Demographics and International Capital Flows: An Empirical Assessment*

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Abstract

This paper empirically investigates whether shifts in demographic structure have an impact on cross-border capital flows. Country-level panel data with global coverage is utilised in fixed effects regressions. Demographic variables are instrumented by their predicted values, which are calculated using a shift-share methodology. Local projections estimates complement the results with a dynamic perspective. The main finding is that there is a persistent positive relationship between a country's old-age dependency ratio and its current and financial account balance – suggesting that population ageing increases net capital outflows. From the perspective of the current account, the mechanism is increased national saving, primarily by households, and exports. From the perspective of the financial account, the increased net outflows are happening primarily through a direct investment channel.

Keywords: population ageing, FDI, saving, current account.

JEL classification: F21, J11, F30, F23.

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1 Introduction

As developed countries are ageing and developing countries are continuing to go through the demographic transition, global demographic conditions are constantly shifting. This phenomenon has a large number of macroeconomic implications, e.g. for pension systems (Clements et al., 2014), growth, investment, real interest rates (Aksoy et al., 2019; Gagnon et al., 2021), and the natural rate of interest (Eggertsson et al., 2019). Demographic shifts can also plausibly affect capital flows: for instance, an ageing population can increase aggregate saving due to life-cycle effects, while domestic investment can decrease due to low population growth. The combination of high saving and low investment can increase the current account balance and thus net capital outflows.

This paper examines empirically whether demographic shifts indeed affect capital flows, what dimension of demographics matters for capital flows, and what the exact mechanisms are for the capital-flow effect of demographics.

The empirical strategy involves the use of country-level panel data with country and year fixed effects, where the outcome variables are measures of capital flows and the explanatory variables of interest are measures of demographics. Demographic measures are instrumented using a shift-share instrument. The contemporaneous panel data setting is also extended into a local projections set-up to estimate the dynamic effects of demographics on capital flows. The instrumental variables for demographic measures are constructed by projecting a country's initial demographic structure from 1980 forward into the future using regional fertility and mortality rates. Regions follow the United Nations' definition and they largely coincide with continents. For instance, Ethiopia's demographic structure is forecasted using aggregate African fertility and mortality rates. These predicted demographic measures are used to instrument for their actual counterparts.

Instrumenting actual demographic measures is necessary, because OLS estimates of a regression of capital flows on demographic structure may suffer from omitted variable bias. For instance, country-specific macroeconomic shocks may affect both fertility and mortality, and capital flows. The idea behind the IV is that while actual demographic structure may be correlated with country-specific macroeconomic shocks as these affect national fertility and mortality rates, predicted demographic structure will not be because regional fertility and mortality rates are not going to be affected by country-specific macroeconomic shocks.

The main result of the paper relates the current and financial account balance to a country's old-age dependency ratio (OADR). The key finding is that there is a robust positive relationship between OADR and the current and financial account. Ultimately what this means is that an older a country's population is, the more net capital outflows it experiences. The size of older cohorts, whether captured by OADR or the share of 65+ year-olds or 65-79-year-olds in the population, is found to be the most robust demographic predictor of capital flows. Other measures such as

the share of middle-aged or younger cohorts or the young-age and overall age dependency ratios do not seem to matter. Thus, it is the presence of older cohorts that gives rise to the relationship between capital flows and demographics.

The channels behind this relationship are explored in detail in the paper as well. It is found that population ageing increases domestic saving, which is consistent with the fact that wealth tends to peak between ages 65-75 (Kooiman et al., 2019; Bauluz and Meyer, 2024). Increased saving ultimately means lower aggregate consumption, which may explain the fact that ageing also increases exports by domestic firms, particularly of goods. While domestic saving increases, the paper finds only an insignificant negative effect on investment. The combination of these two findings of course indicates an increase in net capital outflows. Through what channels do these increased net outflows happen? The paper finds that the most important channel is increased net outflows in direct investment, particularly in the form of debt. This suggests that the key driver behind the increase in net capital outflows is increased foreign direct investment (FDI) activity by domestic firms. Net flows of portfolio and other investment do not respond significantly to population ageing. So overall, the key mechanism behind increased net capital outflows is domestic firms expanding their operations abroad possibly due to scarce labour supply or weak demand at home.

The paper is foremost related to the literature on the effect of demographics on capital flows. This literature primarily includes empirical and quantitative papers. The vast majority of empirical papers use country-level panel data to estimate correlations between demographic variables and the current account: Higgins and Williamson (1997), Higgins (1998), Herbertsson and Zoega (1999), Gerigk et al. (2018), and Koomen and Wicht (2020) essentially all find that the share of approximately 40-64-year-olds is positively associated with the current account. Cohorts in their 50s have the strongest effect. Higgins and Williamson (1997) and Higgins (1998) also decompose the effect into saving and investment with Higgins (1998) finding that the result is primarily explained by a negative effect on investment. These empirical studies, however, are correlational and do not include a full set of country and year fixed effects either. One exception to this rule is Lane and Milesi-Ferretti (2001) who do use country and year fixed effects, but their dependent variable is net foreign assets. They find a positive association between net foreign assets and the share of cohorts in their 50s.

The contribution of this paper to the empirical literature on demographics and capital flows is threefold. First, this is the first paper to go beyond correlations and causally identify the effect of demographics on capital flows. Second, this paper employs a more careful empirical set-up in other ways than most existing papers, particularly with the introduction of both country and time fixed effects as well as the examination of dynamic effects using local projections. Third, the existing literature's focus has not gone beyond the aggergates of the current account, saving, investment, or

net foreign assets. In contrast, this paper looks at the impact of demographics on capital flows at a more granular level by considering the various components of the current and financial account to more accurately pinpoint the mechanisms behind the results.

The quantitative literature on demographics and capital flows has utilised methods such as overlapping-generations models (Miles, 1999; Brooks, 2000, 2003; Börsch-Supan et al., 2006; Brooks, 2007; Krueger and Ludwig, 2007; Attanasio et al., 2016; Auclert et al., 2021) and production function estimations (Lueth, 2008). The contribution of this paper is to use a purely empirical methodology with causal identification to study the link between capital flows and demographics. There are two key advantages to this method: first, it does not suffer from the simplifying assumptions often needed in the models; second, it allows for a more nuanced investigation of the mechanisms.

While this paper's focus is not the effect of demographics on trade, aggregate trade variables such as exports and imports are utilised in the paper when decomposing the current account impact. For this reason, the paper is also marginally related to the literature on the relationship between trade and demographics. Papers relating population age structure to the trade balance include Hill (1989) and Ferrero (2010) who find that age composition is an important determinant of the US trade balance, Pei (2024) who shows that a larger working-age population is associated with comparative advantage in capital-intensive sectors, and Sposi (2019) and Kopecky (2023) who find that an increased working-age population is associated with higher net exports. Further, Brakman et al. (2025) find a relationship between age structure and trade volumes, and Gu and Stoyanov (2019) find that ageing societies lose comparative advantage in skill-intensive industries. The contribution of this paper to the literature on trade and demographics is to causally document the big picture relationship between trade and population ageing, while also showing some of its causes (e.g. higher national saving) and consequences (e.g. higher net capital outflows due to FDI activity).

The rest of the paper is organised as follows. Section 2 presents the data and some descriptive statistics. Section 3 explains in detail the paper's methodology. Section 4 presents the paper's main results on the link between demographics and the current and financial account. Sections 5 and 6 explore the mechanisms behind the main results through the lenses of the current and financial account, respectively. Section 7 concludes.

2 Data

The two main sets of variables employed in this paper are demographic and capital flow variables. This section discusses the demographic data first, followed by the capital flow data, and concludes with the control variables used in the paper.

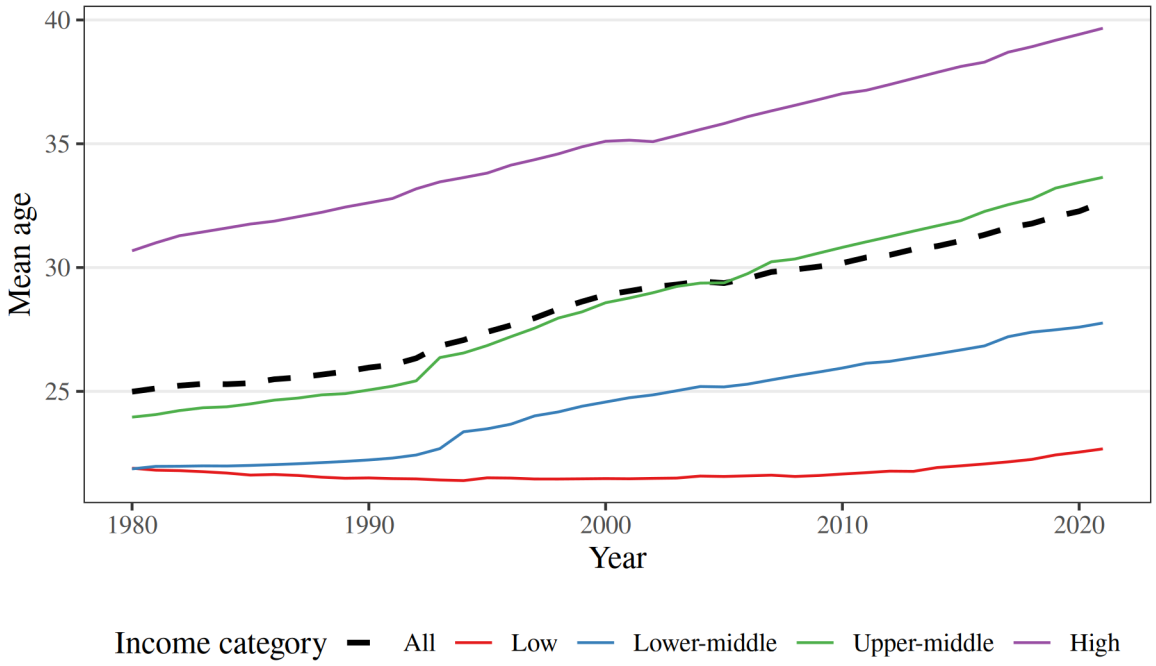


Figure 1: Mean age by country income group

2.1 Demographic Data

The source of demographic data is the World Population Prospects database by the United Nations (2022). This dataset provides population by single age (0-year-olds, 1-year-olds, 2-year-olds, etc.) by country and year from 1950 to 2021. The dataset is complete with no missing country-year observations. This data is then used to construct more aggregate demographic measures such as dependency ratios, cohort shares, and mean age. Dependency ratios measure the size of old (65+) and/or young (0-19) age cohorts relative to the working-age population (20-64). Cohort shares refer to the share of a certain age cohort (e.g. 20-34-year-olds, 35-49-year-olds, etc.) in total population. The baseline demographic measure in the paper is the old-age dependency ratio (OADR). However, other measures are considered in robustness checks as well.

To illustrate demographic data, Figure 1 shows that the global population has been ageing. Between 1980 and 2021, global mean age increased from 25.0 to 32.6 years. It is also apparent that this ageing is not uniform across the world. High and upper-middle income countries saw their mean ages rise further above the global average during this time period: the gap between high-income countries and the global average went from 5.7 to 7.0 years, while for upper-middle income countries it went from -1.0 to 1.0 year. Similarly, lower-middle and low income countries saw their gaps to the global average further increase in the negative direction: for lower-middle income countries the gap went from -3.1 to -4.9 years, while for low-income countries it went

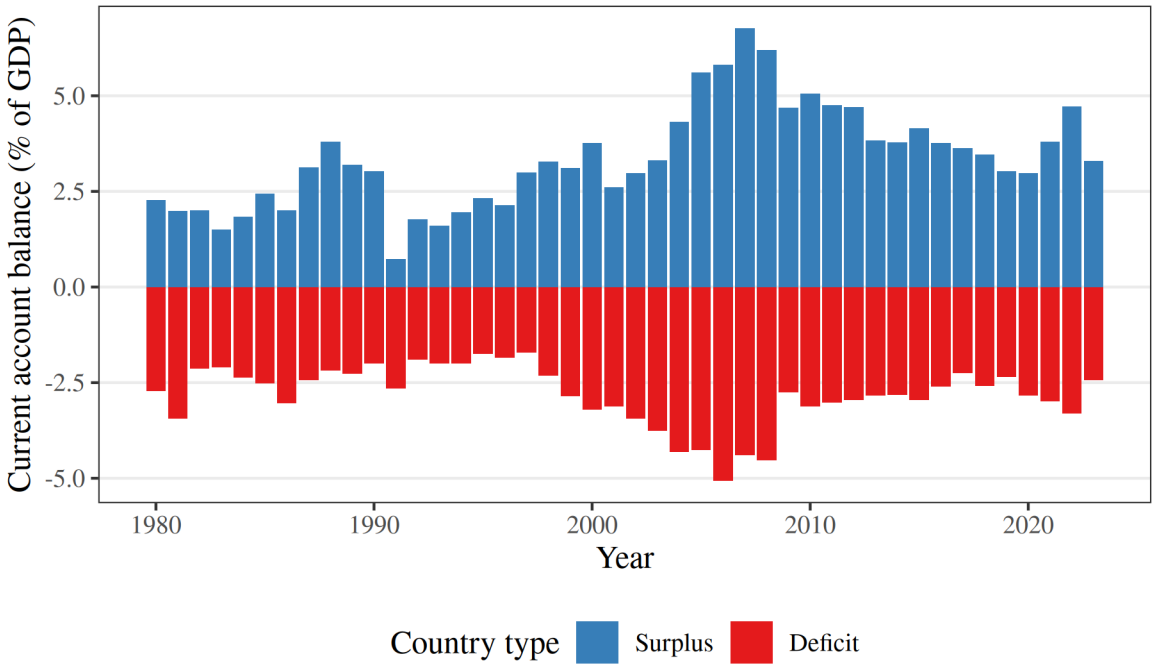


Figure 2: Global imbalances

from -3.1 to -10.0 years. Overall, these facts suggest that there has been a significant divergence in population age structure around the globe with richer countries getting relatively more older than less affluent countries.

2.2 Capital Flow Data

The primary source of capital flow data is the balance of payments dataset by the International Monetary Fund (2024). This dataset contains country-year observations on the components of the current account, financial account as well as the international investment position for 1960-2021. Country coverage varies quite a bit by year with more recent years generally having observations for more countries. The highest number of observations is 185 countries in 2014, the lowest is 1960-1966 with 3 countries. The early years with very few country observations are dropped to ensure a more uniform coverage of countries in each year. The analysis spans the period 1980-2021. In 1980, there is capital flow data for 116 countries. On average, there are 154 countries covered in a year between 1980 and 2021. Capital flow data is fed through a Hodrick-Prescott (HP) filter (Hodrick and Prescott, 1997) with a smoothing parameter of 6.25 as suggested for annual data by Ravn and Uhlig (2002). Robustness checks in Section 4.2 show that the results are not dependent on HP filtering.

Figure 2 illustrates an important aspect of the capita flow data: global imbalances have widened

considerably in the past four decades. The figure shows the total current account surplus of all surplus countries relative to their GDP, and the same for deficit countries. It is apparent that surpluses and deficits have significantly increased during this time period from around $\pm 2.0 - 2.5\%$ in the 1980s and 1990s to around $\pm 2.8 - 4.6\%$ in the 2000s, 2010s, and early 2020s. While these imbalances peaked in the run-up to the Global Financial Crisis, they remained at historically elevated levels through to the early 2020s. International capital flows have increased in importance during this time period (Lane and Milesi-Ferretti, 2018), but they are also more unevenly distributed in a sense as Figure 2 suggests.

2.3 Additional Data

In addition to the demographic and capital flow variables, the paper also relies on a number of control variables. Capital account openness is included to take into account how freely capital can move into and out of a given country in a given year. Financial development is included to take into account the fact that countries with more sophisticated financial systems might see more capital flows or that the composition of their capital flows may be different. An interest rate spread variable is calculated as a country's interest rate minus the US federal funds rate capturing the relative returns between the country and the global benchmark. Similarly, a growth spread variable is calculated as a country's GDP growth rate minus world GDP growth to capture the abundance of investment opportunities in the country relative to the rest of the world. Finally, the year-on-year percentage change in the local currency to USD exchange rate is included to account for the effect of exchange rate fluctuations on capital flows. Further details on these control variables, most importantly their source, can be found in Appendix C.

3 Research Design

The analysis in the paper relates balance-of-payments variables with a country's age structure in two ways. First, a panel data analysis with country and year fixed effects is carried out. Second, to estimate the dynamic effects of demographics on capital flows, a local projections (LP) specification is also implemented following Jordà (2005). This section first describes these two regression specifications in detail, then discusses the identification strategy, and finally explains the polynomial method which is used to determine the relative importance of different age cohorts for the results.

3.1 Main regression specifications

The contemporaneous panel data specification is

$$Y_{it} = \beta D_{it} + \mathbf{X}'_{it}\gamma + \alpha_i + \delta_t + \varepsilon_{it}, \tag{1}$$

where Y_{it} are balance-of-payments variables such as the current and financial account balance in country i in year t, D_{it} are demographic variables such as the old-age dependency ratio or mean age, $\mathbf{X}_{it}$ are the control variables described in Section 2, α_i and δ_t are country and year fixed effects, and ε_{it} represents robust standard errors clustered at the country level. The parameter of interest is β, which measures the response of capital flows to demographic factors.

The local projections (LP) specification is

$$Y_{i,t+\ell} = \beta_\ell D_{it} + \mathbf{X}'_{it}\gamma + \alpha_i + \delta_t + \varepsilon_{it}, \tag{2}$$

where $\ell \in \{0, 1, \ldots, 10\}$ denotes the ℓth lead of the dependent variable. The estimated coefficients, β_ℓ, trace out the impulse response function of capital flows to demographics. Specification (2) helps understand how the impact of demographics on capital flows varies over time and whether it is persistent.

3.2 Identification strategy

Regarding identification, reverse causality is unlikely to be an issue as it would be difficult for capital flows to affect the demographic structure of a country. However, omitted variable bias is a concern. For instance, a country may pursue overall poor macroeconomic policies, which can both lower fertility due to low living standards and impact capital flows (in this example, most likely by increasing outflows and decreasing inflows). Therefore, estimating Equations (1)-(2) with OLS will not necessarily yield a causal estimate of the effect of demographics on capital flows.

To address this concern, an instrumental variables strategy is implemented. The paper uses a Bartik-style instrument (Bartik, 1991) where demographic variables are instrumented by their "predicted" values. The idea is to take a country's initial population age structure in the first year of the analysis (1980), which is pre-determined and is thus not going to be affected by omitted variables during the time period of the study. Then predicted age structure is obtained by combining the initial age structure with *regional* fertility and mortality rates. Regions follow the UN's definition and they include: Africa, Asia, Europe, Latin America and the Caribbean, and Oceania.[1] This is similar in spirit to the strategy of Bartik (1991) who uses national industry-specific growth

[1] Due to missing aggregated fertility and mortality data on North America in the UN data set, Canada and the United States are predicted using Europe's fertility and mortality rates.

rates to predict local industry composition in the US, and Maestas et al. (2023) who use national fertility and mortality data to predict state-level population age structure in the US.

More formally, let $\tilde{N}_{irjt}$ denote the predicted size of cohort j in country i of region r in year t. Then the predicted size of the 0-year-old cohort (new births) in country i of region r in year t is calculated as

$$\tilde{N}_{i,r,0,t} = \sum_{j=0}^{100} \frac{\tilde{N}_{i,r,j,t-1}}{2} \cdot ASFR_{r,j,t-1},$$

where $ASFR_{rjt}$ is the age-specific fertility rate of region r (i.e. the average number of children a woman of age j has). In effect, this calculation assumes a 50-50 sex ratio as it divides the cohort population by two and then multiplies by the average number of children women of that age have. The predicted size of older cohorts ($j > 0$) is calculated as

$$\tilde{N}_{irjt} = \tilde{N}_{i,r,j-1,t-1} \cdot ASSR_{r,j-1,t-1},$$

where $ASSR_{rjt}$ is the age-specific survival rate of region r (i.e. the probability that an individual of age j surives to age $j+1$). The initial cohort sizes for 1980 are taken directly from the data, $\tilde{N}_{i,r,j,1980} = N_{i,r,j,1980}$, where N_{irjt} is the actual population. Given the initial population, one can calculate forward using the equations above to predict the population at each age.

Once the predicted population data is constructed, it is straightforward to calculate predicted demographic summary measures. For instance, the predicted old-age dependency ratio and the predicted mean age would, respectively, be given by

$$\tilde{OADR}_{irjt} = \frac{\sum_{j=65}^{100} \tilde{N}_{irjt}}{\sum_{j=20}^{64} \tilde{N}_{irjt}}$$
$$\bar{j}_{irjt} = \frac{\sum_{j=0}^{100} j \cdot \tilde{N}_{irjt}}{\sum_{j=0}^{100} \tilde{N}_{irjt}}.$$

Regional fertility and survival rates are taken directly from the United Nations (2022), in particular, the fertility and life tables data sets.

3.3 The polynomial method

The baseline specification (1) and the dynamic specification (2) assume that there is one demographic variable of interest, D_{it}. One of the questions the paper investigates, however, is which dimension of demographics matters the most. To do that, it would be of interest to estimate a

version of Equation (1) where there multiple demographic variables of interest, e.g.

$$Y_{it} = \sum_{g=1}^{G} \beta_g D_{git} + \mathbf{X}'_{it}\gamma + \alpha_i + \delta_t + \varepsilon_{it},$$

where the D_{git} stand for the share of different age cohorts (e.g. 0-4, 5-9, 10-14-year-olds, etc.). Estimating such a regression would allow for disentangling which cohorts matter the most for capital flows. The limitation is that such a specification would require too many coefficients to be estimated (e.g. 17 coefficients if one considers five-year age groups up to age 80). A solution to this problem has been devised by Fair and Dominguez (1991) who propose that one can force the demographic share coefficients to lie on a polynomial, which can greatly reduce the number of coefficients to be estimated. This method has been applied e.g. by Gerigk et al. (2018); Koomen and Wicht (2020). Briefly, the polynomial method works the following way. Two constraints are imposed on the coefficients of interest (β_g):

$$\beta_g = \sum_{p=0}^{P} \gamma_p g^p$$
$$\sum_{g=1}^{G} \beta_g = 0,$$

where p corresponds to the pth polynomial, and the coefficients are forced to lie on a P-degree polynomial curve. The first constraint enforces this restriction. The second constraint ensures that no effects are found if cohort shares have no impact on the outcome variable. One can then transform demographic variables using the equation

$$Z_{pit} = \sum_{g=1}^{G} \left[D_{git} g^p - \frac{1}{G} g^p \right].$$

And finally, one can estimate a regression with these transformed variables as follows,

$$Y_{it} = \sum_{p=1}^{P} \gamma_p Z_{pit} + \mathbf{X}'_{it}\gamma + \alpha_i + \delta_t + \varepsilon_{it}, \tag{3}$$

where the gain is that one can estimate P coefficients instead of G. For instance, in the case of five-year age groups G is 17. Using instead a third-degree polynomial ($P = 3$) would require 14 fewer coefficients to be estimated. Once the γ_p are estimated, the β_g can be recovered using the two constraints described above. A more detailed explanation of this method can be found in Fair and Dominguez (1991).

4 The Impact of Demographics on the Current and Financial Accounts

This section first discusses the paper's main results which relate the old-age dependency ratio to the current and financial account balance. It then explores the robustness of this result to a number of different factors.

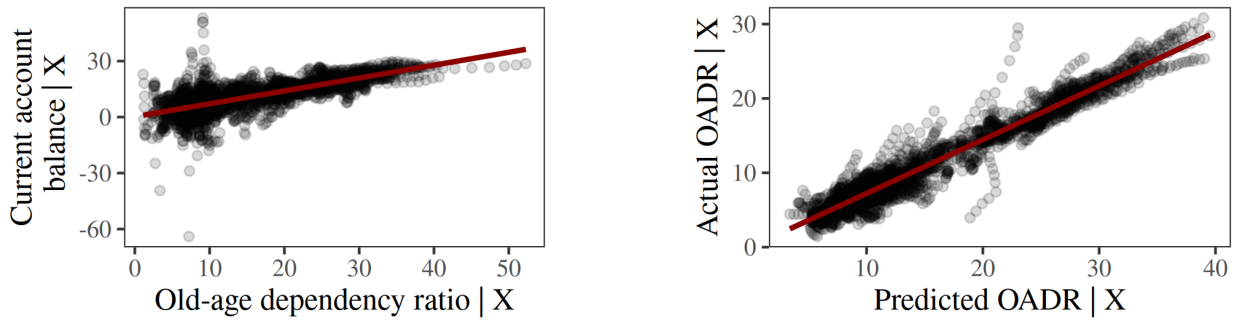
4.1 Main Results

Table 1: Main results

	Current account			Financial account		
	Levels	10-yr diff.	10-yr avg.	Levels	10-yr diff.	10-yr avg.
	(1)	(2)	(3)	(4)	(5)	(6)
OADR	0.7061***	0.4907**	0.9113***	0.7285***	0.5395**	0.9423**
	(0.2088)	(0.2205)	(0.2997)	(0.2589)	(0.2509)	(0.4024)
First-stage F	148.1	153.8	92.49	148.1	153.8	92.49
Observations	3,931	3,171	430	3,931	3,171	430
Year fixed effects	✓	✓	✓	✓	✓	✓
Country fixed effects	✓		✓	✓		✓

Note: This table shows the impact of population ageing on the current and financial accounts. The old-age dependency ratio (OADR) is instrumented by its predicted value. The current and financial account data are HP-filtered. "Levels" columns use levels, "10-yr diff." columns use the 10-year difference, "10-yr avg." columns use the 10-year average of the dependent variable and OADR. Control variables include capital account openness, financial development, interest spread, growth spread, and exchange rate change. Robust standard errors are clustered at the country level.

Table 1 shows the paper's main results regarding the effect of demographics on the current and financial accounts. The demographic variable of choice in this table is the old-age dependency ratio (OADR) as it captures population ageing rather well. The role of other demographic variables is explored in Section 4.2. Table 1 shows the results from estimating Equation (1) in Columns (1) and (4) for the current and financial accounts, respectively. These estimates instrument for OADR using its predicted value. It is apparent that there is a positive relationship between population ageing (a higher OADR) and both the current and the financial account. In particular, a one percentage point increase in the OADR is predicted to increase the current and financial accounts by 0.71 and 0.73 percentage points, respectively.



(a) IV estimates

(b) First stage

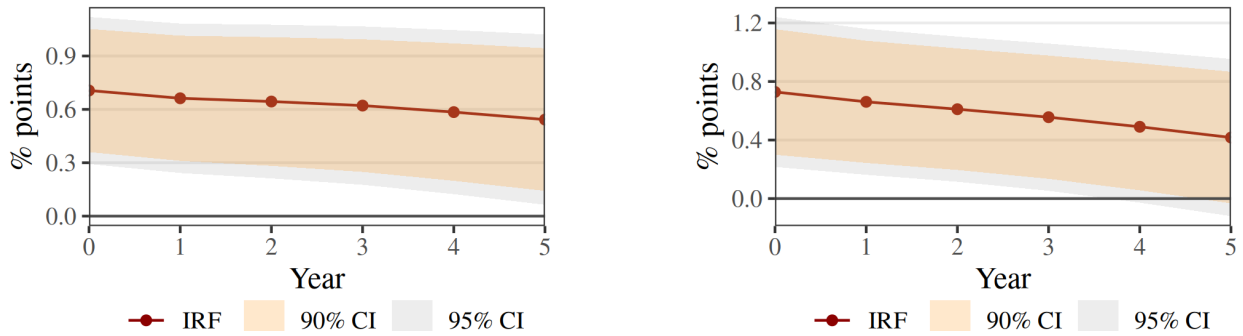
Figure 3: Conditional scatter plots

To put the magnitudes into context, consider a few examples. The sample median 10-year change in OADR is a 0.5 percentage point increase. A country that experienced such a change was Senegal in the decade preceding 1997 when its OADR rose from about 7.5 to 8.0. Such an increase is predicted to exert an upward pressure of $0.5 \cdot 0.7061 = 0.35$ percentage points on the current account and 0.36 percentage points on the financial account.

Figure 3 visualises the main result in the form of two conditional scatter plots. The left panel shows the relationship between the current account balance and OADR corresponding to Column (1) of Table 1. Most importantly, the relationship is seemingly not driven by outliers. The right panel shows that the first stage corresponding to the same regression is strong. Indeed the first stage F-statistics are also shown in Table 1 and they are well above the rule-of-thumb value of 10. The outlier observations in both the left and right panels correspond to Japan, which is the country with the highest OADR by far in the world.

Columns (2) and (5) of Table 1 reestablish the main result in a long-difference specification. In these columns, the 10-year difference of the dependent variable is regressed on the 10-year difference in OADR. Meanwhile, Columns (3) and (6) use decadal averages of the data instead of the annual observations in Columns (1) and (4). In both of these cases, the main results still hold. The estimated coefficients, however, vary from a low of 0.49 to a high of 0.94 suggesting that the magnitude of the effect may vary over time. The levels specifications mostly capture the contemporaneous effect, the 10-year differences capture the 10-year effect, and the 10-year average specifications capture the average size of the effect during those ten years. To elucidate these dynamic effects more clearly, the local projections (LP) method is utilised.

The LP method is implemented by estimating Equation (2) for 0-5 leads. So dynamic effects are estimated for up to 5 years after a shock to the old-age dependency ratio. The impulse response function is traced out by the β_ℓ coefficients in (2), which are plotted in Figure 4 for both the current and the financial account balance. Two things are apparent in the figure. First, the effect of



(a) Dependent variable: current account balance

(b) Dependent variable: fin. account balance

Figure 4: Impulse response functions from LP estimates

population ageing (higher OADR) on the current and financial account diminishes somewhat over time. The magnitude declines to about 0.4-0.6 percentage points from the initial contemporaneous effect that is around 0.7 percentage points. Second, the effect is persistent in that it remains mostly significantly above zero for five years.

The main estimates of this paper thus establish a clear positive relationship between OADR and the current and financial accounts. How can these findings be interpreted? An increase in the current account balance can be either understood through its definition or through its relation to saving and investment. The definition of the current account balance (CAB) is $CAB = NX + PIB + SIB$, where NX is net exports, PIB is primary income balance (net factor income), and SIB is secondary income balance (net transfers). The main results suggest that ageing improves the CAB, which could mean some combination of an increase in net exports (e.g. due to lower consumption by older cohorts), an increase in the primary income balance (e.g. due to more factor income being withdrawn from foreign investments during retirement), and an increase in the secondary income balance (it is perhaps intuitively unclear why this should be the case). The relationship of the current account with saving (S) and investment (I) is $CAB = S - I$. This equation suggests that ageing might improve the current account by a combination of increased domestic savings (e.g. as older cohorts have a higher stock of savings) and decreased domestic investment (e.g. low or negative population growth in ageing societies might discourage investment).

Meanwhile, an increase in the financial account balance suggests an increase in net capital outflows. This could be perhaps because an ageing society has lower asset returns due to less attractive investment opportunities which channels domestic savings abroad. There can be at least three important channels for such a net outflow of domestic savings. For instance, it could be driven by direct investment flows (e.g. domestic firms increase FDI activity), portfolio investment flows (e.g. domestic households directly invest savings abroad), or other investment flows (e.g. domestic banks make more loans abroad).

Overall, a large number of potential mechanisms may lie behind the positive relationship between population ageing and the current and financial accounts. The next two sections of the paper investigate potential evidence for these mechanisms. Section 5 explores which of these mechanisms is driving the results for the current account, and Section 6 does the same for the financial account.

4.2 Robustness

This section examines the robustness of the main results to different demographic measures, not HP filtering the dependent variables, and an alternative functional form.

Cohort Shares

Table B.1 replaces the OADR as the explanatory variable of interest with cohort shares. Columns (1) and (3) examine the effect of the share of 20-34, 35-49, 50-64, and 65+ year-olds on the current and financial accounts. Columns (2) and (4) also decompose the 65+ cohort into a 65-79 and 80+ year-old range. Since cohort shares for the entire population add up to 100%, one cohort has to be omitted, which is the 0-19-year-old cohort in this case. The same IV strategy is utilised here as for the main results: cohort shares are instrumented by their predicted values. Table B.1 suggests that it is indeed population ageing that matters for capital flows, and not the size of younger or middle-aged cohorts. In particular, it is the share of 50-65+ year-olds that is found to be important in Columns (1) and (3). Among the 65+ year-olds, it is the 65-79-year-olds whose share is predictive of capital flows. The amount of advanced ageing (80+ year-olds) does not appear to matter as much. Indeed, this result dovetails with the fact that wealth tends to peak around the ages of 65-75 (Kooiman et al., 2019; Bauluz and Meyer, 2024). The presence of these age cohorts could thus correlate with higher domestic savings and higher capital outflows.

As explained in Section 3.3, the polynomial method can be used to pinpoint more precisely which age cohorts are the most important for the results. To that end, Equation (3) is estimated with five-year age groups, and the cohort coefficients are forced to lie on a third-degree polynomial. The results are illustrated graphically in Figure A.1 using the current and financial account as dependent variables. The polynomial method suggests that it is primarily the presence of cohorts aged 70 and above that exerts a positive influence on net capital outflows. This is largely consistent with the results using 15-year age groups. These results also reveal that there is a slight negative effect on the current and financial account from the presence of some younger (5-14-year-old) and working-age (30-44-year-old) cohorts.

Other Demographic Measures

Table B.2 shows the impact of further demographic variables on the current and financial accounts: the young-age dependency ratio (YADR), the age dependency ratio (ADR), mean age, and worker share. Consistent with the cohort share results, the share of young cohorts as captured here by the YADR does not appear to matter. The ADR also does not matter. It is worth noting that the ADR is the sum of YADR and OADR, so it captures dependency on both ends of the age distribution. Clearly, this is not as good a predictor of capital flows as focusing on old cohorts specifically. Mean age does have a robust positive relationship with the current and financial accounts: the older the population, the higher the balance on these accounts consistent with the paper's main results. Worker share also does not seem to be a great predictor of external balances.

Overall, these results suggest that demographics do not matter much for capital flows until ageing, especially above the age of 50, kicks in. Until then, demographic changes (such as a falling YADR or ageing in the middle-aged cohorts) will not exert a significant force on the current and financial accounts.

No HP Filter

As discussed in Section 2, the dependent variables so far have been HP-filtered. This step was taken to focus on the overall trends in the current and financial accounts as opposed to year-to-year fluctuations that are likely due to specific macroeconomic events. But as Table B.3 shows, HP filtering is not necessary for the paper's main results to hold. The point estimates overall are somewhat smaller without HP filtering, but are still very close to the main estimates from Table 1. They are also significant throughout all columns including the levels, 10-year difference, and 10-year average specifications for both the current and the financial account.

Alternative Functional Form

Both the dependent variable and the explanatory variable of interest enter the original specification in (1) linearly. However, as Table B.4 shows, the results also hold in a log-log specification where both the dependent variable and the OADR are logged. Given that the current and financial account balance can take negative values, they are transformed before logging. In particular, the sample minimum is subtracted from and 0.01 is added to each observation. This ensures that all observations are positive while maintaing the level difference between each observation.

The results in Table B.4 suggest that a 1% increase in OADR would increase the current and financial accounts by 0.16% and 0.18%, respectively, on impact. The 10-year average effect would be 0.45% and 0.52%. To put this into context, a 10% increase in OADR would amount to about 1 percentage point at the median, which would then lead to a 0.04 percentage point increase in

both the current and financial accounts at the median. The median 10-year change in OADR in the sample is about +5% which corresponds to a 0.5 percentage point increase in OADR. Some observations around this median include e.g. Iceland whose OADR increased from 19.1 in 1991 to 20.0 in 2001, and Nepal whose OADR increased from 7.6 in 1981 to 8.0 in 1991.

5 Mechanisms through the Current Account

This section examines possible mechanisms behind the main results through the lens of the current account. As discussed above, one can interpret the positive relationship between population ageing and the current account balance through two characterisations of the current account. First, the defintion of the current account as $CAB = NX + PIB + SIB$ can be used to decompose the effect into the trade balance (NX), net factor income (PIB), and net transfer income (SIB). Second, the relationship of the current account to saving and investment, $CAB = S - I$, can be used to decompose the effect into the effect of ageing on domestic saving and domestic investment. This section explores these two broad decompositions in turn.

5.1 Decomposing through the Definition of the Current Account

To decompose the current account into trade, primary income, and secondary income balance, Equation (2) is utilised to estimate local projections specifications and plot impulse response functions (IRFs) of the outcome variables to predicted OADR. To begin, recall that the overall effect of ageing on the current account balance has been positive and around 0.5-0.9 percentage points (Figure 4a).

The results for the trade balance (NX) and its components are shown in Figure A.2. There is a small but insignificant positive effect on the trade balance (Figure A.2a. Digging deeper, there appears to be a significant positive effect on exports on impact (Figure A.2b), driven entirely by a persistent positive effect on goods exports (Figure A.2c), with no discernible effect on services exports (Figure A.2d). There also seems to be a positive, though imprecisely estimated, effect on imports whose magnitude is smaller than the effect on exports (Figures A.2e-A.2f).

Figure A.3 shows the impact of ageing on the primary (PIB) and secondary income balance (SIB). The PIB seems to be positively affected, but the results are insignificant (Figure A.3a). This suggests some combination of more factor income (e.g. dividends) being withdrawn by residents from foreign investments and less factor income being withdrawn by foreign investors from domestic investments. But these results must be interpreted cautiously as they are not significant. For secondary income, the point estimates are much closer to zero (Figure A.3b) suggesting that it is not significantly impacted by population ageing.

Overall, the narrative behind the current account appears to be that, while there are subtleties involved, increased goods exports are the most robust driver of the positive current account effect of ageing. This could result from lower aggregate consumption in ageing economies, potentially due to lower population growth or life-cycle effects (lower consumption among elderly cohorts). This phenomenon is what appears to result in firms exporting more, especially goods. Indeed, the flipside of such a result would be increased saving, which is also observed in the data as shown in the next section.

5.2 Decomposing through Saving-Investment

To decompose the current account balance into saving and investment, these two variables are used as dependent variables in the baseline specification (1) where the demographic variable of interest is predicted OADR. Contemporaneous specifications are preferred to the dynamic ones here due to the lower sample size of these dependent variables. The results are shown in Table B.5. It is apparent that ageing has a significant positive effect on saving of around 0.56 percentage points. This result complements the findings from the previous section: it appears that older societies save more and consume less on the aggregate, which in turn makes domestic firms export more. The increase in saving appears to come from both private and public channels. About 60% of the increase is due to private saving (though the impact on private saving is imprecisely estimated), while the remaining 40% is from increased public saving. There is also a small negative, albeit insignificant, effect on investment. While due to the lack of significance, this has to be interpreted cautiously, it would suggest that domestic investment opportunities are less attractive in ageing societies perhaps due to high asset prices and a smaller consumer market.

Naturally, the combination of increased domestic saving and potentially lower domestic investment would imply an increase in net capital outflows. This is indeed why ageing also has a positive effect on the financial account as established earlier (Figure 4b). But what form do these increased net capital outflows take? This question is explored in the next section.

6 Mechanisms through the Financial Account

This section examines the mechanisms behind the main results from Section 4 through the lens of the financial account. The main results suggest an increase in net capital outflows in response to population ageing. First, it is examined which types of investment (direct, portfolio, other) are the biggest drivers behind this result. Second, it is explored whether the increase in net capital ouflows happens primarily through a debt or equity channel. Third, the effect of ageing on the gross stocks of different types of investment is investigated. Finally, the paper takes a look at whether certain

sectors (households, financial corporations, non-financial corporations, government) play a more or less important role in driving the effect of ageing on capital flows.

6.1 Effect on Different Types of Investment

The financial account balance is typically decomposed into net capital outflows in direct, portfolio, and other investment.[2] Direct investment is an investment that gives rise to significant management control in an enterprise, typically subsidiaries of multinational enterprises. Portfolio investment refers to investment in financial securities, typically cross-border stock or bond trading. Other investment refers to most other cross-border capital movements, of which cross-border bank loans form a big part (International Monetary Fund, 2009).

To explore which of these categories is primarily affected by population ageing, and thus lies behind the positive effect on the financial account balance as a whole in response to ageing, variations of Equation (2) are estimated with net flows in direct, portfolio, and other investment as dependent variables. The results are shown in Figure A.4. It is apparent that population ageing has a significant and persistent positive effect on direct investment net flows. There is not much of an effect on portfolio and other investment – the point estimates are close to zero and insignifnicant.

Overall, this finding suggests that population ageing increases net capital outflows primarily through the decisions of firms, as it is multinational enterprises (MNEs) that drive direct investment flows rather than the financial sector or individuals. The decisions of the financial sector and individuals to invest more abroad is better captured by portfolio and other investment flows, which do not see much impact from ageing.

6.2 Debt and Equity Flows

Different types of investment can be further divided into whether the flows are equity or debt flows. Figure A.5 shows the results of estimating a version of Equation (2) where the dependent variable is direct and portfolio investment split up into debt and equity flows, respectively. The key takeaway here is that direct investment net flows seem to increase primarily through a debt channel. Though the point estimates are similar for debt and equity direct investment, only the former is significant. There is no significant effect on portfolio investment debt or equity flows – not surprising given the lack of aggregate effect on portfolio investment.

What this result suggests is that MNEs increase direct investment activity in response to increased population ageing, and they do so by lending more to their existing subsidiaries rather than acquiring more equity share in new or existing subsidiaries. A potential reason for this could

[2] Two other, usually relatively minor, categories include reserve assets and financial derivatives.

be labour shortages at home due to low population growth rates incentvising firms to shift more operations abroad.

6.3 Sectoral Heterogeneity

Ultimately, a positive impact on the financial account balance from population ageing implies that the country's assets should increase more from transactions than its liabilities, overall. The difference between a country's assets and liabilities is its net financial position (NFP). This figure is reported by the OECD for the economy as a whole as well as by sector (households, financial corporations, non-financial corporations, government). To investigate which sectors are the primary contributors to the rising financial account balance, this smaller OECD data set (OECD, 2025) is used to estimate versions of Equation (1) where the dependent variables are net financial positions (NFPs) expressed in % of GDP.

The results of this analysis are shown in Table B.6. Column (1) shows that there is a positive effect on a country's overall net financial position. Columns (2)-(5) show that it is primarily households' and to a lesser extent the government's NFP that improves, while non-financial and financial corporations' NFP does not respond to ageing. While these results are insignificant at traditional thresholds, the p-value on the coefficient for OADR in the household regression is 0.11, for the government regression it is 0.19. What this suggests is that households are the primary source of increased saving in ageing societies. There is some evidence that the government contributes as well. But firms do not do so.

7 Conclusion

This paper shows that population ageing has a causal positive impact on a country's current and financial account balance. This effect primarily manifests itself once a country's old-age dependency ratio starts growing. What exactly generates this positive effect on the current and financial account? The paper finds that domestic consumption drops, which has two effects: saving increases and more goods are exported. This is primarily driven by the increasing share of older cohorts, primarily ages 60-79. What happens to these increased savings? The paper finds that it is indeed primarily households that generate these savings, but they are not necessarily the ones that directly increase net capital outflows by investing abroad. Instead, the domestic financial system channels these savings to non-financial corporations who use them to expand their existing subsidiaries abroad through direct investment. This increased FDI primarily takes the form of debt, i.e. loans to foreign subsidiaries.

From the perspective of policymakers, it is essential to be aware of the consequences of an

ageing population for capital flows. Some of these consequences may not be desirable, especially as surplus countries have recently been targeted by retaliatory policies. The findings of this paper provide a detailed description of the reasons why ageing increases net capital outflows, which can help guide policymakers to potentially rein in their surpluses. For instance, it appears that the primary channel for increased net capital outflows is increased outward FDI. If one wants to reduce net capital outflows, then one would want to incentivise firms to reinvest their capital domestically rather than in foreign affiliates. Similarly, the paper indicates that incentivising consumption would allow these countries to reduce the source of their "excess" savings. This could be done either by encouraging older cohorts to spend, or by redistributing spending power towards younger and middle-aged cohorts (particularly, up to approximately age 45).

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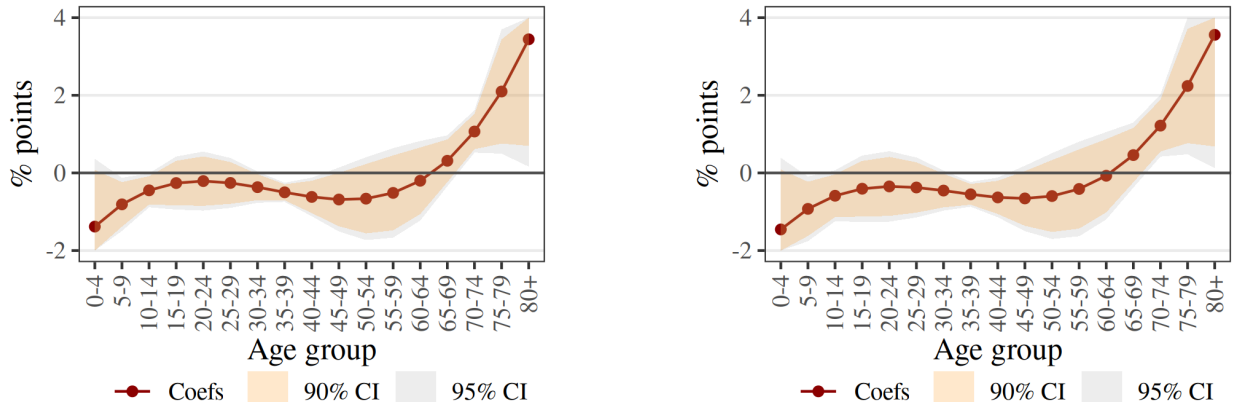
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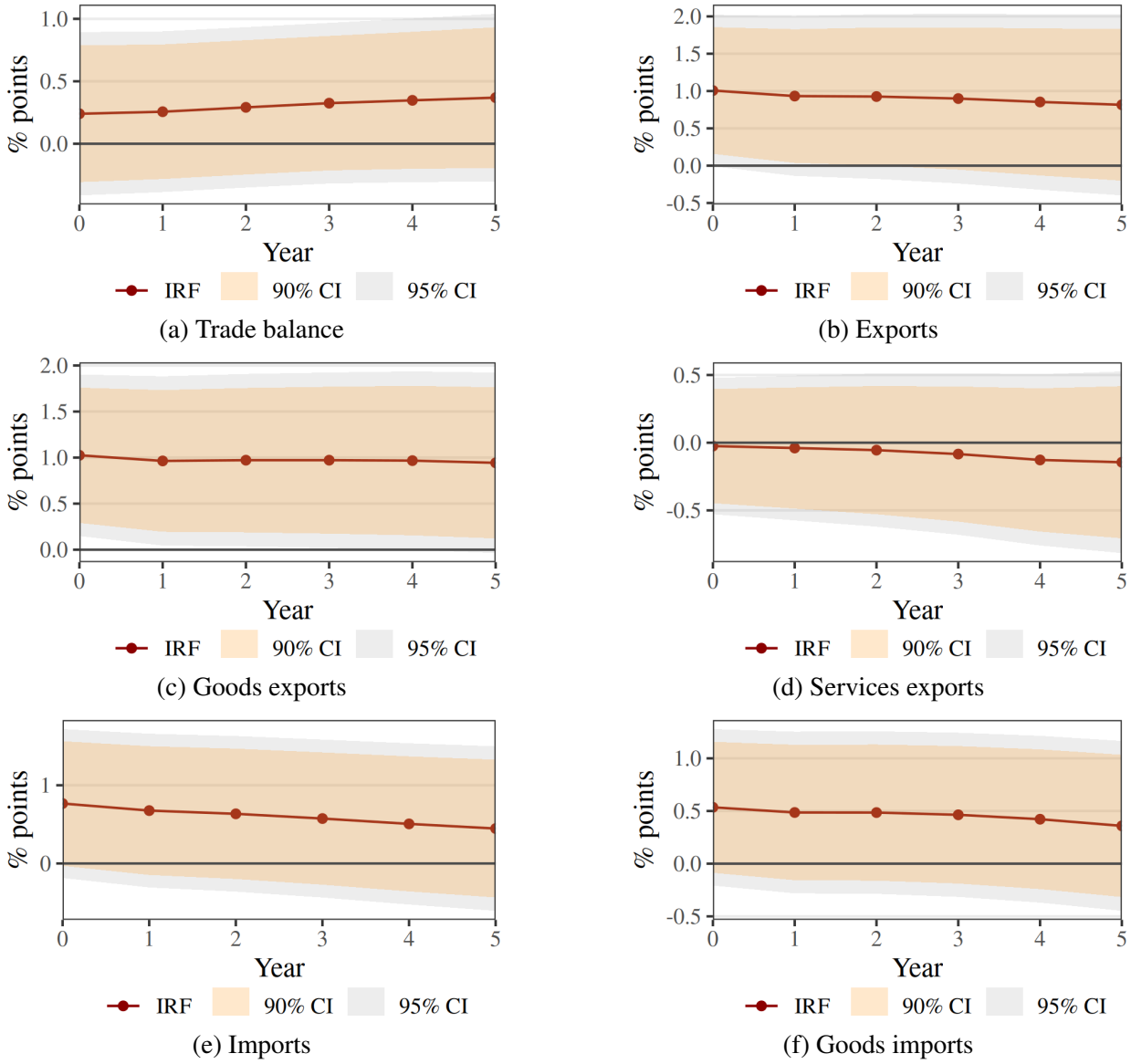
A Figures



(a) Current account balance

(b) Financial account balance

Figure A.1: The impact of different cohorts using the polynomial method



(a) Trade balance

(b) Exports

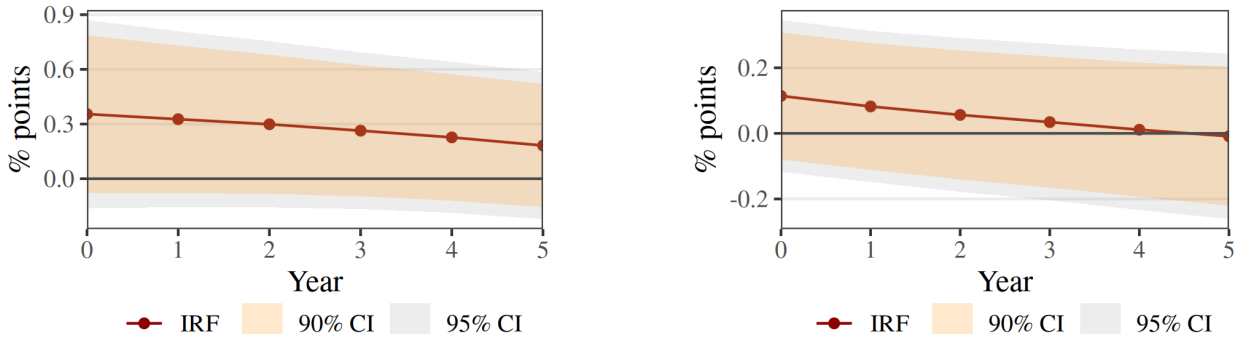
(c) Goods exports

(d) Services exports

(e) Imports

(f) Goods imports

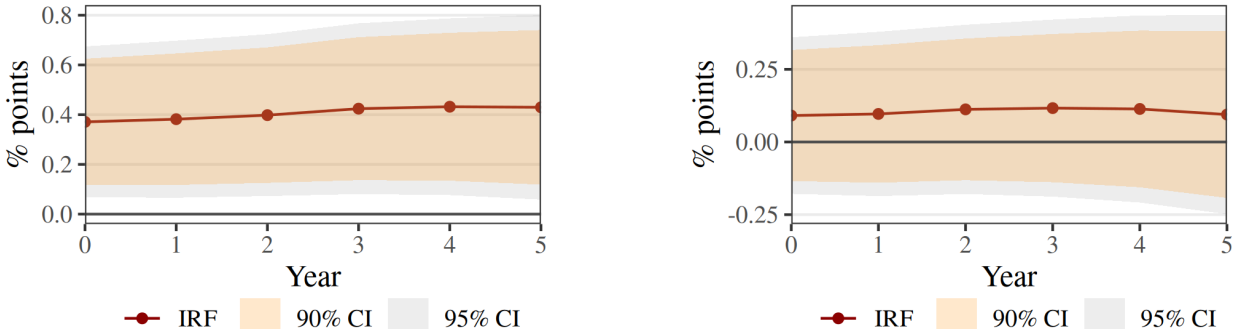
Figure A.2: IRFs for the trade balance and its components



(a) Primary income balance

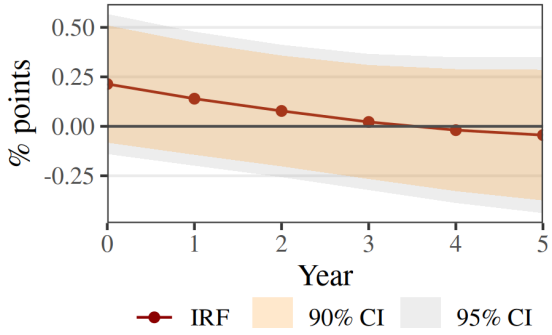
(b) Secondary income balance

Figure A.3: IRFs for the primary and secondary income balance



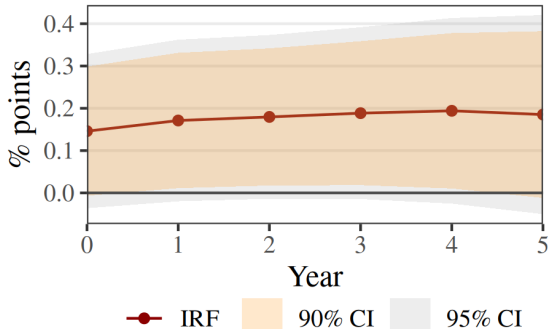
(a) Direct investment

(b) Portfolio investment

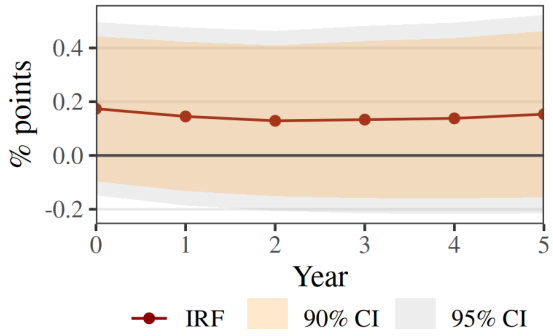


(c) Other investment

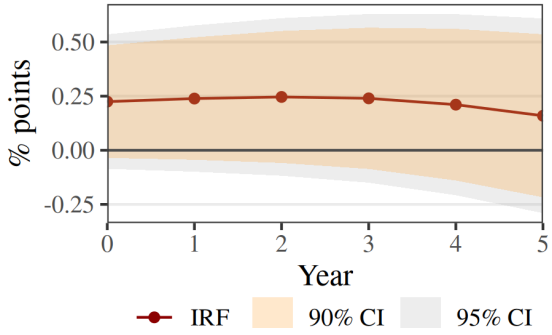
Figure A.4: IRFs for direct, portfolio, and other investment (net flows)



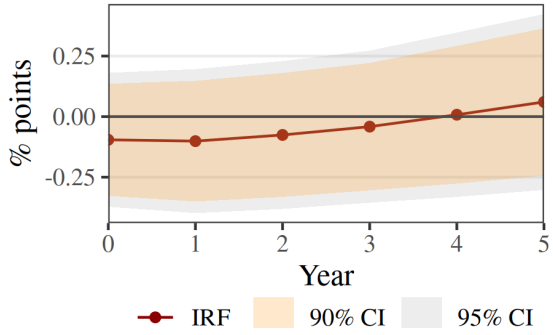
(a) Direct investment, debt



(b) Direct investment, equity



(c) Portfolio investment, debt



(d) Portfolio investment, equity

Figure A.5: IRFs for debt and equity (net flows)

B Tables

Table B.1: The effect of cohort shares

	Current account		Financial account	
	(1)	(2)	(3)	(4)
% 20-34	-0.2049	-0.1719	0.1157	0.2109
	(0.5663)	(0.6170)	(0.6453)	(0.6946)
% 35-49	-0.2489	-0.2276	-0.2603	-0.1988
	(0.3636)	(0.3936)	(0.3941)	(0.4304)
% 50-64	0.7874**	0.7898**	1.040**	1.046**
	(0.3280)	(0.3281)	(0.4575)	(0.4595)
% 65+	1.243*		1.659*	
	(0.7100)		(0.9479)	
% 65-79		1.165*		1.433
		(0.6589)		(0.9000)
% 80+		1.626		2.761
		(1.539)		(1.795)
Observations	3,931	3,931	3,931	3,931
Year fixed effects	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓

Note: This table shows the impact of cohort shares on the current and financial accounts. The cohort shares are instrumented by their predicted values. The current and financial account data are HP-filtered. Control variables include capital account openness, financial development, interest spread, growth spread, and exchange rate change. First stage F-statistics range from 8.5 to 73.5. Robust standard errors are clustered at the country level.

Table B.2: The effect of alternative demographic measures

	Current account				Financial account			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
YADR	0.0046				-0.0302			
	(0.0673)				(0.0721)			
ADR		0.0420				0.0169		
		(0.0537)				(0.0531)		
Mean age			1.287**				1.691*	
			(0.6175)				(0.9097)	
Worker share				-0.1061				0.0225
				(0.2025)				(0.2143)
First-stage F	46.98	75.26	22.34	72.02	46.98	75.26	22.34	72.02
Observations	3,931	3,931	3,931	3,931	3,931	3,931	3,931	3,931
Year fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓

Note: This table shows the impact of the young-age dependency ratio (YADR), age dependency ratio (ADR), mean age, and worker share on the current and financial accounts. The demographic variables are instrumented by their predicted values. The current and financial account data are HP-filtered. Control variables include capital account openness, financial development, interest spread, growth spread, and exchange rate change. Robust standard errors are clustered at the country level.

Table B.3: Main results without HP filtering

	Current account			Financial account		
	Levels	10-yr diff.	10-yr avg.	Levels	10-yr diff.	10-yr avg.
	(1)	(2)	(3)	(4)	(5)	(6)
OADR	0.5890***	0.3958*	0.8233***	0.6431***	0.4622*	0.9389**
	(0.2003)	(0.2274)	(0.2967)	(0.2303)	(0.2586)	(0.4138)
First-stage F	165.6	167.6	109.6	165.6	167.6	109.6
Observations	4,243	3,440	467	4,243	3,440	467
Year fixed effects	✓	✓	✓	✓	✓	✓
Country fixed effects	✓		✓	✓		✓

Note: This table shows the impact of population ageing on the current and financial accounts without HP filtering the dependent variables. The old-age dependency ratio is instrumented by its predicted value. "Levels" columns use levels, "10-yr diff." columns use the 10-year difference, "10-yr avg." columns use the 10-year average of the dependent variable and OADR. Control variables include capital account openness, financial development, interest spread, growth spread, and exchange rate change. Robust standard errors are clustered at the country level.

Table B.4: Alternative functional forms

	Log current account		Log financial account	
	Levels	10-yr avg.	Levels	10-yr avg.
	(1)	(2)	(3)	(4)
Log OADR	0.1551***	0.4546***	0.1779***	0.5163*
	(0.0474)	(0.1453)	(0.0666)	(0.2832)
First-stage F	50.73	36.92	50.73	36.92
Observations	3,931	430	3,931	430
Year fixed effects	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓

Note: This table shows the impact of population ageing on the current and financial accounts in a log-log specification. The old-age dependency ratio is instrumented by its predicted value. "Levels" columns use levels, "10-yr avg." columns use the 10-year average of the dependent variable and OADR. Control variables include capital account openness, financial development, interest spread, growth spread, and exchange rate change. Robust standard errors are clustered at the country level.

Table B.5: Effect of ageing on saving and investment

	Total saving (1)	Private saving (2)	Public saving (3)	Investment (4)
OADR	0.5592*	0.3079	0.1982*	-0.0957
	(0.2860)	(0.2672)	(0.1077)	(0.1830)
First-stage F	94.38	96.45	153.6	101.2
Observations	2,188	2,197	3,335	2,380
Year fixed effects	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓

Note: This table shows the impact of population ageing on total saving, private saving, public saving, and investment. The old-age dependency ratio (OADR) is instrumented by its predicted value. The dependent variables are HP-filtered. Control variables include capital account openness, financial development, interest spread, growth spread, and exchange rate change. Robust standard errors are clustered at the country level.

Table B.6: Effect on sectoral net financial position

	NFP, Total	NFP, Households	NFP, Fin. corps	NFP, Non-fin. corps	NFP, Gov't
	(1)	(2)	(3)	(4)	(5)
OADR	13.85*	8.528	0.5537	-2.144	6.911
	(7.349)	(5.235)	(2.023)	(4.862)	(5.141)
First-stage F	7.709	7.709	7.709	7.709	7.709
Observations	852	852	852	852	852
Year fixed effects	✓	✓	✓	✓	✓
Country fixed effects	✓	✓	✓	✓	✓

Note: This table shows the impact of population ageing on sectoral net financial position. The old-age dependency ratio is instrumented by its predicted value. The net financial position data are HP-filtered. Control variables include capital account openness, financial development, interest spread, growth spread, and exchange rate change. Robust standard errors are clustered at the country level.

C Data description

C.1 Dependent variables

Balance of payments variables: all expressed as a % of GDP. From the current, these include: current account balance, trade balance, exports, goods exports, services exports, imports, goods imports, services imports, primary income balance, secondary income balance. From the financial account, these include : financial account balance, direct investment, portfolio investment, other investment, equity direct investment, debt direct investment, equity portfolio investment, debt portfolio investment. From the international investment position, these include: direct investment assets, portfolio investment assets, share of direct investment in assets, share of portfolio investment in assets, direct investment liabilities, portfolio investment liabilities, share of direct investment in liabilities, share of portfolio investment in liabilities. Source: International Monetary Fund (2024).

Total saving: total national saving, expressed as a % of GDP. This is calculated as the sum of private (S_P) and public (S_G) saving, which are explained below. Source: International Monetary Fund (2024, 2025b,a).

Private saving: expressed as a % of GDP. Private saving is $S_P = GNDI - C - T$, where $GNDI = GDP + PIB + SIB$. PIB is the primary income balance, SIB is the secondary income balance, C is the final consumption expenditure of the private sector, T is general government revenue. Source: International Monetary Fund (2024, 2025b,a).

Public saving: expressed as a % of GDP. Public saving is net lending and borrowing by the general government. Source: International Monetary Fund (2024, 2025b,a).

Investment: gross fixed capital formation, expressed as a % of GDP. Source: International Monetary Fund (2025b).

Sectoral balance of payments variables: all expressed as a % of GDP. These include the net financial position of households, financial corporations, non-financial corporations, and the government. Source: OECD (2025).

C.2 Explanatory variables

Demographic variables

Old-age dependency ratio (OADR): the number of 65+ year-olds divided by the number of 20-64-year-olds. Source: author's calculations based on United Nations (2022).

Young-age dependency ratio (YADR): the number of 0-19-year-olds divided by the number of 20-64-year-

olds. Source: author's calculations based on United Nations (2022).

Age dependency ratio (ADR): the number of 0-19-year-olds and 65+ year-olds divided by the number of 20-64-year-olds. Source: author's calculations based on United Nations (2022).

Mean age: the average age of the population. Source: author's calculations based on United Nations (2022).

Worker share: the number of 20-64-year-olds divided by the total population. Source: author's calculations based on United Nations (2022).

Cohort shares: the share of a given age cohort (e.g. 20-34-year-olds) in total population. Source: author's calculations based on United Nations (2022).

Control variables

Capital account openness (Chinn-Ito): A measure of a country's openness to capital flows ranging from 0 to 1. Source: Chinn and Ito (2006).

Financial development: The financial development index developed by the IMF. This is a composite of the financial institutions index and the financial markets index. Covers years 1980-2021. Source: Svirydzenka (2016).

Interest rate spread: a country's deposit interest rate minus the US federal funds rate. Source: World Bank (indicator code: `FR.INR.DPST`) and Board of Governors of the Federal Reserve System (2024).

Growth spread: a country's real GDP growth rate minus the world real GDP growth rate. Source: World Bank (indicator code: `NY.GDP.MKTP.KD`).

Exchange rate: year-on-year percentage change in the country's exchange rate relative to the USD. Source: World Bank (indicator code: `PA.NUS.FCRF`).