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Household Heterogeneity and Monetary Policy Amplification in Austria^{*}

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Abstract

We extend Auclert’s (2019) sufficient-statistics decomposition of the consumption response to monetary policy to an open economy in which households hold foreign assets and liabilities. Each foreign channel then splits into a level component, driven by the aggregate foreign position, and a redistribution component, driven by how foreign exposures are distributed across households. Using Austrian household survey data, we find that redistribution raises the consumption response to a rate cut by 18 percent relative to a redistribution-free benchmark, mostly through households with variable rate mortgages. Income–GDP elasticities from quantile regressions decline steeply with income, but because marginal propensities to consume (MPCs) are only weakly related to income, the earnings-heterogeneity channel adds about 3 percent with a profile based on personal gross earnings and 0.4 to 0.5 percent with household-income profiles. In an illustrative calibration, the foreign channels add about 13 percent, mostly as a level effect from the revaluation of net foreign assets that a representative household would also experience. Relative to an open-economy redistribution-free benchmark, heterogeneity amplifies the response by 17.5 percent.

Keywords: MPC, Household balance sheets, Monetary policy transmission, Consumption dynamics, Open economy, Net foreign assets

JEL: D12, D31, E12, F41

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1. Introduction

Households do not respond uniformly to monetary policy. They vary in their consumption and saving behavior, as well as in the level and composition of their income, assets, and liabilities. In addition, these balance-sheet positions are unequally exposed to policy shocks. The effect of monetary policy therefore depends not only on the magnitude of the aggregate change in income or wealth, but also on which households experience that change and how they respond to it. In other words, monetary policy redistributes between households. How strongly a household’s consumption responds to an additional unit of income or wealth is measured by its marginal propensity to consume (MPC). Using the ECB Household Finance and Consumption Survey (HFCS), [Albacete et al. \(2025\)](#) measure self-reported MPCs in 20 European countries, 17 of them in the euro area, and show that they decrease systematically with cash-on-hand, so that the same aggregate stimulus has different effects depending on where it lands in the distribution.

The role of redistribution has long been recognized (e.g. [Blinder, 1975](#); [Tobin, 1982](#)), but it has only recently been incorporated into general equilibrium models of monetary transmission. In New Keynesian representative-agent (RA) models, redistribution between households is absent by design. Two-agent New Keynesian (TANK) models take a step toward heterogeneity, grouping households into savers and spenders with MPCs of near zero and one. This dichotomy collapses the distribution of MPCs to two points ([Galí et al., 2007](#)).

Heterogeneous-agent New Keynesian (HANK) models take this further by embedding a full incomplete-markets structure, in which households face uninsurable idiosyncratic income risk and borrowing constraints. The distribution of MPCs across households emerges endogenously, including the high values found in microdata. [Auclert et al. \(2024\)](#) show that the empirical path of intertemporal MPCs is inconsistent with both representative-agent and standard two-agent models, but can be matched by certain heterogeneous-agent models and by a two-agent model with bonds in the utility function. Two results from this literature are central to our analysis. First, when markets are incomplete, the indirect general-equilibrium effects of monetary policy operating through incomes and balance sheets dominate the direct intertemporal substitution effect that carries the transmission in the RA benchmark ([Kaplan et al., 2018](#)). Second, because households differ in their exposure to interest rate and price changes, monetary policy redistributes income and wealth between them, and this redistribution affects aggregate consumption through the covariance between exposures and MPCs ([Auclert, 2019](#)). Auclert’s sufficient-statistics decomposition quantifies these effects without solving a full HANK model: it expresses the consumption response in terms of observable moments, namely the distribution of household balance-sheet exposures, the associated MPCs, and a few aggregate elasticities. In an open economy, foreign exposures add level effects that depend on the household sector’s aggregate foreign position.

The open-economy dimension is the focus of this paper. We show analytically that once households can hold claims on the rest of the world, the closed-economy market-clearing restrictions that allow [Auclert \(2019\)](#) to express the aggregate consumption response purely in terms of covariances between MPCs and balance-sheet exposures no longer hold for the foreign block of the balance sheet. The cross-sectional mean of foreign exposures does not net out against a domestic government counterparty. Instead, it equals the household sec-

tor’s aggregate foreign exposure. This is a qualitative departure from the closed-economy benchmark. In a closed economy, the aggregate exposures of households are absorbed by the government and net to zero, so that only distributional covariances survive, whereas an open economy experiences valuation effects from exchange rate and foreign-price movements that are scaled by the average MPC. The open-economy decomposition therefore acquires three additional balance-sheet channels: exchange rate revaluation, foreign interest rate exposure, and the foreign Fisher channel, each of which depends on aggregate foreign exposure. A fourth channel operates through the earnings of households employed in the traded sector. Its level term is already captured by the calibrated aggregate income response and is therefore excluded from the headline decomposition. Its covariance term, which we estimate from the sector of employment recorded in the HFCS, is negligible.

This paper builds on [Pekanov \(2024a\)](#), who applies the sufficient-statistics approach of [Auclert \(2019\)](#) to the euro area. We extend this approach to a small open economy. We evaluate how differences in household income, assets, liabilities, and interest rate exposures, together with heterogeneous MPCs, shape the transmission of monetary policy in Austria. We further extend the framework by allowing the elasticity of earnings to aggregate income to vary across households, rather than imposing a common elasticity. We calibrate heterogeneous earnings elasticities from quantile regressions of income on GDP. Combining the HFCS with national data sources, we quantify the contribution of these channels in Austria and compare the results in the closed- and open-economy settings.

We find that, relative to a redistribution-free benchmark, household heterogeneity amplifies the closed-economy response to a rate cut by 18 percent in Austria, compared with 15 percent in the euro area ([Pekanov, 2024a](#)), mostly through the unhedged interest rate exposure channel. The Fisher channel is small. Relative to proportional incidence, allowing earnings elasticities to vary across the income distribution raises the earnings-heterogeneity channel from zero to about 3 percent of the response with a profile based on personal gross earnings, and to 0.4 to 0.5 percent with household-income profiles. The channel is small although the estimated incidence is steep. What limits the channel is that the MPCs of the households that receive more of the income gain than under proportional incidence are only slightly higher than those of the households that receive less. In aggregate, the households in our sample hold positive net foreign assets. Treating these exposures, which we impute from residency-based assets and foreign-currency liabilities, as exposed to the euro’s external value, we find that in an illustrative calibration the foreign channels add about 13 percent to the response of the domestic block, mainly through their revaluation when the euro depreciates in real terms, while the foreign Fisher channel is negligible. A representative household holding the same foreign position would experience this level effect as well. Relative to an open-economy redistribution-free benchmark, heterogeneity amplifies the response by 17.5 percent.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 presents the sufficient-statistics framework of [Auclert \(2019\)](#) and derives our open-economy extension. Section 4 describes the data. Section 5 presents the closed-economy results, the results under heterogeneous earnings elasticities, and the open-economy results. Section 6 discusses limitations and ideas for further research, and Section 7 concludes.

2. Related Literature

A central contribution is [Auclert \(2019\)](#), who shows that redistribution is a first-order channel of monetary policy transmission. In this framework, interest rate changes affect aggregate consumption through five channels, three of which are redistributive: heterogeneous labor-income responses (earnings heterogeneity channel), redistribution between nominal creditors and debtors (Fisher channel), and differences in unhedged interest rate exposure (URE). The aggregate-income and intertemporal-substitution channels complete the decomposition. For each redistributive channel, the aggregate effect depends on the covariance between household MPCs and exposure, not on average exposure.

[Slacalek et al. \(2020\)](#) develop a related back-of-the-envelope calculation for the euro area and find that the indirect labor-income channel and the effect of housing wealth, rather than the direct balance-sheet channels, drive both the size of the aggregate consumption response and its dispersion across countries. [Tzamourani \(2021\)](#) measures unhedged interest rate exposure in the HFCS for every euro area country and traces the cross-country pattern largely to the prevalence of variable rate mortgages. Austria, where few households overall hold such mortgages but deposits make up a large share of household wealth, has one of the largest positive mean exposures.

Building on this logic, [Patterson \(2023\)](#) demonstrates that labor-market heterogeneity amplifies business-cycle fluctuations because high-MPC workers are disproportionately employed in jobs whose earnings are more cyclical. In US administrative data, this matching multiplier raises the aggregate MPC by about 20 percent relative to a benchmark of equal exposure, and the covariance between MPCs and earnings elasticities that generates it is closely related to the earnings-heterogeneity channel we estimate for Austria. [Pekanov \(2024b\)](#) shows that earnings elasticities in the euro area are highest for the bottom income groups and decline along the income distribution, and that the groups with the highest elasticities also have higher MPCs on average.

[Boehnert et al. \(2025\)](#) highlight expenditure composition as an additional channel, which our balance-sheet decomposition does not capture. Across the member states of the euro area, countries with higher inequality have larger service expenditure shares and a weaker output response to common monetary policy, because services are luxuries and the income of wealthier households is disproportionately exposed to the service sector. With a service expenditure share of 38 percent, Austria is below most euro area countries in their data, which in their framework places it on the side of comparatively strong transmission.

Household heterogeneity is carried into an open-economy setting by [de Ferra et al. \(2020\)](#), who build a heterogeneous-agent New Keynesian small open model economy (HANKSOME) that experiences a sudden stop in capital inflows. When high-MPC households hold foreign-currency liabilities, exchange rate depreciations generate large negative wealth effects that make depreciation welfare-reducing. This mechanism provides a micro-founded explanation for “fear of floating” and shows that a depreciation can have adverse welfare effects in economies with vulnerable household balance sheets. Austria was among the countries with more than 20 percent of household debt denominated in foreign currency during the 2000s, a feature that is directly relevant to the foreign exposures we measure below.

A note of caution comes from [Bilbiie \(2025\)](#), who shows analytically that the quantitative importance of heterogeneity hinges on how the income of high-MPC (hand-to-mouth) households moves with aggregate income: amplification obtains only when their income is more cyclical than average, and it can turn into dampening otherwise. Because taxes and transfers are countercyclical, inequality in disposable income, which [Bilbiie \(2025\)](#) regards as the empirical counterpart of the model’s key object, is less countercyclical than inequality in labor earnings and may even be procyclical. This mutes the amplification and can bring aggregate outcomes close to those implied by representative-agent models. [Bilbiie et al. \(2025\)](#) provide the empirical counterpart. Using Norwegian administrative data on income, wealth and actual consumption, they find that the aggregate MPC is very close to the average MPC, so that heterogeneity barely amplifies demand shocks once income is measured after taxes and transfers, even though measures based on labor earnings point to amplification.

By contrast, [Crawley and Kuchler \(2023\)](#) estimate Auclert’s sufficient statistics on Danish administrative data and find the redistribution channels to be large: a one-percentage-point increase in the real interest rate lowers aggregate consumption growth by 29 basis points through interest rate exposure alone. They attribute the small interest rate exposure channel in the United States to the lower prevalence of variable rate mortgages, and the smaller Fisher channel to lower household debt.

Our open-economy extension connects the literature on heterogeneous-agent monetary transmission with the literature on external balance sheets. The literature on household heterogeneity following [Auclert \(2019\)](#) studies monetary transmission in closed economies and isolates distributional covariances, while the literature on net foreign assets, exemplified by [Ghironi \(2008\)](#), examines how a country’s external balance sheet shapes the response of the aggregate economy to shocks without allowing for heterogeneity in MPCs. The HANKSOME framework of [de Ferra et al. \(2020\)](#) bridges these strands for the special case of foreign-currency debt concentrated among constrained households. [Auclert et al. \(2021\)](#) quantify the real-income channel of exchange rate movements in an open-economy HANK model, a channel that operates through the effect of import prices on real incomes and is therefore distinct from the balance-sheet revaluation we isolate. [Guo et al. \(2023\)](#), in turn, show that heterogeneity in households’ exposure to international markets drives unequal consumption responses to external shocks more than heterogeneity in income or wealth does, and that monetary policy in open economies faces a tradeoff between stabilization and inequality.

We extend Auclert’s sufficient-statistics framework by allowing households to hold foreign positions of any maturity and type, all of which are treated as positions in a single foreign currency. We show that each of the resulting foreign channels then separates into two components: a level component governed by the household sector’s aggregate foreign exposure and a redistribution component governed by the covariance between foreign exposures and household MPCs. This distinction allows us to quantify how both the level and distribution of foreign exposures shape the transmission of monetary policy in an open economy.

3. Theoretical Approach

3.1. The closed-economy decomposition

We closely follow the approach developed by [Auclert \(2019\)](#) and applied to the euro area in [Pekanov \(2024a\)](#). When households differ, monetary policy has implicit redistribution effects, and these change the aggregate consumption response to interest rate changes. Three redistribution channels operate when households have different MPCs and different portfolios: an unhedged interest rate exposure (URE) channel, an earnings heterogeneity channel and a net nominal position (NNP) channel. To quantify them, we assume a monetary policy change equal to an interest rate cut of $dR/R = -1\%$ and, following the calibration adopted in [Pekanov \(2024a\)](#), that this cut raises aggregate GDP, and therefore income, by $dY/Y = +0.4\%$ and the aggregate price level by $dP/P = +0.2\%$. Here R is the gross real interest rate, which is close to one, so that a cut of one percentage point corresponds approximately to $dR/R = -1\%$. We treat the one-percentage-point cut in the ECB policy rate as an equal decrease in the relevant real rate of return, which is a calibration assumption. These magnitudes are in line with the output and price responses to a one-percentage-point policy rate change in structural models of the euro area (cf. [Coenen et al., 2012](#), Section III) and define the comparative statics exercise. In most of the models compared by [Coenen et al. \(2012\)](#), a 100 basis-point increase in policy rates for one year lowers GDP by around 0.5 percent by the end of the first year.

Households are differently exposed to these aggregate changes (dP, dY, dR) , and we can quantify these exposures given suitable household-level data. First, the net nominal asset position (NNP) describes the nominal asset exposures of households. Additional inflation $dP/P = +0.2\%$ due to the monetary policy change creates implicit redistribution from holders of nominal assets, who lose due to the inflation, to holders of nominal liabilities, who gain in real terms. The net nominal position (NNP) channel describes this redistribution and its effect on consumption. Second, the total income of households is also influenced by the monetary policy change due to the aggregate output growth $dY/Y = +0.4\%$. In the simplest benchmark, each household is affected one-for-one by the aggregate output change, so that the income of each household increases by 0.4 percent. Our baseline instead follows [Auclert \(2019\)](#) in letting relative incomes respond to aggregate income. Individual earnings elasticities are a central input to our analysis. We later allow these elasticities to vary across the income distribution. This relaxation permits households to respond differently to aggregate GDP fluctuations depending on their income position. Following [Guvenen et al. \(2017\)](#), we define individual earnings elasticities with respect to aggregate output as shown in Equation (1), where γ_h is the earnings elasticity of an individual or household in a specific income bin. E_h denotes the individual's or household's earnings and Y is the aggregate GDP of an economy. In US administrative data, [Guvenen et al. \(2017\)](#) find that the exposure of individual earnings to GDP is U-shaped in the level of earnings, with the highest exposure at both tails and the increase at the top concentrated in the 99th and 99.9th percentiles. The Austrian profile estimated in Section 5.1.1 declines from the 10th to the 90th percentile.

$$\gamma_h = \frac{dE_h}{dY} \frac{Y}{E_h}. \quad (1)$$

Finally, the rate cut also affects households differently: households with unhedged interest payments pay less after the central bank’s rate cut, while households that receive interest income receive less. This implicit redistribution through households’ unhedged positions is the unhedged interest rate exposure (URE) channel.

Auclert (2019) shows that, in the above comparative statics exercise, the consumption response to a standard interest rate change can be expressed analytically and decomposed in a reduced form with only a small number of channels, estimable from microdata. The decomposition in Equation (2) shows that the aggregate consumption response to an interest rate change can be described by products of the three macroeconomic changes described above (dP, dY, dR) and five objects describing the households’ exposures: M and S for aggregate income and intertemporal substitution respectively, and three elasticities E_P , E_Y and E_R . This simplified decomposition rests on two assumptions: that the elasticity of intertemporal substitution is the same across individuals ($\sigma_i = \sigma$) and that the elasticity of relative income to aggregate income is the same across households ($\eta_i = \eta$).¹ The consumption change from a standard consumption choice problem following an interest rate change can be expressed using the following elasticities:

$$\frac{dC}{C} = (M + \eta E_Y) \frac{dY}{Y} - E_P \frac{dP}{P} + (E_R - \sigma S) \frac{dR}{R}. \quad (2)$$

We write η for Auclert’s relative-income parameter and reserve γ_i for household earnings incidence. Two remarks on the parameter η in Equation (2) are important for what follows. First, η here is Auclert’s elasticity of *relative* income to aggregate income, not the Guvenen-type earnings elasticity γ_h of Equation (1): proportional incidence ($\gamma_h = 1$ for all h) corresponds to $\eta = 0$, in which case the earnings-heterogeneity channel is exactly zero by construction. The decomposition implements η through the incidence rule $dY_i = [Y_i + \eta(Y_i - \mathbb{E}_I[Y_i])] dY/Y$, which reproduces the earnings term $\eta E_Y dY/Y$ of Equation (2) and adds up to the aggregate income change for any η . Proportional incidence means that every household gains the same percentage of its income. With $\eta = -1$, every household gains the same euro amount instead, so that low-income households gain more in percent of their income. Second, our baseline decomposition sets $\eta = -1$, consistent with the evidence cited by Auclert (2019) that income risk is countercyclical and that monetary accommodation reduces income inequality (Coibion et al., 2017), so that the baseline earnings-heterogeneity channel contributes $-E_Y dY/Y$. Pekanov (2024a) assumes proportional incidence ($\eta = 0$), but we reproduce his reported total response of 0.86 pp and amplification of 15 percent with $\eta = -1$.

Table 1 defines the five sufficient statistics used in Equation (2). The three redistribution elasticities are covariances between MPCs and the unhedged interest rate exposure, the net nominal position and income.

3.2. General form of the closed-economy decomposition

Equation (2) is the special case, under $\sigma_i = \sigma$ and $\eta_i = \eta$, of the general first-order decomposition in Theorem 3 of Auclert (2019), which is the starting point of our open-economy

¹Werning (2015) discusses the theoretical implications of this assumption for incomplete markets.

Table 1: Channels of monetary policy transmission

Moment	Definition	Name	Channel
E_R	$\text{cov}_I \left(MPC_i, \frac{URE_i}{\mathbb{E}_I[c_i]} \right)$	Redistribution elasticity for R	Interest rate exposure
S	$\mathbb{E}_I \left[(1 - MPC_i) \frac{c_i}{\mathbb{E}_I[c_i]} \right]$	Hicksian scaling factor	Substitution
E_P	$\text{cov}_I \left(MPC_i, \frac{NNP_i}{\mathbb{E}_I[c_i]} \right)$	Redistribution elasticity for P	Fisher
E_Y	$\text{cov}_I \left(MPC_i, \frac{Y_i}{\mathbb{E}_I[c_i]} \right)$	Redistribution elasticity for Y	Earnings heterogeneity
M	$\mathbb{E}_I \left[MPC_i \frac{Y_i}{\mathbb{E}_I[c_i]} \right]$	Income-weighted MPC	Aggregate income

$\mathbb{E}_I$ and cov_I denote the survey-weighted cross-sectional mean and covariance over households. All exposures are normalized by mean household consumption $\mathbb{E}_I[c_i]$, so that each moment reads as an aggregate consumption elasticity. E_P , E_R and E_Y are the three redistribution elasticities. The moments M and S are present even without heterogeneity. Source: adapted from Table 1 of [Auclert \(2019\)](#).

extension. To first order, aggregate consumption in a closed economy responds to a shock to the vector (dY_i, dY, dP, dR) according to

$$\begin{aligned}
 dC = & \underbrace{\mathbb{E}_I \left[\frac{Y_i}{Y} \widehat{MPC}_i \right] dY}_{\text{aggregate income}} + \underbrace{\text{cov}_I \left(\widehat{MPC}_i, dY_i - Y_i \frac{dY}{Y} \right)}_{\text{earnings heterogeneity}} \\
 & - \underbrace{\text{cov}_I \left(\widehat{MPC}_i, NNP_i \right) \frac{dP}{P}}_{\text{Fisher}} + \underbrace{\text{cov}_I \left(\widehat{MPC}_i, URE_i \right) \frac{dR}{R}}_{\text{interest rate exposure}} - \underbrace{\mathbb{E}_I [\sigma_i (1 - \widehat{MPC}_i) c_i] \frac{dR}{R}}_{\text{substitution}}, \tag{3}
 \end{aligned}$$

where $\widehat{MPC}_i$ denotes household i 's MPC out of a change in total income, defined below, NNP_i its net nominal position, URE_i its unhedged interest rate exposure, c_i consumption, and σ_i the elasticity of intertemporal substitution.

The hat on the MPC is Auclert's Corollary 1: because a household that receives a windfall income may choose to adjust its working hours, the change in its *total* income differs from the transfer, and the consumption response per unit of total income is $\widehat{MPC}_i = MPC_i / (MPC_i + MPS_i) = MPC_i / (1 + w MPN_i)$, where MPS_i and $MPN_i \leq 0$ are the marginal propensities to save and to work. This adjustment vanishes when labor supply is inelastic: then $MPN_i = 0$ and $\widehat{MPC}_i = MPC_i$. Since the HFCS lottery question asks about spending out of a windfall without inviting any adjustment of hours, we set $\widehat{MPC}_i = MPC_i$ throughout.

A closed economy with consolidated firms entails the following two market-clearing identities:

$$\mathbb{E}_I [NNP_i] = -NNP_g, \quad \mathbb{E}_I [URE_i] = -URE_g, \tag{4}$$

where g denotes the government. Combined with a lump-sum fiscal rule, the aggregate balance-sheet exposures of households are absorbed by the government and net to zero in the household decomposition. Only the cross-sectional *covariances* between MPCs and exposures remain. This is the central insight of Auclert (2019): average exposures are irrelevant, only their distribution across the MPC distribution matters.

3.3. Open-economy setting

Next, we extend the sufficient-statistics decomposition of Auclert (2019) to a small open economy in which households hold heterogeneous foreign positions. The treatment is more general than the Austrian implementation in Section 5.2. We derive the decomposition for arbitrary domestic and foreign positions and only adapt it to a member of the euro area in the final step (Section 3.8). The key insight is that the closed-economy market-clearing restrictions that underlie Auclert’s covariance representation do not apply in the presence of foreign assets and liabilities in the household balance sheet, so that the aggregate consumption response gains new channels, each of which depends on the *level* of the household sector’s aggregate foreign exposure in addition to its cross-sectional distribution.

Households and the foreign asset menu

Consider a small open economy populated by I types of households as in Auclert (2019), but augment the asset menu with claims on the rest of the world. Each household i holds a portfolio that splits into a domestic-currency part and a foreign part:

- **Domestic nominal positions** NNP_i^d (domestic-currency deposits, mortgages, government and corporate bonds).
- **Domestic real positions** (equity in domestic firms, inflation-indexed bonds). Equity is a real position because it is a claim on dividends whose nominal value moves with the price level, so a one-time jump in P leaves its real value unchanged. Only claims fixed in units of currency belong in NNP_i^d . Treating equity as a purely real position is a simplification consistent with the consolidated firms of Auclert (2019). Doepke and Schneider (2006) instead attribute to shareholders a leveraged share of the net nominal position of the business sector, and they also count nominal assets held indirectly through investment intermediaries.
- **Foreign nominal positions** NNP_i^f , denominated in a basket of foreign currencies. We keep a single index f for notational simplicity. The extension to a multi-currency setting is mechanical and is precisely the disaggregation called for in Section 6.
- **Foreign real positions**, principally foreign equity θ_i^f , with foreign-currency dividend stream d_t^f and price S_t^f .
- **Foreign-currency liabilities**, which enter NNP_i^f with a negative sign (historically important in Austria: CHF-denominated mortgages, mostly issued before new foreign-currency lending to households was curbed in 2008, a stock that has been running off since but was still about EUR 9.5 bn at the end of 2021).

Let $\mathcal{E}_t$ denote the nominal exchange rate expressed as units of domestic currency per unit of foreign currency, so an increase in $\mathcal{E}_t$ is a domestic-currency depreciation. Let P_t^* be the

foreign price level, R_t^* the foreign real interest rate, and Q_t^* the foreign nominal discount factor, with a foreign Fisher relation holding analogously to the domestic side.

Open-economy budget and balance-sheet exposures

Adapting Auclert (2019)'s flow budget constraint, the household's initial ($t = 0$) resource flow in domestic currency now includes converted foreign flows:

$$\begin{aligned}
P_0 c_{i0} = & P_0 y_{i0} + W_0 n_{i0} - T_{i0} \\
& + \left[(-1 B_{i0}^d) + \sum_{s \geq 1} Q_s (-1 B_{is}^d - {}_0 B_{is}^d) \right] \\
& + P_0 \left[(-1 b_{i0}^d) + \sum_{s \geq 1} q_s (-1 b_{is}^d - {}_0 b_{is}^d) \right] \\
& + (d_0 + S_0) \theta_{i,-1}^d - S_0 \theta_{i0}^d \\
& + \mathcal{E}_0 \left[(-1 B_{i0}^f) + \sum_{s \geq 1} Q_s^* (-1 B_{is}^f - {}_0 B_{is}^f) \right] \\
& + \mathcal{E}_0 P_0^* \left[(-1 b_{i0}^f) + \sum_{s \geq 1} q_s^* (-1 b_{is}^f - {}_0 b_{is}^f) \right] \\
& + \mathcal{E}_0 \left[(d_0^f + S_0^f) \theta_{i,-1}^f - S_0^f \theta_{i0}^f \right].
\end{aligned} \tag{5}$$

Here ${}_t B_{is}$ and ${}_t b_{is}$ are the nominal and inflation-indexed amounts falling due at date s from the bond positions that household i holds at the end of period t , and Q_s and q_s are the corresponding nominal and real discount factors.² Equity holdings are θ_i , with dividend d and ex-dividend price S , y_{i0} is non-financial unearned income, $W_0 n_{i0}$ labor income and T_{i0} net taxes. Foreign-currency counterparts carry the superscript f , foreign prices and discount factors carry a star, and the last three lines convert the foreign block into domestic currency at the spot rate $\mathcal{E}_0$. Every deposit, bond or mortgage is treated as a set of payments falling due at future dates, so that ${}_{-1} B_{is}$ is the amount due at date s from positions chosen before the shock. Only the amounts due today ($s = 0$) must be reinvested at the new rate, which is why they make up the unhedged interest rate exposure. Define open-economy analogues of Auclert's exposure measures. We express all exposures in units of domestic consumption. Foreign positions are first valued in units of foreign consumption and then converted at the real exchange rate $e_0 \equiv \mathcal{E}_0 P_0^* / P_0$. The *foreign net nominal position* is

$$NNP_i^f \equiv e_0 \sum_{s \geq 0} Q_s^* \frac{{}_{-1} B_{is}^f}{P_0^*}, \tag{6}$$

and the *foreign unhedged interest rate exposure* is the value, in units of domestic consumption, of maturing foreign-currency claims net of foreign-currency liabilities at $t = 0$, excluding

²The first four lines combine the domestic budget constraints of Auclert (2019), with nominal and real bonds as in his problem (1) and equity as in his budget constraint (9). The pre-shock present-value normalizations $q_0 = Q_0 = q_0^* = Q_0^* = 1$ are imposed. The interest rate changes last one period, while the changes in the price levels and in the real exchange rate are permanent. The expected future path of the exchange rate shifts only by this permanent change and does not otherwise respond to the foreign interest rate. Maturing foreign-currency positions are rolled over in foreign currency.

consumption (since the household consumes the domestic good):

$$URE_i^f \equiv e_0 \left[\frac{d_0^f \theta_{i,0}^f}{P_0^*} + (-_1 b_{i0}^f) + \frac{-_1 B_{i0}^f}{P_0^*} \right]. \quad (7)$$

The household's net foreign asset position is $NFA_i \equiv NNP_i^f + e_0 S_0^f \theta_i^f / P_0^*$ plus any other foreign real claims. It is the total value of foreign holdings exposed to the exchange rate, in units of domestic consumption.

The shock vector and asset-price responses

The closed-economy experiment now generalizes to a vector

$$\left(dY_i, dY, \frac{dP}{P}, \frac{dR}{R}, \frac{dP^*}{P^*}, \frac{dR^*}{R^*}, \frac{d\mathcal{E}}{\mathcal{E}} \right). \quad (8)$$

Two cases should be distinguished. After a monetary shock in a small open economy with its own monetary authority, the domestic block and the exchange rate move, while world prices and world interest rates remain fixed. After an ECB shock, Austria is small but the currency area is not, so that foreign prices and interest rates may respond as well. The assumption of a small economy plays a role in only one place. The foreign block $(dP^*/P^*, dR^*/R^*, d\mathcal{E}/\mathcal{E})$ is taken as exogenous rather than determined jointly with the domestic block, because domestic households are too small to move world prices, world interest rates or, in our application, the euro exchange rate. Proposition 1 itself is a comparative statics result that holds for any shock vector and for any open economy whose domestic block satisfies the closure conditions stated before Proposition 1. For a large economy only the calibration of the foreign block would change. For a euro area member, the policy rate is set by the ECB for the currency area as a whole. Our calibration therefore applies euro area responses of the interest rate, the price level and income $(dR/R, dP/P, dY/Y)$ to Austria. This is an approximation, because national prices and output can respond differently from the euro area averages. What the decomposition allows to differ across member states is the *incidence* (heterogeneous dY_i and heterogeneous foreign exposures). The foreign block $(dP^*/P^*, dR^*/R^*)$ moves only to the extent that ECB shocks spill over abroad, and the exchange rate $d\mathcal{E}/\mathcal{E}$ is typically the most responsive. Asset prices adjust to reflect discounting alone, mirroring [Auclert \(2019\)](#)'s assumption. Foreign equity is a claim on foreign real dividends, so that, for a one-period change in the foreign real rate, its real price $s^f \equiv S^f/P^*$ moves by $ds^f/s^f = -dR^*/R^*$, and its nominal price by $dS^f/S^f = dP^*/P^* - dR^*/R^*$. In units of domestic consumption, the value of foreign equity therefore changes by

$$\frac{d(e s^f)}{e s^f} = \frac{de}{e} - \frac{dR^*}{R^*}, \quad (9)$$

which delivers a separate exchange rate revaluation that closed-economy households do not experience. Only the real depreciation de/e in (9) survives into the wealth change below. Under the timing assumptions of the budget constraint, the discount-rate part of the capital gain, $-dR^*/R^*$, does not change the payments that a household holding its foreign positions to maturity converts into domestic consumption, as in the closed economy. The only remaining foreign-rate exposure is therefore the unhedged one in URE_i^f , which arises because maturing foreign-currency claims and liabilities are rolled over at the new foreign rate.

3.4. The open-economy net-wealth revaluation

Repeating the proof of Theorem 1 in [Auclert \(2019\)](#) on the augmented budget constraint (5), the household's net-of-consumption wealth change becomes

$$d\Omega_i = \underbrace{dY_i}_{\text{income}} - \underbrace{NNP_i^d \frac{dP}{P}}_{\text{domestic Fisher}} + \underbrace{URE_i^d \frac{dR}{R}}_{\text{domestic URE}} - \underbrace{NNP_i^f \frac{dP^*}{P^*}}_{\text{foreign Fisher}} + \underbrace{URE_i^f \frac{dR^*}{R^*}}_{\text{foreign URE}} + \underbrace{NFA_i \frac{de}{e}}_{\text{exchange rate revaluation}}, \quad (10)$$

where URE_i^d is Auclert's original URE measure restricted to domestic-currency flows. The foreign-Fisher and foreign-URE terms have the same structure as their domestic counterparts. Foreign inflation erodes the real value of foreign-currency nominal claims, and a decrease in the foreign real rate redistributes from foreign net savers (positive URE_i^f) to foreign net borrowers. The exchange rate term is qualitatively distinct. All exposures are measured in units of domestic consumption, so every foreign position revalues with the real exchange rate $e = \mathcal{E}P^*/P$, whose change is $de/e = d\mathcal{E}/\mathcal{E} + dP^*/P^* - dP/P$. A real depreciation of 1 percent raises the value of any foreign position, nominal or real, by 1 percent, scaled by NFA_i . The three foreign exposures are overlapping slices of one and the same portfolio: NNP_i^f is its nominal part, URE_i^f its fast-repricing part, and NFA_i the whole stock exposed to the exchange rate. They nevertheless do not double-count, because each multiplies a different shock: NNP_i^f is the exposure to foreign inflation, URE_i^f the exposure to the foreign real rate, and NFA_i the exposure to the real exchange rate. The same overlap is already present on the domestic side between NNP_i^d and URE_i^d .

Remark (valuation of foreign positions). All terms in (10) are changes in units of domestic consumption, and the foreign terms can be checked on four simple positions, each maturing or revalued at $t = 0$ with no interest rate or income shock. A foreign nominal claim B^f is worth $\mathcal{E}B^f/P$, so that its value changes by $d\mathcal{E}/\mathcal{E} - dP/P = de/e - dP^*/P^*$. This is the exchange rate revaluation term plus the foreign Fisher term, since the claim enters both NFA_i and NNP_i^f . A foreign price-indexed claim b^f is worth $\mathcal{E}P^*b^f/P = eb^f$ and changes by de/e , which is the revaluation term alone. A foreign-currency liability enters as a negative nominal position, so that the same valuation factor, $de/e - dP^*/P^*$, produces an oppositely signed wealth change. Foreign equity is a claim on foreign real dividends, so that its value changes by de/e , as in Equation (9) without a change in the foreign rate. Applying the nominal rate $d\mathcal{E}/\mathcal{E}$ instead of the real rate de/e would omit the term $dP^*/P^* - dP/P$. In our calibration this term equals $-0.1 - 0.2 = -0.3$ percentage points, so that the nominal depreciation of 0.5 percent corresponds to a real depreciation of only 0.2 percent.

3.5. Open-economy aggregation: a new decomposition

The crucial difference from the closed economy is that the cross-sectional means of foreign exposures do *not* net out against a government counterparty:

$$\mathbb{E}_I[NNP_i^f] = NNP_c^f, \quad \mathbb{E}_I[URE_i^f] = URE_c^f, \quad \mathbb{E}_I[NFA_i] = NFA_c, \quad (11)$$

where the subscript “c” denotes the aggregate exposure of the modeled household sector, expressed per household so that it is commensurate with the cross-sectional means on the

left-hand side. This exposure need not equal the residency-based NIIP, because currency denomination and counterparty residency define different sets of positions. Our implementation uses household-sector aggregates constructed from the OeNB statistics. For a net creditor NFA_c is positive by definition, whereas NNP_c^f and URE_c^f can take either sign. In Austria, NNP_c^f is small relative to NFA_c , and URE_c^f is negative because fast-repricing foreign-currency liabilities (the legacy CHF variable rate mortgages) exceed maturing foreign-currency claims.

The identities (4) continue to hold for the domestic block if domestic-currency positions are held by domestic households and net out against the domestic government and the consolidated domestic firms, and if government gains and losses are rebated equally per household. Domestic positions held by non-residents, or rebates with heterogeneous incidence, would add domestic level or fiscal-incidence terms that the decomposition omits. Summing the consumption responses of the individual households, given by Theorem 2 of [Auclert \(2019\)](#), across households yields the following extension of his Theorem 3, in which the mean foreign exposures remain as level terms.

Proposition 1 (Open-economy redistribution channel). *To first order, in response to the shock vector $(dY_i, dY, dP, dR, dP^*, dR^*, d\mathcal{E})$ under lump-sum rebates of domestic government surpluses that are equal across households, aggregate consumption changes by*

$$\begin{aligned}
dC = & \underbrace{\mathbb{E}_I \left[\frac{Y_i}{Y} \widehat{MPC}_i \right] dY + \text{cov}_I \left(\widehat{MPC}_i, dY_i - Y_i \frac{dY}{Y} \right)}_{\text{closed-economy core}} \\
& - \text{cov}_I \left(\widehat{MPC}_i, NNP_i^d \right) \frac{dP}{P} + \left[\text{cov}_I \left(\widehat{MPC}_i, URE_i^d \right) - \mathbb{E}_I [\sigma_i (1 - \widehat{MPC}_i) c_i] \right] \frac{dR}{R} \\
& - \underbrace{\mathbb{E}_I [\widehat{MPC}_i] NNP_c^f \frac{dP^*}{P^*} - \text{cov}_I \left(\widehat{MPC}_i, NNP_i^f \right) \frac{dP^*}{P^*}}_{\text{foreign Fisher channel}} \\
& + \underbrace{\mathbb{E}_I [\widehat{MPC}_i] URE_c^f \frac{dR^*}{R^*} + \text{cov}_I \left(\widehat{MPC}_i, URE_i^f \right) \frac{dR^*}{R^*}}_{\text{foreign URE channel}} \\
& + \underbrace{\mathbb{E}_I [\widehat{MPC}_i] NFA_c \frac{de}{e} + \text{cov}_I \left(\widehat{MPC}_i, NFA_i \right) \frac{de}{e}}_{\text{exchange rate revaluation channel}} \\
& + \underbrace{\mathbb{E}_I [\widehat{MPC}_i] \mathbb{E}_I [\pi_i^{f,X} Y_i] \frac{de}{e} + \text{cov}_I \left(\widehat{MPC}_i, \pi_i^{f,X} Y_i \right) \frac{de}{e}}_{\text{foreign earnings channel}},
\end{aligned} \tag{12}$$

where $\pi_i^{f,X}$ denotes the share of traded-sector labor and profit income in household i 's income Y_i , so that $\pi_i^{f,X} Y_i$ is its traded-sector income, which is assumed to increase one-for-one with a real depreciation, and $\mathbb{E}_I [\pi_i^{f,X} Y_i] / \mathbb{E}_I [Y_i]$ is the aggregate tradables income share. In Equation (12), dY_i and $dY = \mathbb{E}_I [dY_i]$ denote income changes excluding the response of traded-sector earnings to the real exchange rate, which the last line adds explicitly. The total income change of household i is therefore $dY_i^{tot} = dY_i + \pi_i^{f,X} Y_i de/e$, and the foreign earnings channel decomposes it rather than adding a further source of income. Note that Equation (12) is a comparative static with respect to an arbitrary shock vector: it does not require the elements of that vector to be mutually orthogonal. Our empirical implementation

uses the total-income formulation instead. The calibrated dY is a total equilibrium income response of the euro area from [Pekanov \(2024a\)](#), in which the accompanying depreciation already contributes, so that the level term of the foreign earnings channel is set to zero. The covariance term measures how much of the earnings-heterogeneity channel is due to traded-sector exposure. Since the estimated incidence profile of Section 5.1.1 may already capture part of it, we report this term as a sensitivity check (Section 5.2). The foreign elements of our shock vector are an illustrative calibration (Section 4.1).

Sketch. The proof follows the steps of Theorem 3 in [Auclert \(2019\)](#). The only modification is that the foreign block of exposures does not net out by an analogue of (4). For any foreign exposure X_i^f , the aggregate of the MPC-weighted revaluation satisfies

$$\mathbb{E}_I[\widehat{MPC}_i X_i^f] = \mathbb{E}_I[\widehat{MPC}_i] X_c^f + \text{cov}_I(\widehat{MPC}_i, X_i^f), \quad (13)$$

using $\mathbb{E}_I[X_i^f] = X_c^f$ from (11). This delivers a level term (the household sector's aggregate exposure times the average MPC) *plus* a covariance term for each foreign exposure. For the earnings channel, write the total income change of household i as $dY_i^{\text{tot}} = dY_i + \pi_i^{f,X} Y_i de/e$, where dY_i excludes the traded-sector component induced by the exchange rate. Applying the mean-covariance identity to the traded-sector component gives the last line of (12). $\square$

3.6. No foreign substitution channel

Households consume the domestic basket and discount at the domestic real rate, so intertemporal substitution responds to dR alone and the Hicksian scaling factor S is unchanged by opening the economy. Foreign financial exposures enter through balance-sheet effects rather than through a separate substitution channel. A foreign substitution term would arise if households could shift consumption across currencies, or if the relevant discount rate were a portfolio-weighted average of domestic and foreign rates, and neither is implied by the environment above. This is why the open economy adds four channels rather than five.

3.7. Estimable moments and the open-economy elasticity

Under the same assumptions as Auclert's Corollary 2 ($\sigma_i = \sigma$ and constant relative-income elasticity η), the open-economy aggregate consumption elasticity becomes

$$\begin{aligned} \frac{dC}{C} = & (M + \eta E_Y) \frac{dY}{Y} - E_P \frac{dP}{P} + (E_R - \sigma S) \frac{dR}{R} \\ & - (F^{f,NNP} + E^{f,NNP}) \frac{dP^*}{P^*} + (F^{f,URE} + E^{f,URE}) \frac{dR^*}{R^*} + (F^{f,NFA} + E^{f,NFA}) \frac{de}{e} \\ & + (F^{f,X} + E^{f,X}) \frac{de}{e}, \end{aligned} \quad (14)$$

where M , E_Y , E_P , E_R and S are the closed-economy moments of Table 1, while $\mathcal{E}$ continues to denote the exchange rate. Suppressing the $1/\mathbb{E}_I[c_i]$ normalization, each new pair consists of a level moment $F^{f,\cdot} \equiv \mathbb{E}_I[\widehat{MPC}_i] X_c^f$ and a redistribution-elasticity moment $E^{f,\cdot} \equiv \text{cov}_I(\widehat{MPC}_i, X_i^f)$. Table 15 in Section 5.2 reports the contributions of three of these four pairs for Austria, that is, the moments $F^{f,\cdot}$ and $E^{f,\cdot}$ for NFA , URE^f and NNP^f multiplied by the corresponding shocks. For the foreign earnings channel, the level term $F^{f,X}$ is excluded to avoid double counting, and the covariance term $E^{f,X}$ is estimated separately.

3.8. Adaptation to Austria and testable priors

Adapting the decomposition to Austria as a euro area member, the relevant exchange rate is the euro’s external value. Three priors follow from the decomposition together with what is known about Austrian balance sheets.

1. **Aggregate NFA is positive and rising.** The level component $F^{f,NFA}$ is therefore positive, contributing an expansionary effect of ECB easing through a real depreciation of the euro that is absent in the closed-economy decomposition. (The level components of the foreign Fisher and foreign URE channels depend on NNP_c^f and URE_c^f , which need not be positive, as noted above.)
2. **Foreign equity is concentrated at the top of the wealth distribution.** If MPCs decline with wealth, as they do with cash-on-hand in the euro area (Albacete et al., 2025), the covariance component $E^{f,NFA}$ is negative and partially offsets the positive level effect $F^{f,NFA}$. Whether this holds is an empirical question for each country. The same reasoning does not determine the role of $E^{f,URE}$ and $E^{f,NNP}$, because the foreign nominal and fast-repricing positions are dominated by foreign-currency mortgages held by working-age borrowers. Their signs depend on whether these borrowers have higher or lower MPCs than the holders of foreign deposits and bonds.
3. **Net effect.** Whether the exchange rate revaluation channel amplifies ECB transmission in Austria, relative to the closed-economy benchmark, hinges on the relative magnitudes of its level component and its redistribution component. For typical orders of magnitude ($\mathbb{E}[\widehat{MPC}] \approx 0.46$, $NFA/C > 0$, and a moderately negative MPC–NFA covariance), the level effect dominates, yielding net amplification through the exchange rate revaluation channel even after redistribution is accounted for.

A symmetric statement applies to the foreign earnings channel, whose level component is positive because a depreciation raises traded-sector earnings. If high-MPC households are concentrated in non-tradables employment, $\text{cov}_I(\widehat{MPC}_i, \pi_i^{f,X} Y_i) < 0$, and the redistribution component attenuates the level component.

4. Data and Empirical Approach

Three empirical approaches measure MPCs out of transitory income shocks. Quasi-experimental studies use the randomized timing of the 2001 and 2008 tax rebates in the United States (Johnson et al., 2006; Parker et al., 2013) or lottery winnings in Norwegian administrative data (Fagereng et al., 2021), and find higher responses for households with low income or low liquid wealth. Semi-structural studies recover the pass-through from income to consumption from covariance restrictions in panel data (Blundell et al., 2008; Crawley and Kuchler, 2023). Survey-based studies ask households directly how they would respond to a hypothetical income change (Shapiro and Slemrod, 1995, 2003; Sahm et al., 2010). Jappelli and Pistaferri (2014) apply this approach to Italian data and find much higher MPCs for households with low cash-on-hand. We build on the survey-based approach.

We use the HFCS question that elicits the marginal propensity to consume of households in euro area countries. The question has been part of the survey since the third wave. In

Austria it was also asked in the fifth wave of 2023 (Albacete and Lindner, 2025), whereas the present analysis uses the fourth wave. Comparable sufficient-statistics analyses are the study by Auclert (2019), which uses data for the US and Italy, the study by Crawley and Kuchler (2023) using Danish data, the euro area calculations in Slacalek et al. (2020), the study by Pekanov (2024a) for the euro area as a whole, and the sufficient-statistics analysis of Bilbiie et al. (2025) for Norway.

The HFCS is a detailed microdata survey, intended to be conducted every three years, in which households in the euro area countries and in some other EU countries respond to an extensive questionnaire regarding their household characteristics, income, consumption, assets and liabilities. Most importantly for our purposes, the recent waves of the HFCS also include a unique direct question on consumption behavior after unexpected, transitory income shocks. The question asks:

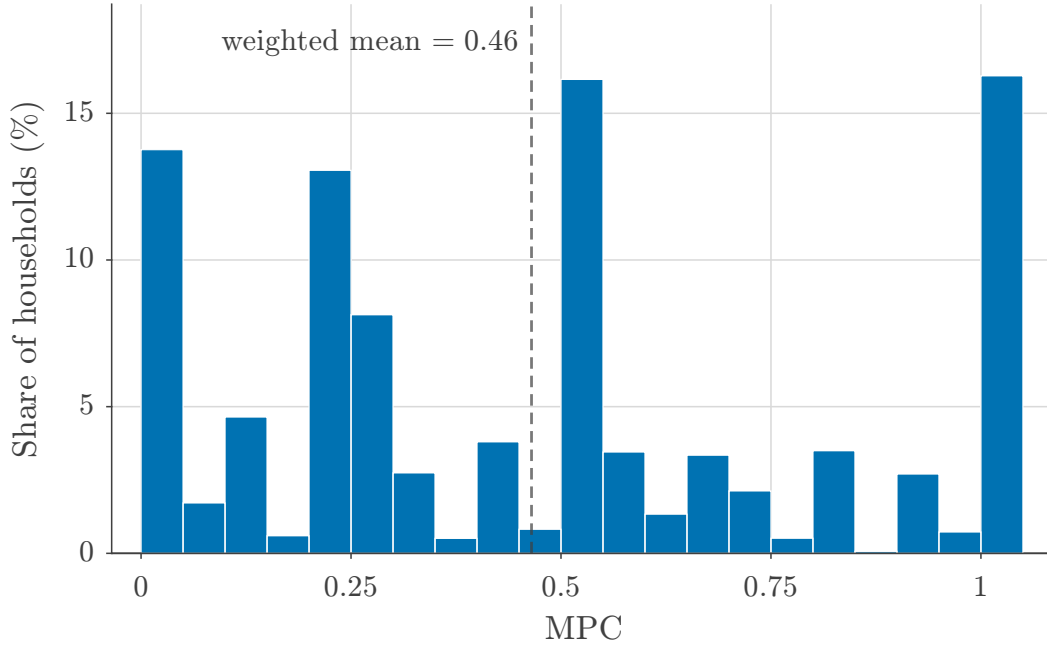
“Imagine you unexpectedly receive money from a lottery, equal to the amount of income your household receives in a month. What percent would you spend over the next 12 months on goods and services, as opposed to any amount you would save for later or use to repay loans?”

The question elicits a household-specific reported spending response to a hypothetical windfall equal to one month’s income, which allows MPCs to be linked directly to balance-sheet characteristics. Since the question asks about spending rather than consumption, respondents are likely to include durable as well as non-durable goods.

Figure 1 shows the resulting distribution of MPCs for Austria. While the sample mean MPC for the euro area is 42 percent in the fourth wave and the sample of household heads aged 25–64 used by Pekanov (2024a), the corresponding value for Austria is slightly higher at 46 percent, indicating that Austrian households spend, on average, just under half of an additional euro of income. The euro area mean of 46 percent reported by Albacete et al. (2025) refers to the third wave and to households of all ages, and is therefore not directly comparable. As noted in Pekanov (2024a), there is noticeable heaping around round numbers, as well as bunching around the points 0, 50 and 100 percent. A pitfall of this estimation method is the fact that it only allows us to note households’ intentions instead of their actions. However, the results from the HFCS allow us to conduct comparisons across the entire euro area. In addition, Colarieti et al. (2024) show for a large survey of US households that answers to hypothetical income-shock scenarios closely match the responses estimated in earlier studies from observational and quasi-experimental data. They conclude that surveys are useful for anticipating household responses in macroeconomic and policy settings. They attribute this accuracy to scenarios that resemble everyday financial decisions rather than rare events such as a lottery jackpot. The HFCS windfall, although framed as a lottery win, equals one month of household income and is therefore modest.

Using this data, we characterize the sign and magnitude of the redistribution channels in Austria and the euro area. Because the HFCS records only part of household consumption, we impute total consumption by scaling the HFCS expenditure items with the consumption shares of the Eurostat Household Budget Survey, matched by percentile of household income. To obtain the necessary covariance measures we need data on the MPC of households,

Figure 1: Distribution of the marginal propensity to consume, Austria



The figure shows the survey-weighted shares of households by the MPC reported in the HFCS lottery question, in bins of five percentage points. The dashed line marks the weighted mean of 0.46. Source: HFCS Wave 4, own calculations.

together with their consumption, income, assets and liabilities. We restrict the sample to households whose heads are aged 25–64. All measurements are calculated using survey weights. The main results of this paper use the fourth wave of the HFCS.

4.1. Data for the open-economy extension

We assemble the data for the open-economy extension from four complementary sources, and we are explicit about where measurement is exact and where it rests on imputation.

Aggregate external position. Austria’s NIIP provides the context for the level terms of the new channels, which are determined by the household-sector and estimation-sample exposures described below. We measure the NIIP relative to GDP and per capita from the OeNB statistical database ([Oesterreichische Nationalbank, 2024](#)), scaled by GDP and population from the World Bank ([World Bank, 2024a,b](#)). These series, discussed in Section 5.2, establish that Austria has been a net foreign creditor since around 2013. The national position alone does not determine the sign of the level component of the exchange rate revaluation channel, which depends on the net foreign assets of the estimation sample and on how much of them is exposed to the euro exchange rate. Both are discussed below. The signs of the level components of the foreign Fisher and foreign interest rate exposure channels depend on the household sector’s foreign nominal and fast-repricing positions.

Household-level foreign exposures. The household-level foreign exposures NNP_i^f , URE_i^f and NFA_i that enter the covariance components are more difficult to construct. The Austrian HFCS records direct holdings of deposits, bonds, mutual funds, listed shares, voluntary pension plans and business wealth, as well as a module on foreign-currency loans. It does not, however, record the currency or issuer-residency composition of these holdings. Moreover, a large share of household foreign-equity exposure is held *indirectly* through Austrian-domiciled funds. In the absence of a security-level portfolio decomposition, we impute household foreign exposures by allocating the aggregate household-sector foreign positions from the OeNB financial accounts and bank statistics (2021 Q4) to the households that report holding the corresponding instrument in the HFCS. Foreign listed shares are allocated to the households that report holding shares issued by foreign companies (item HD1520), the only survey item that identifies a foreign holding, and foreign credit liabilities to all indebted households in proportion to their total debt. The asset allocation proceeds in two steps: across income quintiles in proportion to the income shares of the eligible households, and within quintiles in proportion to the corresponding domestic balance-sheet item. Since the harmonized dataset does not record the currency of individual loans, we assume that foreign-currency loans were issued at variable rates and allocate them to households with variable rate mortgages in proportion to their total mortgage debt. The Austrian questionnaire collects information on foreign-currency loans as a country-specific addition that is not part of the harmonized euro area dataset (Albacete and Lindner, 2025). By construction this calibrated imputation preserves the aggregate level of foreign exposure, which is what the level components of the new channels require, but the distribution of foreign holdings across households is only approximated, a limitation we return to in Section 6. The OeNB aggregates are residency-based. We treat them as exposed to the euro’s external value, which assumes that foreign holdings revalue one-for-one with the real exchange rate of the euro, irrespective of their currency of denomination. The allocation is carried out over the full Wave 4 household population, so that the estimation sample (household heads aged 25–64 with a valid MPC response) holds its population-consistent share of the sector aggregates (about 55 percent of the constructed household-sector foreign-exposure aggregate) rather than absorbing the entire aggregates. Figure 2 shows the eight OeNB aggregates that serve as calibration targets: foreign investment-fund and listed-equity holdings dominate the asset side. The liability side consists of the legacy CHF mortgage stock and foreign credit liabilities.

Reconciliation of domestic and foreign exposures. Part of the imputed foreign holdings is already contained in the survey. To avoid double counting, we subtract the imputed foreign part from the reported item and treat the remainder as domestic (Table 2). Of the imputed foreign assets of EUR 46.9 bn, EUR 30.3 bn is covered by reported holdings, so that the foreign block adds EUR 16.6 bn to the survey balance sheets, mostly in listed shares. This is consistent with survey under-coverage of financial assets, but it also reflects that the foreign listed shares are assigned only to the households that report foreign shares, and how survey and financial-accounts categories are matched.

The constructed foreign positions combine two classifications. Foreign assets and foreign credit liabilities are positions against non-residents in the residency-based financial accounts, whereas the CHF mortgages are foreign-currency loans from Austrian banks. The aggregate of about EUR 62 bn is therefore not the household sector’s residency-based net foreign asset

position. Treating the CHF mortgages as foreign positions assumes that the lending banks have passed the currency risk abroad through foreign funding or hedging, so that no offsetting valuation effects arise for resident counterparties.

Table 2: Reported and imputed foreign holdings of the estimation sample (EUR bn)

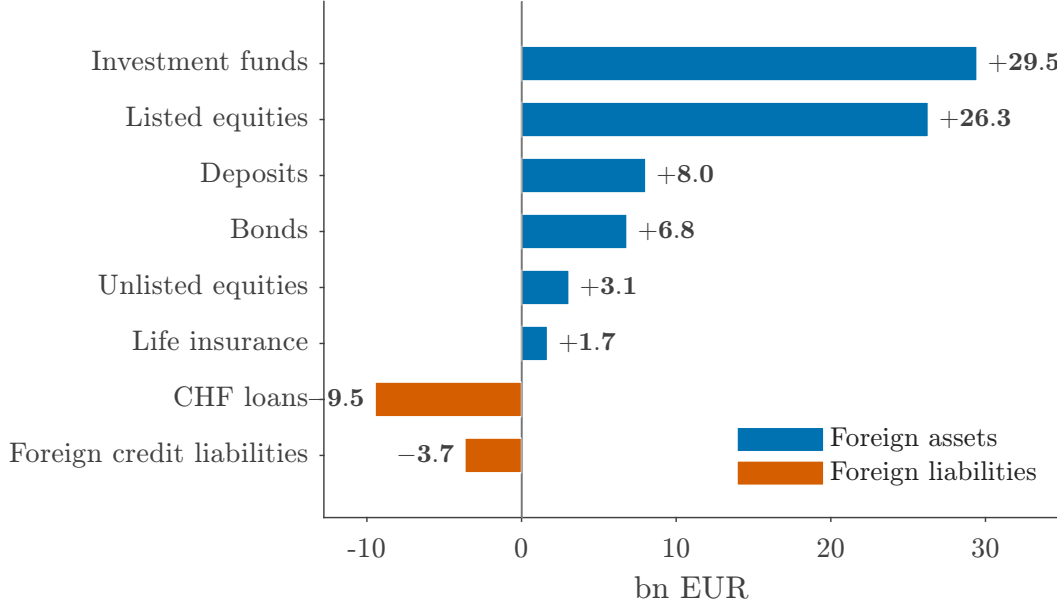
Item	Reported (HFCS)	Imputed foreign	Covered by reported	Added beyond survey
Deposits	80.8	5.1	5.1	0.0
Bonds	1.6	3.2	1.6	1.6
Mutual funds	18.8	20.7	18.2	2.4
Listed shares	5.1	13.8	2.2	11.7
Unlisted equity	1.8	2.4	1.6	0.8
Life insurance, pensions	9.9	1.6	1.6	0.0
Foreign assets	118.0	46.9	30.3	16.6
Foreign liabilities	61.9	12.6	12.6	0.0

For each item j , the domestic holding of household i is $A_{ij}^d = \max\{A_{ij}^{\text{HFCS}} - \hat{A}_{ij}^f, 0\}$, and the full imputed foreign holding $\hat{A}_{ij}^f$ enters the foreign exposures. Foreign liabilities are the imputed CHF mortgages and foreign credit liabilities, and the reported column shows total liabilities. The CHF mortgages are subtracted from the variable rate mortgage balances and from total liabilities, and the foreign credit liabilities from total liabilities. The maturity scaling of the unhedged interest rate exposure is applied after the subtraction. The covered foreign assets amount to 25 percent of the sample’s reported total financial assets, which also include items not listed in the table. Totals are calculated from unrounded estimates. Source: HFCS Wave 4, OeNB, own calculations.

Earnings elasticities. The heterogeneous earnings elasticities γ_i that govern the earnings-heterogeneity channel are estimated from EU-SILC for Austria over 2008–2024 using the quantile-regression approach described in Section 5.1.1. We use the resulting decile-level elasticities of personal gross labor income with respect to GDP as the heterogeneous- γ_i inputs to the decomposition, after rescaling the profile so that the implied household income changes add up to the aggregate income change (Table 10).

Shock calibration. The closed-economy block retains the calibration of [Pekanov \(2024a\)](#), which is based on the model comparison of [Coenen et al. \(2012\)](#). The open-economy block adds our own calibration of the response of the euro’s external value and of foreign rates to ECB easing. Identified responses, for instance from the high-frequency identification of [Jarociński and Karadi \(2020\)](#), would be needed to replace it (Section 6). The direction of the exchange rate response is well established. Contractionary ECB policy shocks lead to a sizable appreciation of the euro against both its nominal effective and its bilateral exchange rates, with the peak on impact ([Franz, 2020](#)). For the size of the response we choose a deliberately small nominal depreciation of 0.5 percent, so that a larger exchange rate response would strengthen rather than weaken the open-economy effects. Since the exchange

Figure 2: Foreign exposures of Austrian households, 2021 Q4



The figure shows the OeNB aggregates of the household sector in bn EUR that serve as calibration targets of the household-level imputation. The foreign assets and the foreign credit liabilities are residency-based financial-accounts positions, whereas the CHF loans are foreign-currency loans from Austrian banks, taken from the OeNB bank statistics. Their sum, EUR 62.3 bn, is the constructed net position in foreign-residency and foreign-currency claims, not the household sector's residency-based external position. NNP^f comprises deposits and bonds net of liabilities, and NFA additionally includes equities, funds and life insurance. Source: OeNB, own calculations.

rate revaluation channel is linear in the real depreciation, the results can be rescaled: each percentage point of real depreciation adds about 0.32 pp to the consumption response, the MPC-weighted net foreign assets of the estimation sample relative to mean consumption. The foreign block also depends on the assumed decreases in the foreign real rate and in foreign prices, so the foreign calibration as a whole is not necessarily conservative. The full shock vector for a 100 basis-point ECB rate cut is

$$\text{Domestic: } dR/R = -1.0\%, \quad dY/Y = +0.4\%, \quad dP/P = +0.2\%$$

$$\text{Foreign: } d\mathcal{E}/\mathcal{E} = +0.5\% \text{ (euro depreciation)}, \quad dR^*/R^* = -0.5\%, \quad dP^*/P^* = -0.1\%$$

together with an elasticity of intertemporal substitution $\sigma = 0.5$. Together with the domestic and foreign price changes, the nominal depreciation implies a real depreciation of $de/e = 0.5 - 0.1 - 0.2 = +0.2\%$, which drives the exchange rate revaluation channel. The foreign earnings channel is set to zero in the headline decomposition, because its level term is already embedded in the equilibrium dY . The sensitivity to this choice is reported in Section 5.2. Table 3 collects every object that enters the decomposition.

Table 3: Decomposition inputs: construction and sources, Austria

Object	Construction	Source
<i>Closed-economy block</i>		
MPC_i	lottery answer /100, taken as measured	HFCS Wave 4 (2021)
c_i	HFCS expenditure items scaled to total consumption	HFCS + Eurostat HBS shares
Y_i	gross income, post-tax income in URE_i	HFCS, OECD tax rates as in Pekanov (2024a)
NNP_i	nominal claims (deposits, bonds, money owed to the household) – total liabilities, net of imputed foreign holdings	HFCS balance sheets
URE_i	$Y_i - c_i +$ maturing assets – repricing liabilities, with Y_i post-tax income (OECD tax rates), net of imputed foreign holdings	HFCS, duration-scaled
γ_i	quantile regressions of income on GDP, by decile	EU-SILC 2008–2024
σ	calibrated at 0.5	Pekanov (2024a)
<i>Open-economy block</i>		
NNP_i^f, URE_i^f, NFA_i	imputed: sector aggregates allocated to holders	OeNB, 2021 Q4
$NFA_c, NIIP$	aggregate anchors of the level terms	OeNB, World Bank
<i>Shock vector</i>		
$dR/R, dY/Y, dP/P$	–1%, +0.4%, +0.2%	Pekanov (2024a) , after Coenen et al. (2012)
$d\mathcal{E}/\mathcal{E}, dR^*/R^*, dP^*/P^*$	+0.5%, –0.5%, –0.1%	own calibration

The estimation sample comprises 1,265 households whose heads are aged 25–64 and who gave a valid MPC response, representing 2.58 of 4.07 million Austrian households. All moments are survey-weighted. Exposures are normalized by mean annual consumption (EUR 21,517), so that each channel reads as an elasticity of consumption. The γ_i profile is rescaled to satisfy $\mathbb{E}_I[\gamma_i Y_i] = \mathbb{E}_I[Y_i]$, so that it distributes the aggregate income change without altering it. Source: own compilation.

5. Results

5.1. Closed Economy

The Austrian exposures in this section exclude the imputed foreign holdings (Section 4.1), so that the closed-economy results describe the domestic block of the open-economy decomposition. Tables 4 and 5 present the summary statistics of households’ main balance-sheet positions in the euro area as a whole and in Austria. For the euro area we reproduce the means and standard deviations reported by [Pekanov \(2024a\)](#), which uses the same survey wave, the same age range of household heads and the same normalization by mean consumption. For Austria we also report the 5th, 25th, 50th (median), 75th and 95th percentiles. Austrian households are broadly similar to euro area households in terms of income-consumption ratios. However, there are differences in their balance-sheet structure and consumption behavior. Austrian households have less dispersed incomes: the standard deviation of gross income is 1.68 times mean consumption, against 3.06 in the euro area. The standard deviation of the Austrian net nominal position, which we restrict to nominal claims, is 3.79, against 14.01 for the broader definition used for the euro area. The redistribution channels identified by [Auclert \(2019\)](#) operate through covariances that are driven largely by extreme positions. Lower dispersion can therefore contribute to smaller redistribution elasticities, but their size also depends on how strongly MPCs are associated with the exposures (Table 6). The earnings-heterogeneity elasticity E_Y is small in both, and slightly larger in absolute value in Austria, because in neither sample are MPCs strongly related to income. The URE channel, by contrast, is comparatively strong, reflecting the prevalence of variable rate loans.

Table 4: Summary statistics for the euro area

Variable	Mean	SD
Net income (NY)	2.12	1.96
Consumption (NC)	1.00	0.64
Maturing assets (NB)	3.00	9.86
Maturing liabilities (ND)	1.37	4.77
Unhedged interest rate exposure (NURE)	2.75	11.17
Nominal assets	3.10	13.26
Nominal liabilities	2.44	5.65
Net nominal position (NNNP)	0.66	14.01
Gross income (NINC)	2.75	3.06
Marginal propensity to consume (MPC)	0.42	0.35

The table reproduces the euro area columns of Table 4 in [Pekanov \(2024a\)](#), with the variable labels adapted from that study. The statistics are computed from HFCS Wave 4 using survey weights, and all variables except the MPC are scaled by mean consumption. In that study the sample comprises households whose head is aged 25–64, and the unhedged interest rate exposure is computed with after-tax income approximated using OECD personal income tax rates. The publication reports means and standard deviations only. Source: [Pekanov \(2024a\)](#), Table 4.

Table 5: Summary statistics for Austria

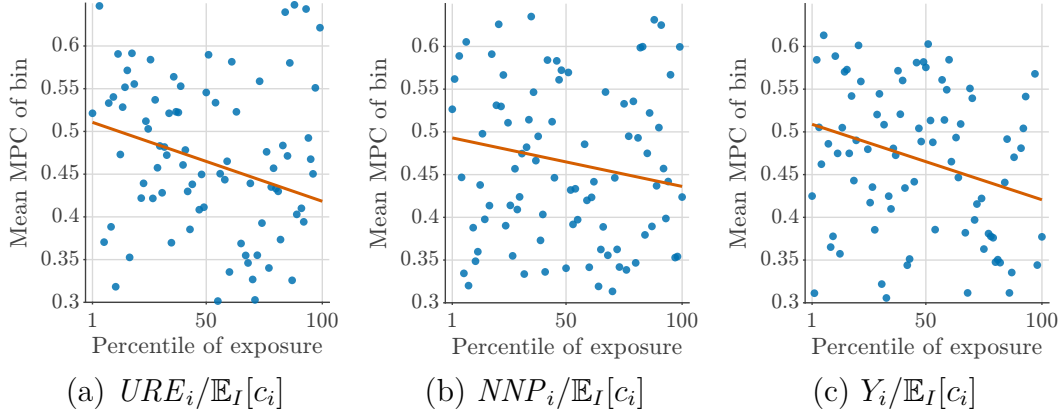
Variable	Mean	SD	p5	p25	p50	p75	p95
Net income (OECD tax rates)	1.93	1.03	0.60	1.18	1.80	2.47	3.70
Disposable income (ECB)	1.96	1.11	0.59	1.10	1.81	2.61	3.83
Gross income	2.62	1.68	0.61	1.39	2.32	3.51	5.68
Consumption c_i	1.00	0.52	0.40	0.65	0.90	1.22	1.95
Maturing assets	2.73	5.50	0.02	0.35	1.34	2.88	9.36
Repricing liabilities	0.55	2.17	0.00	0.00	0.00	0.18	2.57
Interest rate exposure URE_i	3.11	5.90	-0.38	0.69	1.98	3.96	10.72
Nominal assets	1.41	2.80	0.01	0.20	0.70	1.49	4.89
Nominal liabilities	0.89	2.85	0.00	0.00	0.00	0.26	5.38
Net nominal position NNP_i	0.52	3.79	-3.64	0.02	0.38	1.17	4.33
Marginal propensity to consume MPC_i	0.46	0.34	0.00	0.20	0.50	0.71	1.00

All statistics are computed using survey weights. Every variable except the MPC is normalized by mean annual household consumption. *Maturing assets* and *repricing liabilities* are the two stock components of the unhedged interest rate exposure, $URE_i = Y_i - c_i + \text{maturing assets} - \text{repricing liabilities}$. Nominal assets are deposits, bonds and money owed to the household. Maturing assets, repricing liabilities, nominal assets and nominal liabilities exclude the imputed foreign holdings covered by the reported items (Section 4.1). In URE_i , Y_i is net income computed with OECD tax rates, as in [Pekanov \(2024a\)](#). Disposable income from the ECB data is used in the robustness columns of Table 6. Source: HFCS Wave 4, own calculations.

Figure 3 displays the relationship between average MPCs and household exposures to URE, net nominal positions and gross income across percentile bins of each exposure in Austria. The linear fits slope downward in all three panels. From the bottom to the top of each distribution, the fitted MPC falls by 0.10 for URE, by 0.09 for gross income and by 0.05 for the net nominal position, or 21, 19 and 11 percent of the mean MPC of 0.46. The decline is statistically significant for URE and income, with 95 percent bootstrap confidence intervals of $[-0.18, -0.02]$ and $[-0.16, -0.01]$, but not for the net nominal position ($[-0.12, +0.03]$). The relationship is moreover not monotonic. By quintile of each exposure, the mean MPC is lowest in the fourth quintile (0.38 for URE, 0.40 for the net nominal position and 0.39 for income) and rises again in the top quintile (0.48, 0.48 and 0.44). Along the income distribution it is flat across the bottom three quintiles, at about 0.50. Households with the largest exposures therefore do not have systematically lower MPCs. By income decile, the MPC declines only mildly and non-monotonically, while the URE and income exposures increase and the net nominal position is highest in the seventh and the top decile.

Table 6 reports the elasticities that summarize how different monetary policy channels contribute to the aggregate consumption response following an interest rate change of -1 percent. We compare the Austrian estimates with those for the euro area in [Pekanov \(2024a\)](#),

Figure 3: Marginal propensities to consume and balance sheets in Austria



Panel (a): unhedged interest rate exposure. Panel (b): net nominal position. Panel (c): gross income. All exposure measures are normalized by mean consumption. The x axes report the weighted percentile rank of each exposure measure (100 bins). The y axes report the mean MPC within each bin, and the lines are linear fits. Source: HFCS Wave 4, own calculations.

who applies the same method to the fourth wave of the HFCS for household heads aged 25–64, and with those for Italy reported by [Auclert \(2019\)](#). In the baseline, the aggregate-income and earnings-heterogeneity moments use total household gross income, while the unhedged interest rate exposure uses post-tax income computed with OECD tax rates. We retain gross income in the baseline for comparability with the euro area estimates. Because taxes and transfers affect both the amount and the distribution of income available for consumption, column (3) also reports the results with disposable income. The Austrian elasticities are of similar magnitude to those for the euro area. The interest rate exposure elasticity is larger in absolute value (-0.11 against -0.09), and the Fisher elasticity smaller (-0.04 against -0.07). The aggregate-income elasticity is close to the euro area value and about twice the estimate for Italy. Two robustness columns use the disposable income data provided by the ECB. Using this measure in the interest rate exposure raises E_R in absolute value to -0.12 . Using it also for M and E_Y lowers M from 1.18 to 0.89, because disposable income is about a quarter lower than gross income, and E_Y from -0.03 to -0.02 , while S and E_P are unchanged. The baseline restricts nominal assets to deposits, bonds and money owed to the household, as in Section 3.3. Measuring them by total financial assets raises E_P in absolute value to -0.06 and the Fisher contribution from 0.008 to 0.011 pp.

Figure 4 compares the relative contribution of each monetary policy transmission channel for Austria with the euro area, both based on the baseline income definitions. In the euro area (Figure 4a), the three redistribution channels account for 13 percent of a total consumption response of 0.86 pp: 10.5 percent for interest rate exposure, 1.6 percent for the Fisher channel and 0.9 percent for earnings heterogeneity. In Austria (Figure 4b), they account for 15.1 percent of a total response of 0.88 pp. The interest rate exposure channel is larger in Austria (12.6 percent), as is the earnings-heterogeneity channel (1.5 percent), whereas the Fisher

Table 6: Estimates of the elasticities of monetary policy channels

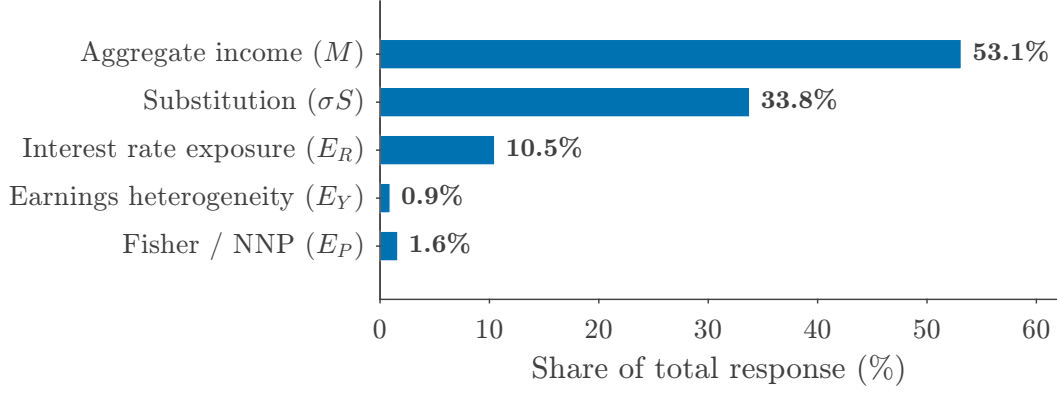
	<i>Austria</i>			Euro area	Italy
	Baseline	(2)	(3)		
Interest rate exposure $\widehat{E}_R$	−0.11	−0.12	−0.12	−0.09	−0.10
Substitution channel $\widehat{S}$	0.54	0.54	0.54	0.58	0.55
Fisher channel $\widehat{E}_P$	−0.04	−0.04	−0.04	−0.07	−0.07
Earnings heterogeneity $\widehat{E}_Y$	−0.03	−0.03	−0.02	−0.02	−0.05
Aggregate income $\widehat{M}$	1.18	1.18	0.89	1.14	0.55

All statistics are computed using survey weights. Baseline: total household gross income for M and E_Y and post-tax income computed with OECD tax rates in the unhedged interest rate exposure, as in [Pekanov \(2024a\)](#). Column (2): disposable income provided by the ECB in the unhedged interest rate exposure. Column (3): ECB disposable income also for M and E_Y . Columns (2) and (3) exclude one household without ECB disposable income data. The Austrian exposures exclude the imputed foreign holdings covered by the reported items (Section 4.1). The euro area column reproduces Table 8 of [Pekanov \(2024a\)](#) (HFCS Wave 4, household heads aged 25–64). The Italian column reproduces the SHIW-based estimates in Table 4 of [Auclert \(2019\)](#). Source: HFCS Wave 4, ECB, [Pekanov \(2024a\)](#), [Auclert \(2019\)](#), own calculations.

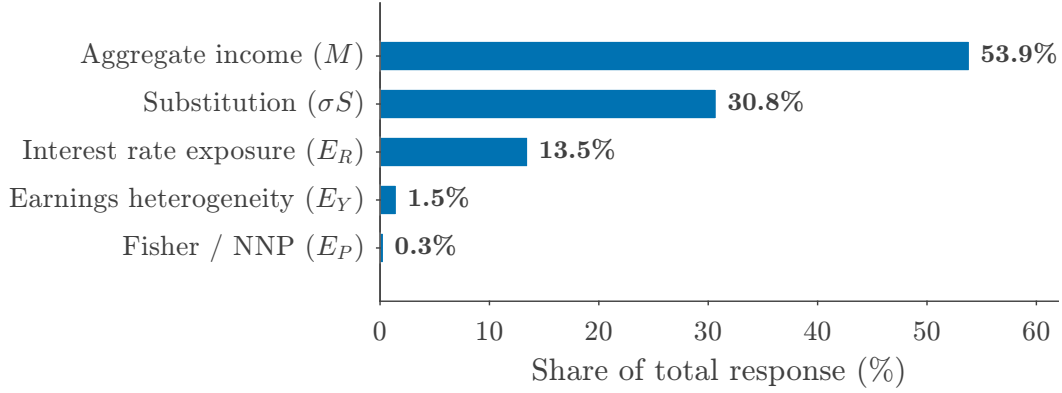
channel is smaller (1.0 percent). Variable rate housing loans are widespread among Austrian mortgage borrowers: in 2017, 63 percent of Austrian mortgagors had a variable rate mortgage ([Tzamourani, 2021](#)). Many Austrian households also took out foreign-currency housing loans to benefit from low foreign interest rates ([Beer et al., 2010](#)). Since only about one in six Austrian households has a mortgage, the mean interest rate exposure is positive and large, driven by high deposit holdings ([Tzamourani, 2021](#)). This channel is strong because the exposure is distributed unevenly: the households with variable rate mortgages, whose debt service changes immediately with the policy rate, have higher MPCs than the deposit holders on the other side. In our sample the 9 percent of households with a variable rate mortgage have a mean MPC of 0.56, whereas the MPC weighted by maturing assets is 0.44.

To quantify how much household heterogeneity matters in total, we follow [Pekanov \(2024a\)](#) and compare the consumption response with a representative-agent (RANK) benchmark in which the three redistribution elasticities E_R , E_P and E_Y are set to zero. Only the aggregate-income channel $M dY/Y$ and the substitution channel $-\sigma S dR/R$ then remain. The benchmark retains the measured moments M and S , so that the difference between the heterogeneous-agent (HANK) response and the RANK response isolates the contribution of the redistribution channels. The RANK benchmark is thus a redistribution-free sufficient-statistics benchmark, not the solution of a representative-agent model, and the labels RANK and HANK refer to this operational definition throughout. Table 7 reports the comparison. In Austria the RANK response is 0.744 pp. The redistribution channels add 0.132 pp under the baseline convention, raising the response to 0.876 pp, an amplification of 17.8 percent.

Figure 4: Contributions of monetary policy transmission channels



(a) Euro area



(b) Austria

The figure shows the contribution of each channel to the consumption response to a monetary policy change ($dR/R = -1\%$, $dP/P = +0.2\%$, $dY/Y = +0.4\%$), in percent of the total response, under the baseline incidence convention $\eta = -1$. The total response is 0.86 pp in the euro area and 0.88 pp in Austria. Both panels use the baseline income definitions of Table 6: gross income for the aggregate-income and earnings channels and post-tax income computed with OECD tax rates in the interest rate exposure. All contributions are expressed as increases in consumption after the rate cut. The euro area shares are computed from the elasticities of [Pekanov \(2024a\)](#), Table 8. Source: HFCS Wave 4, [Pekanov \(2024a\)](#), own calculations.

With the estimated earnings incidence of Section 5.1.1, the amplification is 19.5 percent. In both cases the interest rate exposure channel (0.110 pp) accounts for most of it. With the ECB disposable income data in columns (2) and (3), redistribution adds a similar amount (0.145 and 0.139 pp), although the percentage amplification (19.4 and 22.1 percent) changes with the RANK response it is compared with.

Table 7: Consumption response relative to a redistribution-free benchmark

Channel	<i>Austria</i>				
	Baseline	Baseline	(2)	(3)	Euro area
	$\eta = -1$	γ_i estimated	$\eta = -1$	$\eta = -1$	$\eta = -1$
Aggregate income (M)	+0.474	+0.474	+0.474	+0.357	+0.456
Substitution (σS)	+0.270	+0.270	+0.270	+0.270	+0.290
RANK response	+0.744	+0.744	+0.744	+0.628	+0.746
Interest rate exposure (E_R)	+0.110	+0.110	+0.123	+0.123	+0.090
Fisher (E_P)	+0.008	+0.008	+0.008	+0.008	+0.014
Earnings heterogeneity (E_Y)	+0.013	+0.026	+0.013	+0.008	+0.008
Redistribution channels	+0.132	+0.145	+0.145	+0.139	+0.112
HANK response	+0.876	+0.889	+0.889	+0.767	+0.858
Amplification over RANK (%)	+17.8	+19.5	+19.4	+22.1	+15.0

Contributions to the consumption response to a 1 pp interest rate cut, in percentage points ($dR/R = -1\%$, $dY/Y = +0.4\%$, $dP/P = +0.2\%$, $\sigma = 0.5$). The RANK response sets the redistribution elasticities E_R , E_P and E_Y to zero and retains the measured moments M and S . Amplification is the HANK response relative to the RANK response. Baseline: gross income for M and E_Y and post-tax income computed with OECD tax rates in the interest rate exposure. Columns (2) and (3) correspond to the robustness columns of Table 6: ECB disposable income in the interest rate exposure, and in addition for M and E_Y . They exclude one household without ECB disposable income data. The euro area column uses the elasticities of [Pekanov \(2024a\)](#), Table 8. Totals and percentage changes are calculated from unrounded estimates. Source: HFCS Wave 4, EU-SILC 2008–2024, [Pekanov \(2024a\)](#), own calculations.

For the euro area, the elasticities of [Pekanov \(2024a\)](#) imply a RANK response of 0.746 pp and a HANK response of 0.858 pp, an amplification of 15 percent, the value reported in that study. The Austrian baseline in this paper uses the same income definitions, but its balance-sheet exposures differ in two respects: the imputed foreign holdings are removed, and nominal assets are restricted to nominal claims. Table 8 links the two exercises.

Constructed with the definitions of [Pekanov \(2024a\)](#), the Austrian closed-economy amplification is 16.8 percent. Removing the imputed foreign holdings from the domestic exposures

raises it to 18.1 percent, through a larger Fisher channel, and restricting nominal assets to nominal claims lowers it to 17.8 percent, through a smaller Fisher channel. In all three cases, the point estimate of the amplification is somewhat higher in Austria than in the euro area, mainly because of a larger interest rate exposure channel.³

Table 8: Closed-economy amplification

	$\widehat{E}_R$	$\widehat{E}_P$	HANK (pp)	Amplification (%)
(a) Austria, definitions of Pekanov (2024a)	-0.11	-0.01	0.869	16.8
(b) (a) without imputed foreign holdings	-0.11	-0.06	0.879	18.1
(c) (b) with nominal claims only (baseline)	-0.11	-0.04	0.876	17.8
Euro area (Pekanov, 2024a)	-0.09	-0.07	0.858	15.0

Baseline incidence convention $\eta = -1$. Row (a) measures nominal assets by total financial assets and applies domestic shocks to all reported holdings, as in the euro area estimate of [Pekanov \(2024a\)](#). Row (b) removes the imputed foreign holdings from the domestic exposures (Section 4.1). Row (c), the baseline, also restricts nominal assets to deposits, bonds and money owed to the household. The RANK response is 0.744 pp in all Austrian rows and 0.746 pp in the euro area. Totals and percentage changes are calculated from unrounded estimates. Source: HFCS Wave 4, [Pekanov \(2024a\)](#), own calculations.

5.1.1. Heterogeneous Earnings Elasticities

We next replace the baseline incidence convention with a profile calibrated from quantile regressions and compare both with proportional incidence. Figure 5 displays how individual and household incomes are associated with GDP across the income distribution. We estimate the elasticities using quantile regressions. While OLS delivers an average elasticity, quantile regression estimates conditional quantile functions and thereby traces how the elasticity varies from the bottom to the top of the income distribution. If elasticities decline in income, aggregate risk is disproportionately carried by low-income households. We regress log income on log real GDP in the pooled EU-SILC cross-sections for Austria over 2008–2024, controlling for household size in the household-level regressions ([Koenker, 2005](#)). We estimate the quantiles $\tau = 0.10, 0.20, \dots, 0.90$. The coefficient for $\tau = 0.10$ measures how the 10th percentile of the conditional income distribution moves with GDP, not the income response of a fixed set of individuals. Mapping these quantile responses to the deciles of household income in the HFCS is an additional calibration assumption, and the household-income profiles are conceptually closer to the household exposure Y_i (Table 12). Because GDP varies only across the 17 survey years, standard errors that treat the observations as independent overstate the precision of these coefficients. We therefore use the profiles as calibration inputs and do not report significance levels. The coefficients are descriptive associations between income and GDP over the sample period, which can also reflect common

³Since the published euro area elasticities are rounded to two decimals, the euro area amplification is accurate to about one percentage point.

trends and changes in the composition of respondents. They are not estimated responses to changes in GDP induced by monetary policy.

The top two panels of Figure 5 show the association of individual labor income with GDP. Earnings at the bottom of the distribution are most strongly associated with GDP, with elasticities of 2.76 (gross) and 2.71 (net) at the 10th percentile, declining sharply to 0.13 and 0.27 at the 90th percentile. A similar declining pattern emerges for household income, but the profile is substantially flatter. Household income elasticities decline from 0.81 (total) and 0.78 (disposable) at the 10th percentile to 0.35 and 0.49 at the 90th percentile. This attenuation is consistent with income smoothing mechanisms operating at the household level: multiple earners can offset individual earnings shocks, and social transfers (unemployment benefits, pensions) provide countercyclical support that stabilizes disposable income, and hence household-level consumption, even as individual labor earnings fluctuate.

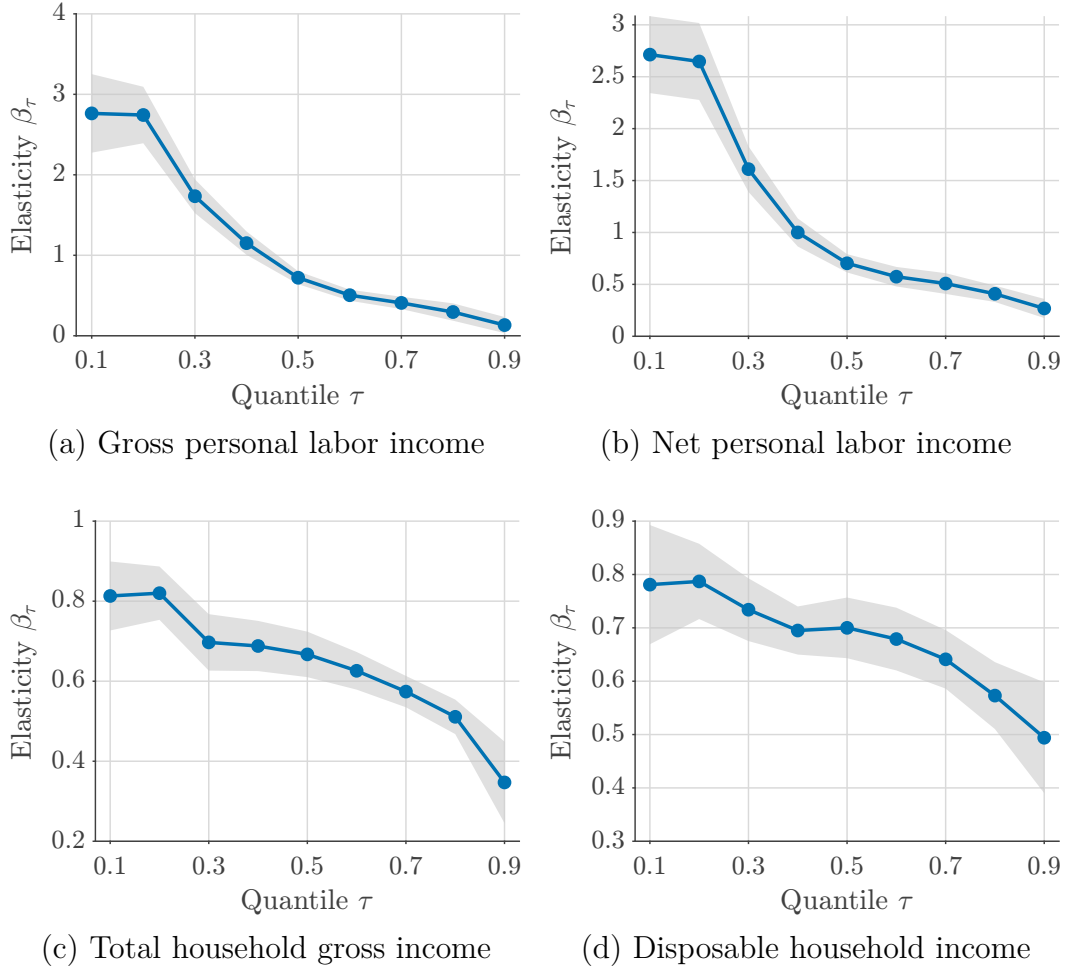
Table 9: Quantile-regression estimates of the income elasticity in Austria

Quantile	<i>Household level</i>		<i>Individual level</i>	
	Disposable HH income	Total HH income	Gross personal	Net personal
q10	0.781	0.813	2.763	2.713
q20	0.787	0.820	2.743	2.647
q30	0.734	0.697	1.734	1.610
q40	0.695	0.688	1.151	1.000
q50	0.700	0.667	0.721	0.703
q60	0.679	0.626	0.504	0.574
q70	0.641	0.574	0.408	0.508
q80	0.573	0.511	0.295	0.409
q90	0.494	0.347	0.133	0.268

The table shows the coefficient on log GDP in simultaneous quantile regressions of log income, that is, the GDP elasticity of the conditional income quantile. The profiles are used as exploratory calibration inputs. Sampling uncertainty is not quantified here, because inference must account for GDP variation across only 17 years and for dependence within the pooled survey observations. The earnings-heterogeneity estimates derived from these profiles therefore carry no quantified uncertainty either. Household regressions include household size as control. Source: EU-SILC 2008–2024, own calculations.

To feed these estimates into the decomposition we collapse them to a single earnings incidence parameter γ_i for each income decile, using the elasticity of *personal gross labor income* with respect to GDP reported in the third column of Table 9. The decile d is represented by the quantile $(d - \frac{1}{2})/10$, with linear interpolation between adjacent estimated quantiles and flat extrapolation below the tenth percentile and above the ninetieth percentile. The resulting profile falls steeply along the income distribution. Under the incidence calibration based on these profiles, low-income households receive a disproportionate share of the aggregate

Figure 5: Income elasticities from quantile regressions in Austria



The figure shows the elasticities of income with respect to GDP, β_τ , by quantile τ of the income distribution. Panels (a) and (b): individual income. Panels (c) and (d): household income. Confidence bands are not shown, for the reasons given in the notes to Table 9. Point estimates are reported in Table 9. Source: EU-SILC 2008–2024, own calculations.

income increment: when aggregate income rises after a rate cut, the income gains of the bottom deciles are amplified relative to the proportional benchmark, while those of the top deciles are damped. Whether this incidence matters for aggregate consumption depends on whether the low-income households that gain also have higher MPCs.

The estimated profile cannot enter the decomposition as it stands. In the setting of his Theorem 3, [Auclert \(2019\)](#) defines the aggregate income change as $dY \equiv \mathbb{E}_I[dY_i]$, so that the incidence of an aggregate income change must add up, equivalently $\mathbb{E}_I[\gamma_i Y_i] = \mathbb{E}_I[Y_i]$: the profile must *distribute* the aggregate income change, not create or destroy it. Taken literally, the raw quantile coefficients have an income-weighted mean of 0.69. They therefore imply that a 1 percent increase in GDP raises aggregate household income by only 0.69

percent, which is inconsistent with the assumption, maintained throughout the calibration, that aggregate household income increases one-for-one with $dY/Y = +0.4\%$. We therefore rescale the profile by its income-weighted mean. The rescaling is multiplicative because what we take from the quantile regressions is the shape of the incidence profile: the share of the aggregate income increment accruing to decile d , $\gamma_d Y_d / \sum_k \gamma_k Y_k$, is invariant to a common rescaling of the profile, so the adjustment moves only the level that the adding-up constraint pins down and leaves the estimated incidence shares untouched. After rescaling, the level term $\mathbb{E}_I[MPC_i] \mathbb{E}_I[(\gamma_i - 1)Y_i]$ is zero to four decimal places and the channel reduces to the covariance $\text{cov}_I(MPC_i, (\gamma_i - 1)Y_i)$ that the theory calls for.

Table 10 reports the profile in both forms together with the incidence shares it implies. The scale-free statement is in the last two columns: the bottom decile holds 2.4 percent of aggregate household income but receives 9.5 percent of the aggregate income increment, while the top decile holds 24.2 percent and receives 4.7 percent. The three lowest deciles together hold about 12 percent of household income but receive about 43 percent of the increment, whereas the three highest deciles hold about 53 percent and receive about 16 percent. The calibrated incidence is thus strongly tilted toward low-income households. The rescaled γ_i should be read as these incidence weights rather than as literal decile elasticities. Their level is set by the adding-up constraint, and their shape by the quantile regressions.

Table 10: Earnings incidence by income decile in Austria

Income decile	γ_i as estimated	γ_i rescaled (adding-up)	Share of income (%)	Share of increment (%)
1 (lowest)	2.76	4.01	2.4	9.5
2	2.75	3.99	3.9	15.8
3	2.24	3.25	5.4	17.4
4	1.44	2.09	6.8	14.3
5	0.94	1.36	8.6	11.7
6	0.61	0.89	9.3	8.3
7	0.46	0.66	10.6	7.0
8	0.35	0.51	12.5	6.4
9	0.21	0.31	16.2	5.0
10 (highest)	0.13	0.19	24.2	4.7
Income-weighted mean	0.69	1.00	100.0	100.0

Column 2 collapses the personal-gross-income column of Table 9 to deciles by evaluating the estimated quantile process at $(d - \frac{1}{2})/10$. Column 3 rescales it so that $\mathbb{E}_I[\gamma_i Y_i] = \mathbb{E}_I[Y_i]$ (Theorem 3 of [Auclert, 2019](#)). This is the profile used in the decomposition. Column 4 is the decile's share of aggregate gross income in the HFCS estimation sample. Column 5 is its share of the aggregate income increment, $\gamma_d Y_d / \sum_k \gamma_k Y_k$, which is invariant to the rescaling. Income deciles are HFCS household gross-income deciles. Source: EU-SILC 2008–2024, HFCS Wave 4, own calculations.

Replacing proportional incidence with the estimated profile changes the decomposition only through the earnings-heterogeneity channel. Three benchmarks have to be kept apart, and Table 11 shows all three. Under *proportional incidence* ($\gamma_i \equiv 1$) every household's income moves with aggregate income, the entire income effect is carried by the aggregate-income channel, and the earnings-heterogeneity channel is zero by construction. The total response is 0.863 pp. Our *baseline* instead sets $\eta = -1$, so that every household gains the same euro amount rather than the same percentage of its income, in line with the evidence cited by Auclert (2019) that η is negative (see the remark after Equation (2)), which adds an earnings contribution of $-E_Y dY/Y = +0.013$ pp, or 1.5 percent of a total response of 0.876 pp. The difference from proportional incidence is small because MPCs covary only weakly with income (Table 6). Under the *estimated incidence* profile the earnings-heterogeneity channel is +0.026 pp, 3 percent of a total response of 0.889 pp.

Table 11: Closed-economy decomposition under three incidence assumptions for Austria

Channel	Contribution to dC/C (pp)		
	Proportional	Baseline	Heterogeneous
	$\gamma_i \equiv 1$	$\eta = -1$	γ_i estimated
Aggregate income (M)	+0.474	+0.474	+0.474
Substitution (σS)	+0.270	+0.270	+0.270
Interest rate exposure (E_R)	+0.110	+0.110	+0.110
Earnings heterogeneity (E_Y)	0.000	+0.013	+0.026
Fisher (E_P)	+0.008	+0.008	+0.008
Closed-economy response	+0.863	+0.876	+0.889
Earnings-heterogeneity share (%)	0.0	1.5	3.0

Contributions to the consumption response to a 1 pp interest rate cut, in percentage points. Calibration: $dR/R = -1\%$, $dY/Y = +0.4\%$, $dP/P = +0.2\%$, $\sigma = 0.5$. Proportional incidence sets $\gamma_i \equiv 1$, under which the earnings-heterogeneity channel is zero by construction. The baseline sets $\eta = -1$ and reproduces Table 6. Heterogeneous incidence uses the decile profile of Table 10 rescaled to satisfy adding-up. Only the earnings-heterogeneity channel differs across the three columns. Totals and percentage changes are calculated from unrounded estimates. Source: HFCS Wave 4, EU-SILC 2008–2024, own calculations.

The appropriate comparison is between the first and the third of these: relative to proportional incidence, letting the incidence of the income gain decline with income raises the aggregate consumption response by 0.026 pp, or 3.1 percent of the proportional-incidence response of 0.863 pp, and this amplification operates entirely through the earnings-heterogeneity channel. The comparison with the baseline (shares of 1.5 and 3 percent) measures the incremental effect of the estimated profile relative to an incidence assumption that is already redistributive, since the baseline convention $\eta = -1$ yields a non-zero earnings contribution.

Why is the channel small when the incidence is steep? Relative to proportional incidence, the estimated profile shifts about 42 percent of the aggregate income increment from households in the upper half of the income distribution, whose γ_i is below one, to households in the lower half, whose γ_i is above one. Because the level term is zero, the channel equals this shifted amount multiplied by the difference between the average MPCs of the households that receive more and those that receive less of the income gain than under proportional incidence, each weighted by the income shifted. This MPC difference is only about 0.06 (0.50 against 0.44). The MPC is 0.49 in both the lowest and the highest income decile and peaks at 0.54 in the sixth decile, and its correlation with gross income in the estimation sample is only -0.06 . A large reallocation of income multiplied by a small difference in spending propensities yields a small channel ($0.06 \times 0.42 \times 2.62 \times 0.4 \approx 0.026$ pp, where 2.62 is mean gross income relative to mean consumption). The earnings-heterogeneity channel in Austria is therefore limited not by the calibrated incidence, which is strongly tilted toward low-income households, but by the weak relationship between MPCs and income. This contrasts with the matching-multiplier evidence of [Patterson \(2023\)](#), in which the workers with the most cyclical earnings also have systematically higher MPCs.

Table 12 shows how the channel responds to the choice of income concept, holding the adding-up constraint fixed. The channel is positive under every specification reported in Table 9 but modest throughout: 3 percent of the response using personal gross labor income, 2.4 percent using personal net labor income, and 0.5 and 0.4 percent using the two household-level income concepts, whose quantile profiles are considerably flatter because within-household pooling of earnings and the tax-and-transfer system both compress cyclical income risk. Restricting the individual regressions to the working-age population that the HFCS decomposition sample covers gives 3.7 percent, the largest value we obtain. The range for the earnings-heterogeneity channel in Austria is therefore 0.4 to 3.7 percent of the consumption response. At the upper end, the channel is about four times the Fisher channel (0.9 percent) and almost a third of the interest rate exposure channel (12.3 percent, both as shares of the upper-end response). At the lower end, it is smaller than the Fisher channel. The household-level profiles are the conceptually closer match, because the exposure Y_i in the decomposition is household gross income. The contrast between the individual and the household profiles mirrors the finding of [Bilbiie et al. \(2025\)](#) for Norway, where amplification based on labor earnings is overturned once income is measured as disposable income, including capital income, taxes and transfers. The individual-earnings profiles, including the one used in our headline specification, describe the incidence before within-household pooling, and the gross profile also before taxes and transfers, and should therefore be read as a higher-end sensitivity specification of the channel.

Table 12: Earnings-heterogeneity channel across incidence profiles for Austria

Income concept	Income-weighted mean elasticity	Channel (pp)	Share of response (%)
Personal gross labor income	0.69	+0.026	3.0
Personal net labor income	0.74	+0.021	2.4
Household gross income	0.54	+0.005	0.5
Household disposable income	0.62	+0.003	0.4
Personal gross, working age (25–64)	0.33	+0.033	3.7

The channel is computed as $\mathbb{E}_I[MPC_i(\gamma_i - 1)Y_i/\mathbb{E}_I[c_i]] dY/Y$ for $dY/Y = +0.4\%$, with the profile rescaled to satisfy $\mathbb{E}_I[\gamma_i Y_i] = \mathbb{E}_I[Y_i]$ in every row. The share is taken over the corresponding total response. Rows 1–4 collapse the four columns of Table 9. Row 5 uses the working-age individual regressions estimated by the same routine but not tabulated above. The first row supplies the incidence profile used in the heterogeneous-earnings specification. In every row the profile is applied to household gross income Y_i , so that the rows differ in the shape of the incidence profile but not in the income concept of the decomposition. Source: EU-SILC 2008–2024, HFCS Wave 4, own calculations.

5.2. Open Economy

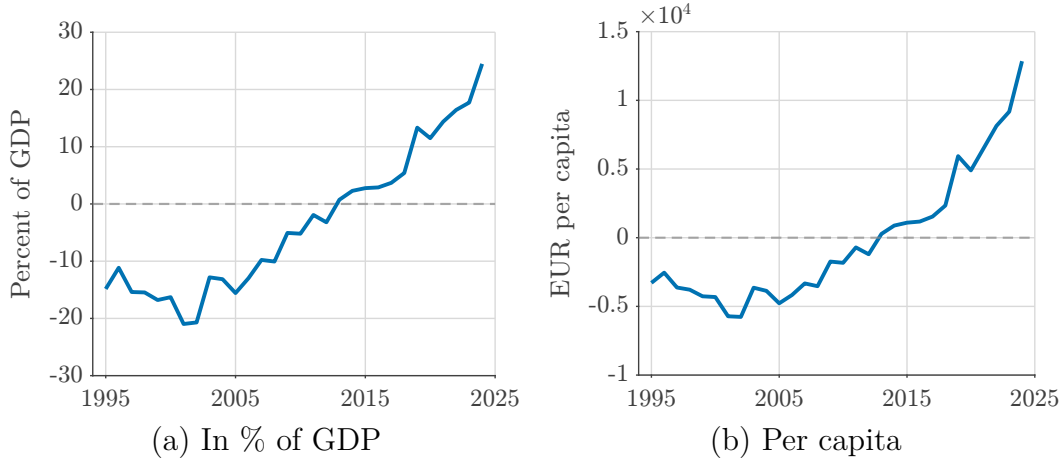
In this section, we extend the analysis to household heterogeneity in an open economy. A key element is the NIIP, which is the difference between a country’s external financial assets and its external financial liabilities.

Figure 6 illustrates how Austria’s NIIP, measured relative to GDP and on a per capita basis, has developed between 1995 and 2024. The NIIP rose from about -21 percent of GDP in 2001–2002 to $+24$ percent in 2024 and has been positive since 2013.

5.2.1. The open-economy decomposition for Austria

We now bring the open-economy decomposition derived in Section 3.3 to Austrian data. The exercise augments the closed-economy experiment with the foreign shock vector specified in Section 4.1: a 0.5 percent euro depreciation, a 0.5 percent decrease in the foreign real rate and a 0.1 percent decrease in foreign prices, which together with the domestic price increase imply a real depreciation of 0.2 percent. Household-level foreign exposures are imputed from the aggregate household-sector foreign positions in the OeNB financial accounts and bank statistics (2021 Q4), allocated to foreign-asset-holding households across HFCS balance-sheet items as described above. The headline decomposition reports three of the four foreign channels of Proposition 1. The level term of the foreign earnings channel is excluded because it is already contained in the calibrated dY , for reasons set out below, and its covariance term, estimated separately below, is negligible. Because the imputation preserves the aggregate level of foreign exposure but does not recover its household-specific variation, the results below are informative about the *level* components of the new channels, whereas the redistribution components are uncertain in sign and size. All open-economy

Figure 6: Net international investment position (NIIP) of Austria



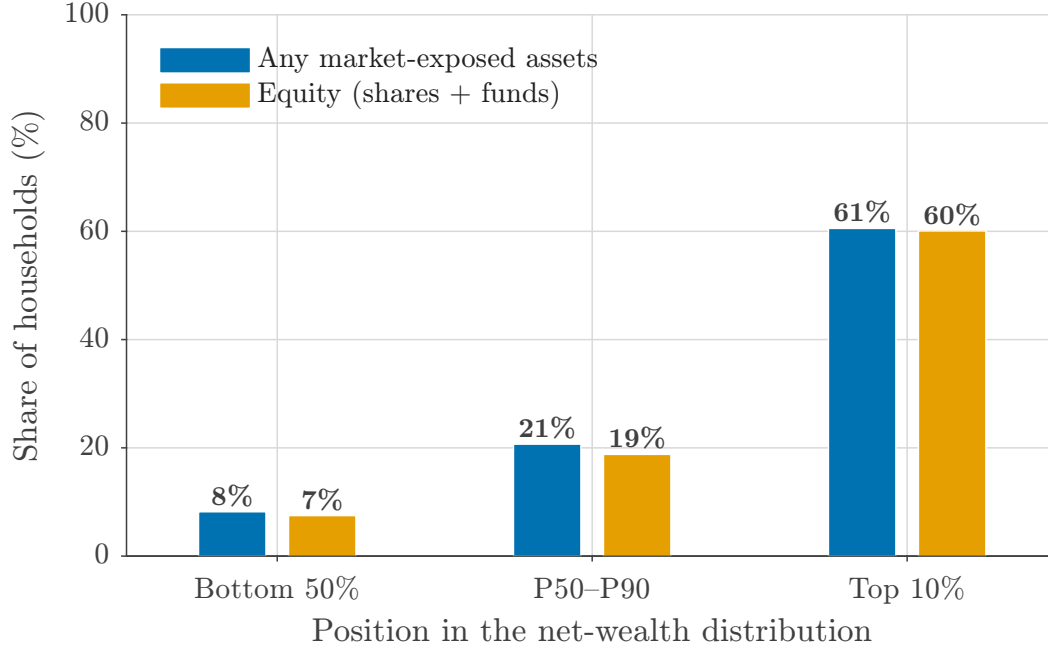
The figure shows Austria's NIIP over 1995–2024, in percent of GDP in current prices (panel a) and in current EUR per capita (panel b). The NIIP has been positive, that is, Austria has been a net creditor, since 2013. Source: [Oesterreichische Nationalbank, 2024](#); [World Bank, 2024a,b](#), own calculations.

results treat the imputed foreign exposures, constructed from residency-based assets and foreign-currency liabilities, as exposed to the real exchange rate of the euro (Section 4.1).

Before turning to the decomposition, Figure 7 documents a distributional fact that the theory says matters: participation in market-exposed assets in Austria rises sharply with wealth. Direct holdings of listed shares, mutual funds and other market-exposed instruments, the vehicles through which households obtain foreign exposure, are concentrated at the top of the distribution. In most euro area countries MPCs are lower at the top of the wealth distribution than at the bottom: in our calculations from HFCS Wave 4, the MPC declines along the distribution of net liquid assets in 15 of the 17 countries with MPC data, in line with the decline along cash-on-hand documented by [Albacete et al. \(2025\)](#). This is the basis for expecting the covariance between MPCs and net foreign assets to be negative, and hence for the redistribution component of the exchange rate revaluation channel to attenuate rather than amplify its positive level component. In Austria, however, MPCs are not below average at the top. Along the distribution of net liquid assets, the mean MPC falls from 0.52 in the bottom quintile to 0.39 in the fourth quintile but rises to 0.49 in the top quintile, against an overall mean of 0.46, and the top tenth of the net wealth distribution has a mean MPC of 0.50. Hence the concentration of foreign assets at the top does not by itself imply a negative covariance. The argument for attenuation also does not carry over to the foreign Fisher and foreign interest rate exposure channels, whose exposures are dominated on the liability side by legacy Swiss franc mortgages held by working-age borrowers. For these channels, whether the redistribution component attenuates or reinforces the level component depends on the signs of the aggregate exposure and of its covariance with MPCs.

Table 13 places the closed- and open-economy decompositions side by side, under the baseline

Figure 7: Participation in market-exposed assets by net wealth, Austria



The figure shows the survey-weighted share of households holding any market-exposed assets (listed shares, mutual funds and bonds) and equity (listed shares and mutual funds), by position in the net-wealth distribution. Source: HFCS Wave 4, own calculations.

and the heterogeneous earnings elasticities respectively. The foreign block is quantitatively important. Under the baseline the foreign channels together add +0.112 pp to the closed-economy response of 0.876 pp, raising the total consumption response to 0.988 pp (12.7 percent more). The foreign block thus accounts for 11.3 percent of the open-economy total. The comparison adds the foreign block to the domestic block of the decomposition, together with the EUR 16.6 bn of assets that the imputation adds to the survey balance sheets (Table 2). Ranked by size, the new contributions are the exchange rate revaluation channel (+0.065 pp), the foreign URE channel (+0.053 pp) and the foreign Fisher channel (−0.006 pp), the last of which is negligible. The foreign block adds the same +0.112 pp under every earnings-incidence assumption, which is 12.6 percent of the closed-economy response under the estimated incidence and 12.9 percent under proportional incidence.

Which aggregate the level terms are anchored to. Since the level components of the foreign channels are proportional to aggregate exposures rather than to covariances, it matters which population they are measured over (Table 14). Austria’s NIIP at the end of 2021 was EUR 58.4 bn, or 14.4 percent of GDP. The *household sector* held a net position in foreign-residency and foreign-currency claims of EUR 62.3 bn, constructed from the OeNB financial accounts and bank statistics. Because it includes CHF mortgages from resident banks (Section 4.1), this aggregate is not the household sector’s residency-based net foreign

Table 13: Monetary-policy transmission in Austria, closed versus open economy

Channel	Contribution to dC/C (pp)	
	Baseline, $\eta = -1$	Heterogeneous γ_i
Aggregate income (M)	+0.474	+0.474
Substitution (σS)	+0.270	+0.270
Interest rate exposure (E_R)	+0.110	+0.110
Earnings heterogeneity (E_Y)	+0.013	+0.026
Fisher (E_P)	+0.008	+0.008
Closed-economy response	+0.876	+0.889
Exchange rate revaluation (NFA)	+0.065	+0.065
Foreign interest rate exposure (URE^f)	+0.053	+0.053
Foreign Fisher (NNP^f)	−0.006	−0.006
Foreign block	+0.112	+0.112
Open-economy response	+0.988	+1.001
Increase over closed economy (%)	+12.7	+12.6

Contributions to the consumption response to a 1 pp policy rate cut, in percentage points. Closed-economy block: $dR/R = -1\%$, $dP/P = +0.2\%$, $dY/Y = +0.4\%$, $\sigma = 0.5$. The open economy adds $d\mathcal{E}/\mathcal{E} = +0.5\%$ (euro depreciation), $dR^*/R^* = -0.5\%$ and $dP^*/P^* = -0.1\%$, which together with dP/P imply a real depreciation of $de/e = +0.2\%$. Household foreign exposures come from the income-stratified, population-consistent imputation of the OeNB financial-accounts and bank-statistics 2021 Q4 aggregates. The first column applies the baseline incidence convention $\eta = -1$, and the second uses the estimated decile profile of Table 10, rescaled to satisfy adding-up. The foreign block adds the same +0.112 pp in both columns, since it does not depend on the incidence convention. The foreign earnings channel is excluded (Section 5.2). Totals and percentage changes are calculated from unrounded estimates. Source: HFCS Wave 4, OeNB, own calculations.

asset position and is not directly comparable with the NIIP. It is the relevant anchor for a household decomposition, and it is the aggregate our imputation in Section 4.1 is calibrated to. The *estimation sample* (household heads aged 25–64 with a valid MPC response, 2.58 of 4.07 million households) holds EUR 34.3 bn of that, or 55.2 percent. All cross-sectional moments reported in this section, including every level component, are computed over the estimation sample, so the reported dC is the consumption response of that sample and not of the household sector as a whole. For the foreign net nominal position the household sector holds EUR 1.7 bn, while the estimation sample’s slice is *negative*, EUR -4.2 bn: the estimation sample holds about 56 percent of the household sector’s foreign deposits and bonds, which make up the asset side of NNP^f , but about 96 percent of its foreign-currency and foreign credit liabilities, which are concentrated among working-age mortgage borrowers. The estimation sample’s foreign URE is EUR -10.2 bn.

Table 14: Aggregation chain for the foreign level terms in Austria

	<i>NFA</i> (EUR bn)	<i>NNP^f</i> (EUR bn)	<i>URE^f</i> (EUR bn)
Austria, NIIP	58.4	–	–
Household sector, foreign positions (OeNB)	62.3	+1.7	–
HFCS estimation sample	34.3	–4.2	–10.2
Estimation sample, % of household sector	55.2	–	–

NIIP from the OeNB statistical database ([Oesterreichische Nationalbank, 2024](#)), equal to 14.4 percent of GDP. Household-sector aggregates are the OeNB financial-accounts and bank-statistics positions of 2021 Q4 used to calibrate the imputation of household foreign exposures (Sections 4.1 and 3.3). The estimation sample comprises HFCS Wave 4 household heads aged 25–64 with a valid MPC response, 2.58 of 4.07 million Austrian households. Its aggregates are weighted sums of the imputed household positions. The sample share of NNP^f is not reported because the sample and sector aggregates carry opposite signs. NNP^f and URE^f are not defined at the level of the national NIIP, which is a net-worth concept without a maturity or currency breakdown by household. Source: OeNB, HFCS Wave 4, own calculations.

Table 15 decomposes each channel into its level component (the aggregate foreign exposure of the estimation sample times the average MPC) and its redistribution component (the covariance between MPCs and household foreign exposure). Three features stand out.

First, the exchange rate revaluation channel is the largest (+0.057 pp level and +0.007 pp redistribution, together +0.065 pp) and is dominated by its *positive level* component. The households in the estimation sample hold positive net foreign assets, and because we treat these as exposed to the real exchange rate of the euro, a real depreciation delivers a first-order valuation gain on their foreign portfolio, which raises consumption in proportion to the average MPC. Second, the level component is reinforced by a small positive redistribution component (+0.007 pp). Because the imputation allocates foreign holdings by income and

by domestic portfolio holdings, the sign of this component reflects how foreign assets are distributed in the imputation, not direct evidence on the MPCs of the actual holders of foreign assets. Third, the foreign URE channel is smaller but positive, because the aggregate foreign URE is negative (maturing foreign-currency liabilities, chiefly legacy CHF variable rate mortgages, exceed maturing foreign claims), so that a decrease in the foreign rate benefits the household sector. With the foreign earnings channel excluded, the foreign contribution we report rests entirely on balance-sheet channels: on stocks of foreign claims, which are not part of the income flow that dY measures, so that none of the three remaining channels is exposed to the double-counting problem.

The foreign Fisher channel is negligible (-0.006 pp), and both of its components are negative. The foreign net nominal position of the estimation sample is negative (EUR -4.2 bn, Table 14), and the foreign-currency and foreign credit liabilities are held by households with higher MPCs than the foreign deposits and bonds (0.52 against 0.39), so that in the foreign Fisher component of the decomposition the decrease in foreign prices raises the real value of net foreign nominal liabilities. The channel is small because the calibrated decrease in foreign prices (-0.1 percent) is small and because its mean-exposure and its covariance components are small in the constructed data.

Table 15: The foreign block split into level and redistribution components in Austria

Channel	Level	Redistribution	Total (pp)
Closed-economy response			+0.876
Exchange rate revaluation (NFA)	+0.057	+0.007	+0.065
Foreign interest rate exposure (URE^f)	+0.043	+0.010	+0.053
Foreign Fisher (NNP^f)	-0.004	-0.002	-0.006
Foreign block	+0.097	+0.015	+0.112
Open-economy response			+0.988

Contributions in percentage points under the baseline incidence convention $\eta = -1$, with $d\mathcal{E}/\mathcal{E} = +0.5\%$, $dR^*/R^* = -0.5\%$ and $dP^*/P^* = -0.1\%$, and hence a real depreciation of $de/e = +0.2\%$. For each foreign exposure X^f the *level* component is $\mathbb{E}_I[MPC_i] X_c^f$ and the *redistribution* component is $\text{cov}_I(MPC_i, X_i^f)$, the two terms of the identity (13), each divided by mean consumption $\mathbb{E}_I[c_i]$ and multiplied by the corresponding shock. The foreign earnings channel is excluded, because its level term is already contained in the equilibrium dY . In the closed economy the level components vanish by (4), so the fact that they are present, and dominant, is what distinguishes the open economy. Totals and percentage changes are calculated from unrounded estimates. Source: HFCS Wave 4, OeNB, own calculations.

The level components also change the comparison with the redistribution-free benchmark of Table 7. A representative household that holds the aggregate foreign position of the estimation sample experiences the level components but none of the redistribution components, because all covariances are zero in a representative-agent economy. The open-economy redistribution-free response is therefore the closed-economy RANK response of 0.744 pp plus the foreign level components of 0.097 pp, that is, 0.841 pp. The level effect alone raises this benchmark by 13.0 percent. Relative to it, heterogeneity amplifies the response by 17.5 percent under the baseline convention (0.988 against 0.841 pp) and by 19.0 percent under the estimated earnings incidence (1.001 pp). This is less than the 17.8 and 19.5 percent of the closed economy, because the redistribution channels add only slightly more in the open economy (0.132 pp domestically and +0.015 pp abroad), while the benchmark they are compared with is larger. The redistribution-free benchmark captures much of the calibrated open-economy response because it retains the foreign level effects. What heterogeneity adds is the domestic redistribution, mainly through the interest rate exposure channel.

Why the foreign earnings channel is excluded from the headline. Proposition 1 derives a fourth foreign channel, the foreign earnings channel in the last line of Equation (12). We exclude its level term to avoid double counting. Because $M = \mathbb{E}_I[MPC_i] \mathbb{E}_I[Y_i]/\mathbb{E}_I[c_i] + E_Y$, the level term equals $(M - E_Y) \times (\pi^{f,X} de/e)$. Under the baseline convention $\eta = -1$, $M - E_Y$ is also the coefficient on dY/Y , so that adding the level term is the same operation as raising dY/Y by $\pi^{f,X} de/e$, where $\pi^{f,X}$ is the aggregate tradables income share. The calibrated $dY/Y = +0.4\%$, however, is an equilibrium income response to the rate cut, in which the accompanying euro depreciation is endogenous and already contributes. Including the channel on top of $M dY/Y$ therefore applies the export gain twice. At most a small part of the level term could legitimately be added back. An aggregate tradables share applied to household gross income would overstate the exposure, because gross income includes pensions, transfers and property income that do not respond to the exchange rate. The euro area response dY does not reflect Austria's specific trade exposure outside the euro area.

Unlike the level term, the covariance term $\text{cov}_I(MPC_i, \pi_i^{f,X} Y_i)/\mathbb{E}_I[c_i] de/e$ is not contained in dY and can be estimated from the HFCS, which records the main economic activity of the employer of each employed household member as a NACE section (variable PE0400). We classify a household as exposed to the tradable sector if the head's employer belongs to agriculture, mining or manufacturing (NACE sections A to C), and we assign the household's employee and self-employment income to that sector. As for the level term, tradable-sector earnings increase one-for-one with the real depreciation of 0.2 percent. On this definition, 9.2 percent of households have a head working in the tradable sector, and they earn 9.3 percent of household gross income. The MPC weighted by tradable-sector income, which determines the covariance, is 0.42, against a sample mean of 0.46. The covariance term is small: -0.002 pp, with a 95 percent bootstrap confidence interval of $[-0.005, +0.002]$. Adding it would lower the foreign block from +0.112 to +0.110 pp and the increase over the closed economy from 12.7 to 12.5 percent, so we leave the headline unchanged. The estimate rests on a coarse classification, on the sector of the head alone and on a one-for-one response of tradable earnings, which overstates the effect of a euro depreciation on trade within the euro area. With the tradables income share measured in this way, the excluded level term would amount to 0.023 pp.

6. Discussion and Further Research

Our closed-economy findings do not conflict with the near-irrelevance of heterogeneity reported by [Bilbiie et al. \(2025\)](#) for Norway. Their sufficient statistics concern how household income and consumption move with aggregate income, which corresponds to our earnings-heterogeneity channel and which we also find to be small. Most of the amplification we find comes instead from the direct redistribution through interest rate exposure after a change in the policy rate, which those statistics do not isolate. The open-economy results are subject to further limitations of the current Austrian data, which bound every open-economy number we report. We discuss them below, together with ideas for further research.

Residency versus currency of denomination. A first qualification applies to the level components themselves. The OeNB financial-accounts aggregates that anchor them are *residency*-based: they record claims of Austrian households on non-residents, irrespective of the currency in which those claims are denominated. For nominal contractual claims, currency denomination determines direct exchange rate exposure, so that euro-denominated deposits at euro area banks do not revalue when the euro depreciates. For funds, equity and other intermediated holdings, exposure depends on the underlying assets and on hedging arrangements, not on the currency in which the instrument is quoted. Fund shares domiciled in Luxembourg or Ireland, the largest single item, can therefore be exposed to the exchange rate although they are quoted in euro, and foreign-currency instruments can be hedged. Residency-based net foreign assets are therefore neither an upper nor a lower bound for the currency-exposed position that the theory calls for, and the headline open-economy results should be read as conditional on the assumption that the constructed foreign exposures are positions in the modeled foreign currency that revalue one-for-one with the real exchange rate of the euro. The portfolio decomposition described below is the natural way to replace this assumption with measurement.

The cross-sectional measurement of foreign exposure. Conditional on that caveat and on the shock calibration, the level components of the new channels are anchored to financial-accounts aggregates. The redistribution components are not. The HFCS does not record the currency or issuer-residency composition of most household holdings, and a large share of household foreign-equity exposure is held indirectly through Austrian-domiciled investment and pension funds, which the survey records as a domestic fund holding rather than as the underlying foreign securities. In the absence of a security-level portfolio decomposition, we impute household foreign exposures by allocating the aggregate household-sector foreign position to the households holding the corresponding instruments, stratified by income and proportionally across HFCS balance-sheet items. This is adequate for the level terms, but the covariance terms depend on how well the allocation approximates the distribution of foreign holdings across households. Figure 7 shows that households at the top of the wealth distribution are much more likely to hold market-exposed assets, but not whether actual foreign holdings are more concentrated among these households than in our imputation. Even if they were, the covariance would become more negative only if MPCs at the top were low. In Austria, MPCs at the top of the wealth and liquid-wealth distributions are not below average (Section 5.2). The direction of any resulting bias in the MPC–foreign-exposure covariances is therefore not clear, and the redistribution component of the exchange rate

revaluation channel in Table 15 should be interpreted with caution. The full-sector exposure totals behind the level component are fixed by construction, but the estimation sample’s share of them and its MPC-weighted response remain conditional on the imputation and on survey measurement.

Top-tail under-coverage. A second, compounding limitation is that the HFCS, like all wealth surveys, under-samples the very top of the wealth distribution, which is exactly where foreign equity exposure is concentrated, so that the MPCs that matter most for the covariance are measured with little precision. This biases both the measured aggregate foreign holdings of the household sector (which we sidestep by anchoring to the financial-accounts aggregates) and, more significantly, the measured covariance between MPCs and foreign exposure. Pareto-tail corrections to the HFCS, or integration with rich-list and administrative tax data, would be required to pin down the redistribution components with confidence.

What the data cannot yet deliver. Realizing the full open-economy decomposition of Section 3.3 at the household level would require three additions. (i) A security-level portfolio decomposition of Austrian household fund and pension holdings, feasible in principle by combining the ECB Securities Holdings Statistics by Sector with the Centralized Securities Database to recover the foreign and currency composition of fund portfolios. (ii) A finer household-level measure of the tradables income share $\pi_i^{f,X}$ than the NACE section of the household head used in Section 5.2. (iii) Identified impulse responses of the euro exchange rate and foreign rates to ECB shocks (for instance from the high-frequency identification of [Jarociński and Karadi \(2020\)](#)) to replace the calibration used here. Requirements (i) and (iii) cannot be met within the present HFCS-based dataset, and (ii) only in the coarse form used here, which is why we present the open-economy results as a transparent, level-anchored first pass rather than a fully identified estimate.

Requirement (ii) would allow the traded-sector component of earnings heterogeneity to be measured separately, without counting incidence already captured by the total-income profile. Estimating it requires that households be assigned a tradables income share. The HFCS records the NACE section of the employer of each employed household member, and our estimate in Section 5.2, based on the household head’s sector, puts the covariance term at -0.002 pp. Three refinements would make the estimate more precise: using the sectors of all earners from the HFCS personal file, adding tradable services to the narrow definition of agriculture, mining and manufacturing, and weighting sectors by their exports to countries outside the euro area, for which a euro depreciation directly improves price competitiveness.

Currency disaggregation and the legacy CHF stock. A further refinement, also beyond the current data, is to separate the foreign block by currency. Exchange rate movements are currency-specific, and the CHF/EUR rate in particular responds differently to ECB shocks than the USD/EUR rate. This matters for Austria because of the historically large stock of CHF-denominated mortgages, whose holders differ from the holders of foreign equity. [Beer et al. \(2010\)](#) find that Austrian households with foreign-currency housing loans tend to be wealthier and less risk-averse than other borrowers, but they do not measure MPCs. In our imputation, which allocates the CHF stock to working-age holders of variable rate mortgages, these liabilities sit with households whose MPCs are higher than those of the

holders of foreign deposits and bonds (0.52 against 0.39). The borrower profile of [Beer et al. \(2010\)](#) cuts against this allocation: if wealthier borrowers had lower MPCs, as wealthier households do in most euro area countries, the imputation would overstate the MPC of the holders of these liabilities. Whether this holds for the actual borrowers, and hence the sign of the redistribution component they generate, is an open question. The scientific-use file of the HFCS does not record loan currency, which is why our imputation allocates the aggregate CHF stock to variable rate mortgage holders as a proxy. Identifying the actual foreign-currency borrowers is a priority for future work, especially because the run-off of the CHF stock means the relevant covariance has been changing over time.

Exchange rate pass-through to domestic prices. Finally, the domestic price response and the nominal depreciation are calibrated separately, although in an economy as open as Austria a euro depreciation passes through to domestic prices. Correlated responses do not invalidate a decomposition into separate terms, but the calibration should be internally consistent. The real depreciation that drives the revaluation channel depends on the domestic price response, and identified responses of both, together with an established Eurosystem estimate of exchange rate pass-through, would replace our values.

7. Conclusion

This paper has quantified the redistribution channels of monetary policy in Austria with the sufficient-statistics approach of [Auclert \(2019\)](#) and has extended the approach, theoretically and empirically, to an open economy. Three findings stand out.

First, in the closed economy, redistribution raises the consumption response to an ECB rate cut by 18 percent relative to a redistribution-free benchmark, a point estimate above the 15 percent reported for the euro area by [Pekanov \(2024a\)](#). About 84 percent of this amplification comes from the unhedged interest rate exposure channel, which reflects the prevalence of variable rate housing loans in Austria. The Fisher contribution is small.

Second, the calibrated incidence of the income gain is steep but contributes little. The incidence profile based on personal gross earnings assigns to the three lowest income deciles about 43 percent of the income gain from a rate cut, although they hold about 12 percent of household income. Because MPCs are only weakly related to income, the earnings-heterogeneity channel nevertheless adds only about 3 percent to the consumption response with this profile, and between 0.4 and 3.7 percent across income concepts.

Third, opening the economy changes the structure of the decomposition. The cross-sectional mean of foreign exposures no longer nets out but equals the household sector’s aggregate foreign exposure, which enters the consumption response multiplied by the average MPC. In aggregate, the households in our sample hold positive net foreign assets, and in an illustrative calibration the foreign channels add about 13 percent to the response of the domestic block, mostly through the valuation gain on net foreign assets when the euro depreciates in real terms. This is mainly a level effect rather than an amplification generated by household heterogeneity. A representative household holding the aggregate foreign position would already respond 13.0 percent more strongly than the representative household of the closed

economy (0.841 against 0.744 pp). This is less than what heterogeneity adds on top of this open-economy redistribution-free benchmark (17.5 percent).

The foreign results are conditional on treating the constructed exposures as positions in the modeled foreign currency and on the foreign shock vector. The largest foreign channel, exchange rate revaluation, is proportional to the real depreciation, which in our calibration is 0.2 percent, because domestic inflation and the decrease in foreign prices offset part of the nominal depreciation of 0.5 percent. The redistribution components of the foreign channels rest on imputed household-level foreign exposures. A more accurate measure would combine the HFCS with security-level portfolio data and with administrative data covering the top of the wealth distribution. The decomposition developed in this paper defines the moments that such an effort would need to estimate.

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