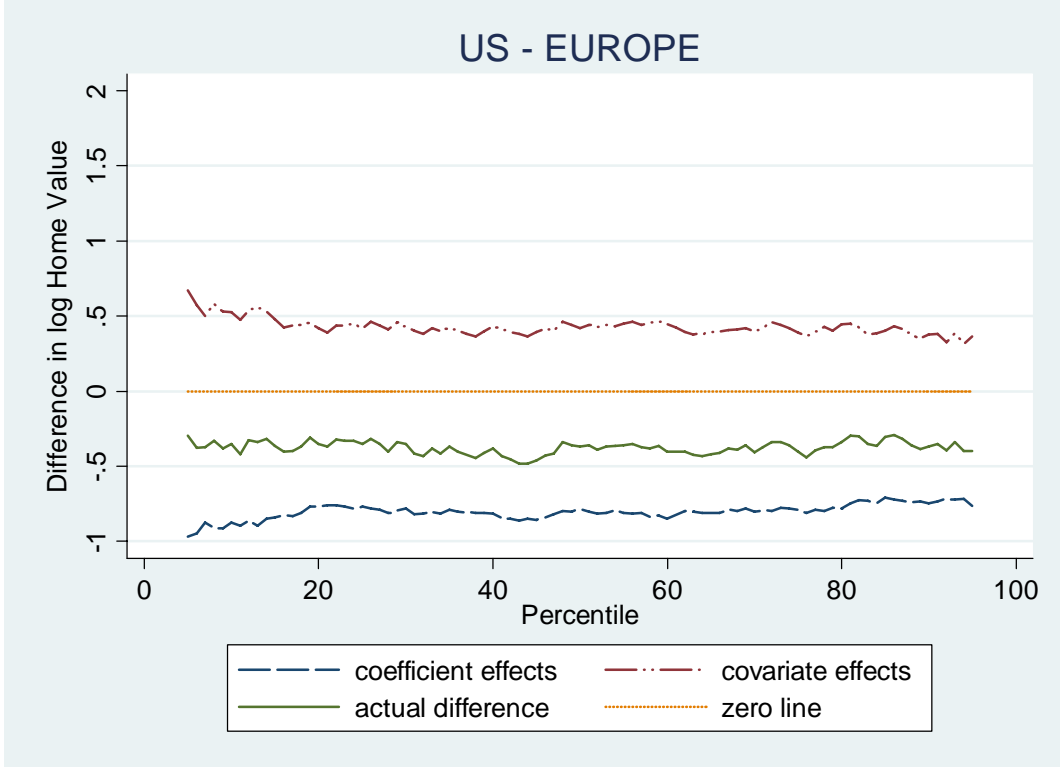
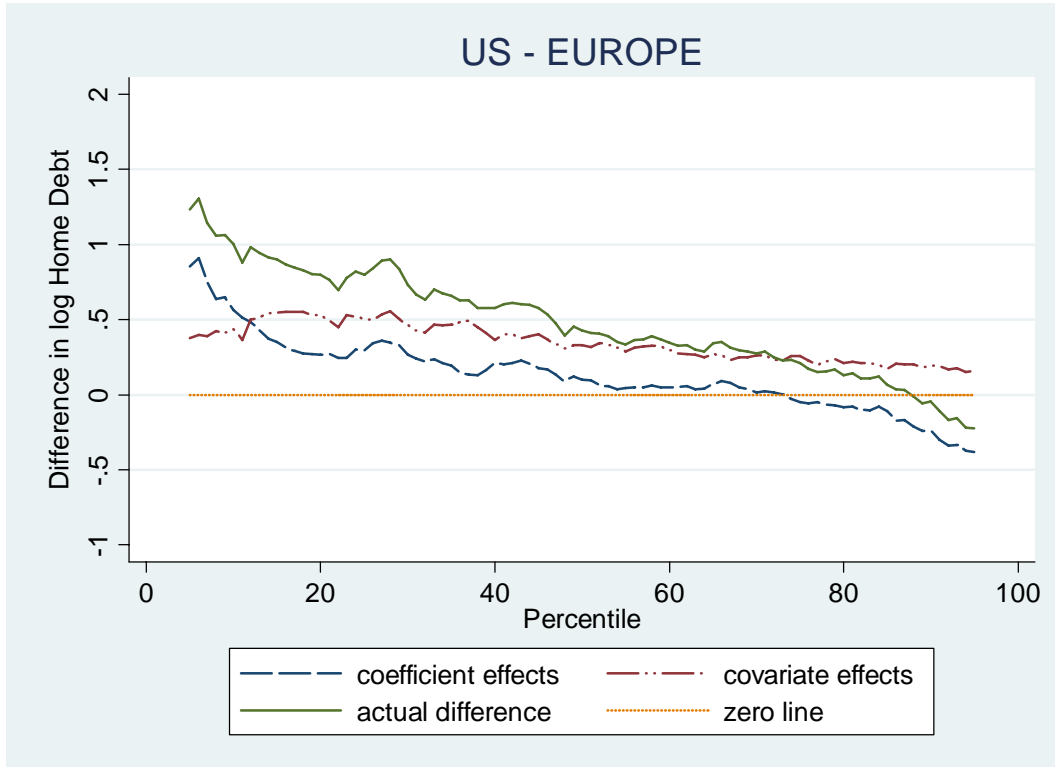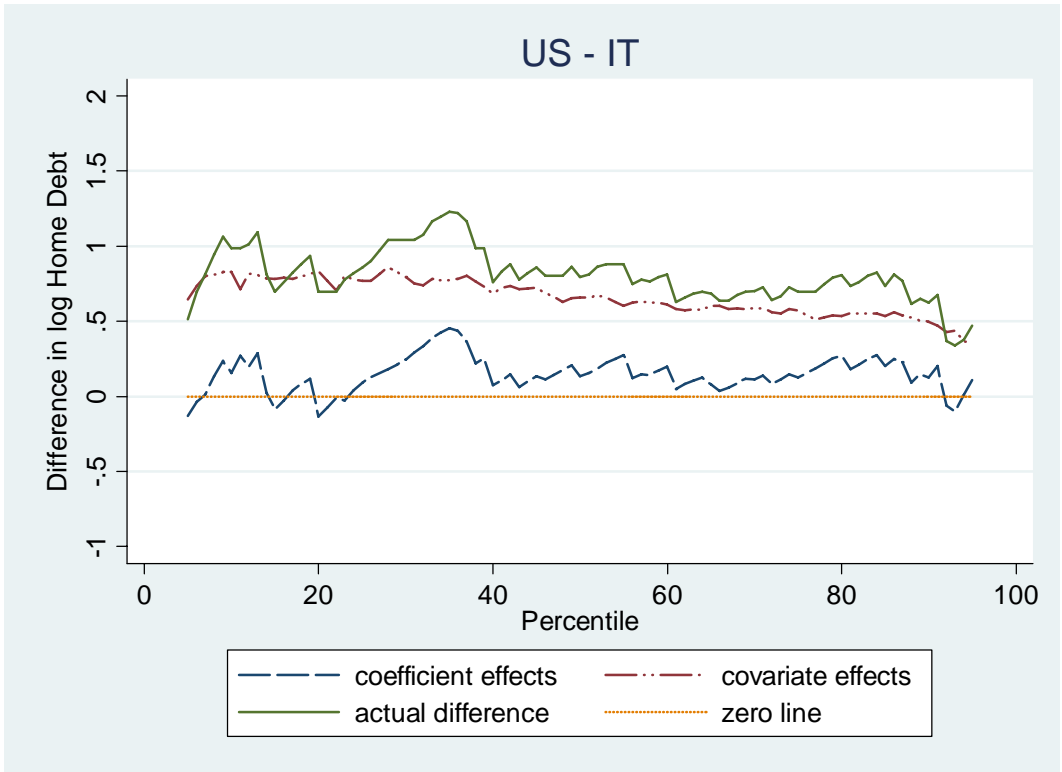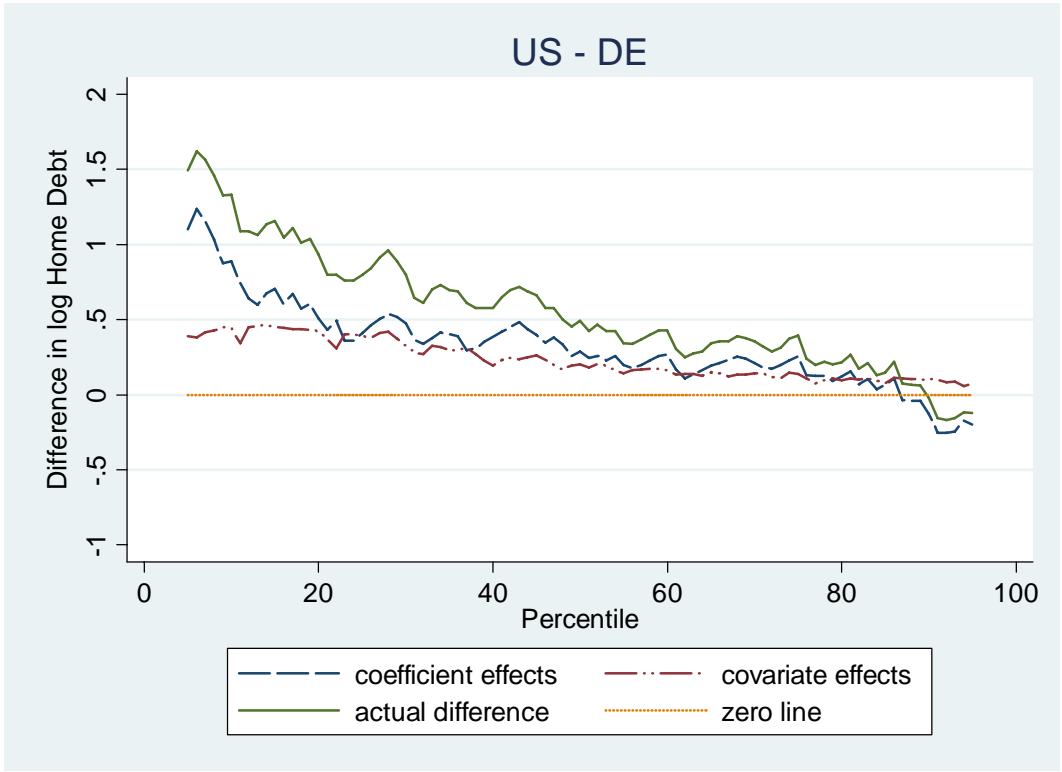**Figure 16: Counterfactuals on Mortgages**

US - DE

Difference in log Home Debt

coefficient effects — covariate effects
actual difference — zero line

US - IT

Difference in log Home Debt
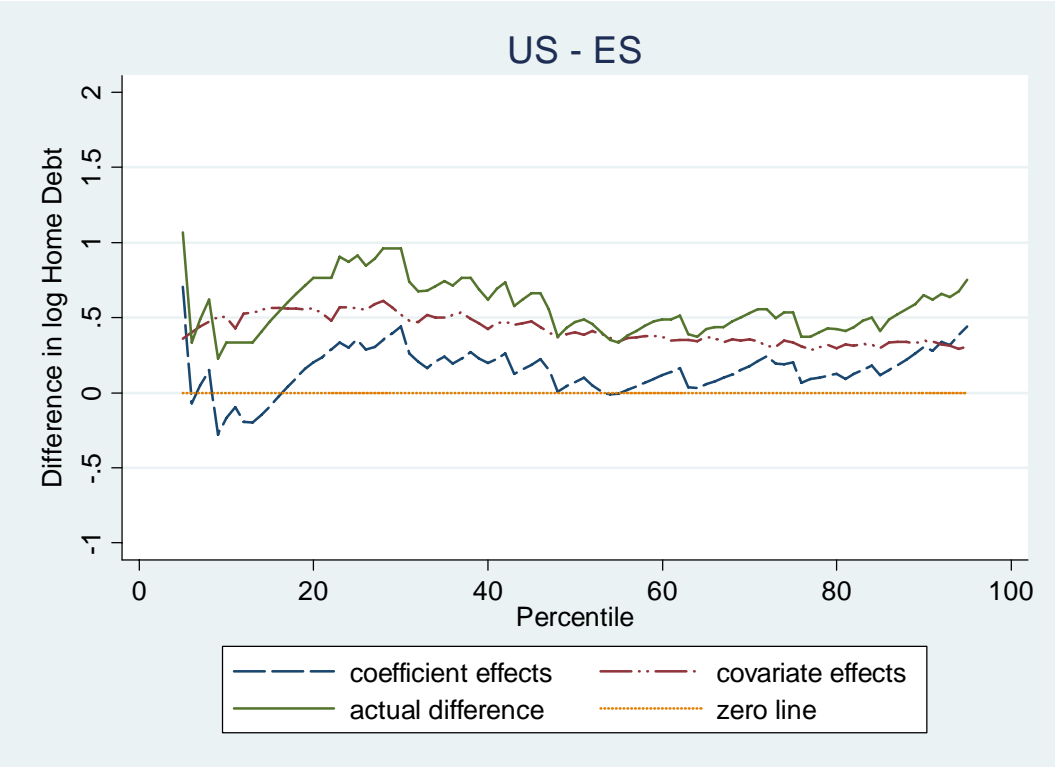
coefficient effects — covariate effects
actual difference — zero line

US - ES
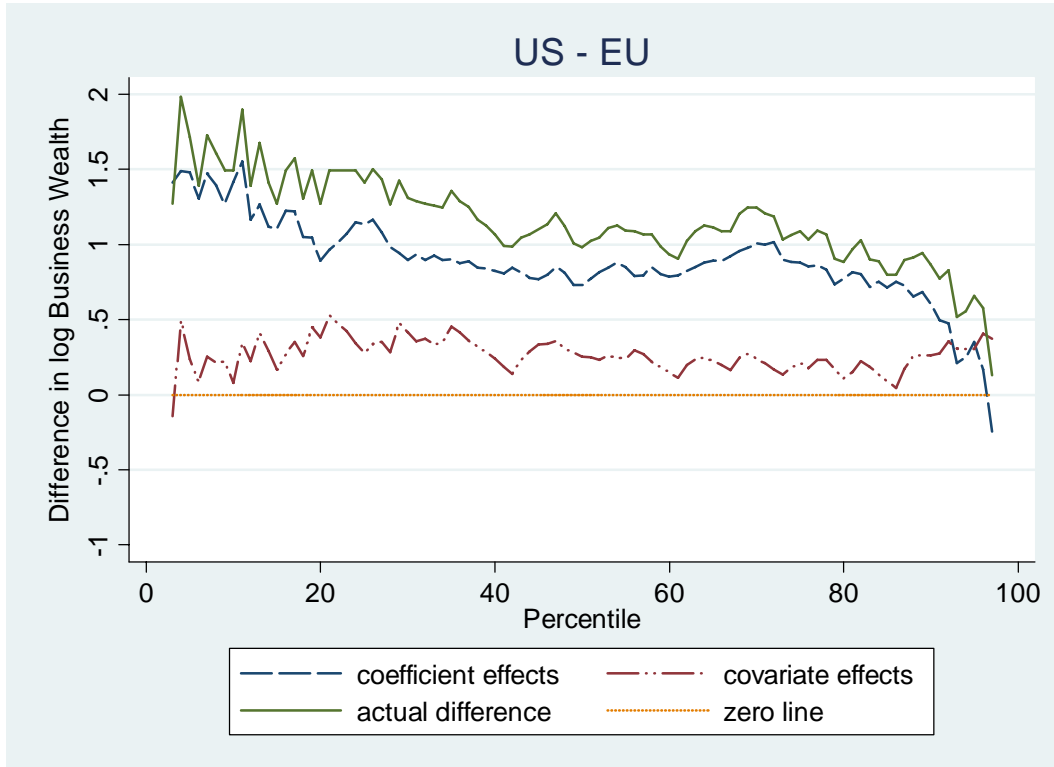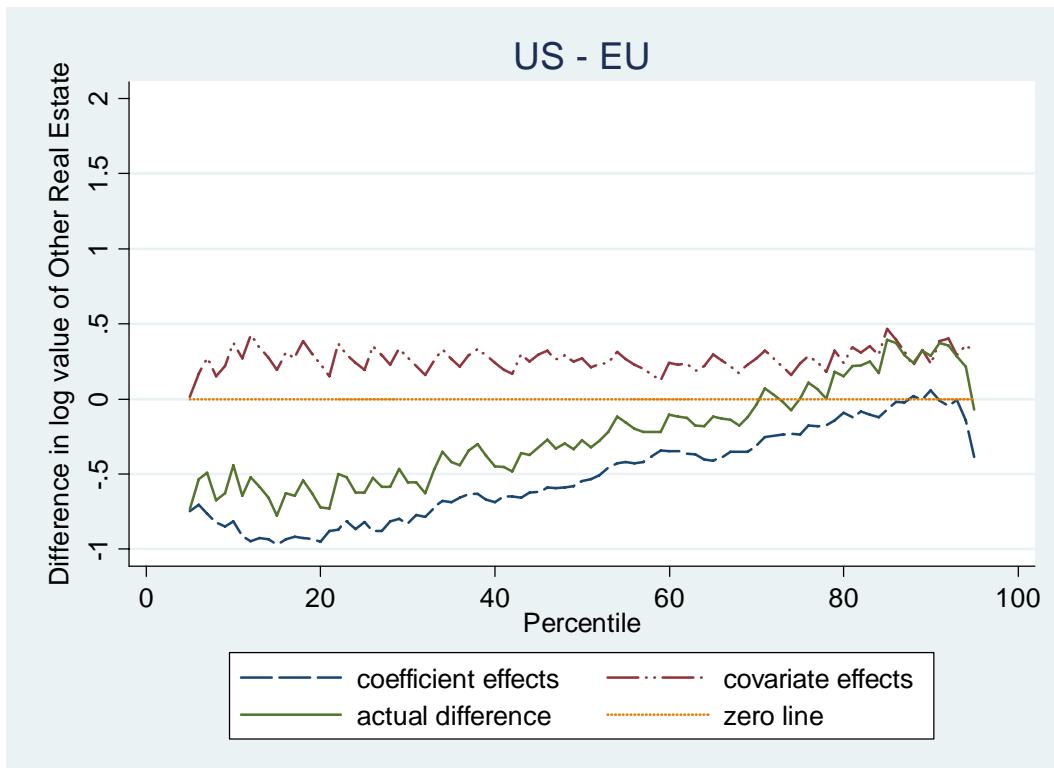

US - UK
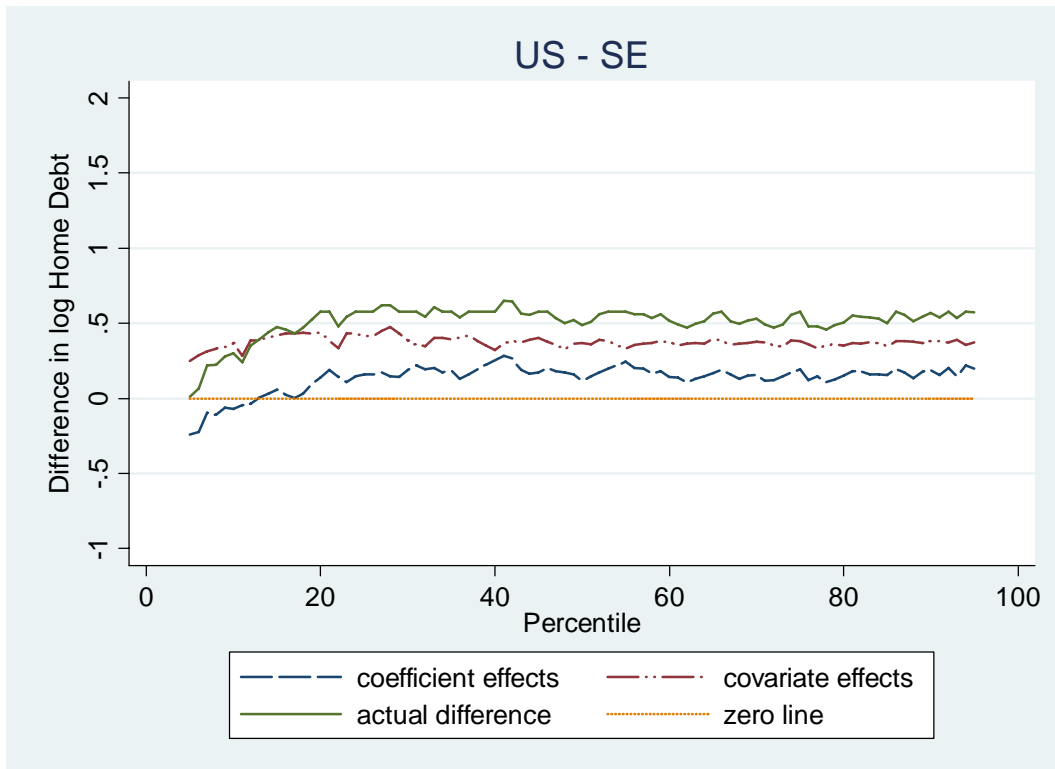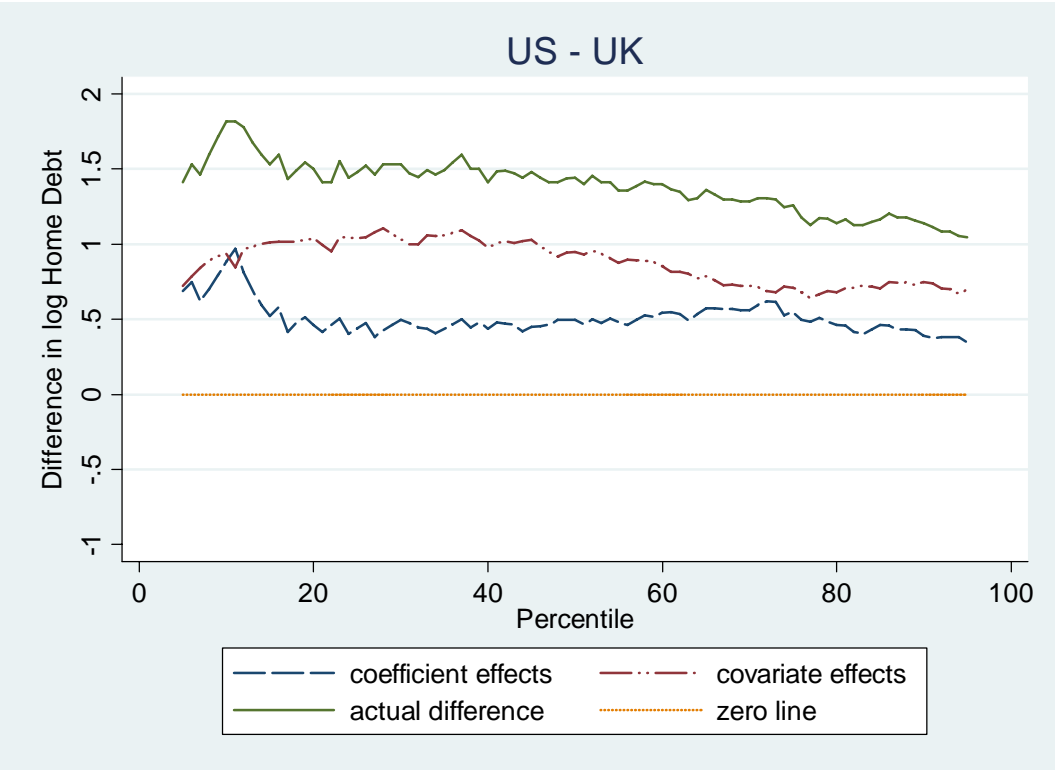
Figure 17: Counterfactuals on Private Business Wealth

Figure 18: Countefactuals on Other Real Estate

Endnotes

[1] The 'unit' increments used to calculate the marginal difference in the four continuous variables are: for age 1 year, for recall score 1 point, for expectation to give a positive bequest 10%, and for household size one member.

[2] This says nothing, of course, about the *type* of private business one owes. Indeed, it may mean that there is enough variation in business types to match every background, so that the effect of the college degree vanishes.

[3] The effect on other real estate is insignificant in Germany and the Netherlands.

[4] In unreported results, we have also considered the effect of belonging in any of the remaining three quartiles. We have found those effects to be largely insignificant or small, at least in comparison to the reported effects of being in the top quartile. Results for the other quartiles are available on request.

[5] We do not report findings for own business, because we exclude occupational status from the regressions for business ownership to avoid endogeneity.

[6] Regressors used in quantile regressions (estimated over owners of the particular asset or debt in the US): 2nd order age polynomial, gender, household size, education (LTHS: high school dropout; HS: high school degree; COL: College degree), recall ability, self-reported bad health (includes responses 'fair' and 'poor' in HRS), work status (retired/working/unemployed-other inactive), marital status (couple/widow/never married), subjective probability to leave a bequest, whether provides help to relatives/neighbors, whether is involved in voluntary activities, income quartile, wealth quartile. The thresholds for income and wealth quartiles are defined for the base-country (US) over all elderly households. European households are then placed in quartiles according to those thresholds. Finally, note that no weights are available for Belgium (the rich are over-represented in the Belgian sample).

[7] Since data from the US HRS and the UK ELSA refer to 2002, as opposed to 2004, they capture less of the adjustment to the downturn than European data. For example, we know from the 2004 SCF that participation rates in stockholding fell slightly between 2001 and 2004.

[8] Weights are used wherever they are available, but results are preliminary until the full set of weights is released.

[9] For the US we may also subtract the value of Home Equity Loans (HEL), however this should not affect the results we present since it involves rather small amounts and does not seem to affect the distribution of (net of mortgage) home equity. Since HRS and ELSA data refer to 2002, they do not reflect the continuation of the bubble in housing prices after that year. Preliminary data from 2004 HRS suggest an increase in housing values across all percentiles, but values in EUROPEAN countries are still higher producing a similar 'actual difference' (green line) to the one we present (subtracting HEL from the US data in a future version will further strength the gap). Data from France, Belgium and Greece are unweighted, producing results that may not be very representative for the higher percentiles.

[10] There is a growing discussion on these issues and an effort to provide codes that circumvent some inefficiencies of standard software packages (see, for instance, King et al., 2003; and Bartus, 2005). Brambor et al. (2005) discuss models with interactions and point to problems in empirical literature. We follow their notion in calculating the effect of the interacted S&P500 real growth rate.