Mortgage Moratoria as Fiscal-free Stimulus: Evidence from Belgium[1]

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Abstract

How can governments stimulate demand and reduce inequality during crises without incurring fiscal costs? We study Belgium's 2020 mortgage moratorium. Using proprietary transaction and credit data and a sharp eligibility cutoff, we show that suspending payments increased household consumption and reduced both income and consumption inequality, especially at the bottom. A life-cycle heterogeneous-agent model with long-term, defaultable mortgages replicates the micro elasticities in the data and uncovers sizable general-equilibrium amplification: moratoria support consumption, stabilize house prices, and strengthen bank balance sheets without fiscal costs. Yet broad extensions backfire by eroding bank net worth and contracting credit, ultimately reducing aggregate demand.

Keywords: Mortgage moratoria, debt relief, inequality, heterogeneous agent models
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1 Introduction

A central challenge of macroeconomic policy is to stimulate aggregate demand during crises while maintaining financial stability, avoiding increases in inequality, and doing so without relying on public spending. Debt moratoria—temporary suspensions of periodic debt payments, often referred to as payment holidays—offer a rare combination of immediacy, simplicity, and fiscal neutrality. By pausing payments without forgiving debt, they provide households with liquidity relief at no direct cost to the public purse. For example, under a typical mortgage moratorium, monthly payments are suspended for six months, and the loan's maturity is extended accordingly, with interest continuing to accrue and the present value of the obligation unchanged.

While the idea of debt moratoria has deep historical roots, their widespread use was rare until the COVID-19 pandemic. One of the earliest known references to debt relief appears in the Quran (2:280), underscoring its longstanding recognition as a means of financial protection. In the modern era, moratoria were implemented only sporadically—for instance, to support farmers during 19th-century droughts (Alston, 1984). The COVID-19 crisis, however, marked a turning point: over 70 countries adopted debt moratoria, primarily to stabilize financial markets and support household balance sheets, particularly among mortgage borrowers. Moratoria are simple to implement, fiscally neutral, and unlike refinancing, do not adversely affect borrowers' credit scores. These features make moratoria a particularly attractive instrument for policymakers seeking to cushion aggregate shocks without deploying public funds. These questions are particularly salient during crises when fiscal space is constrained, administrative capacity is strained, or monetary policy is near the zero lower bound. As governments search for cost-effective stabilization tools, understanding whether liquidity can be reallocated without public transfers becomes critical. We study mortgage moratoria as a policy that delivers such reallocation—by postponing payments rather than forgiving them—and examine their effects on household behavior, inequality, and macroeconomic stability.

We make two main contributions—one empirical, the other theoretical. On the empirical side, we leverage proprietary transaction and credit data from BNP Paribas Fortis, Belgium's largest bank. Our identification strategy exploits a sharp eligibility rule based on delinquency status. The official policy required borrowers to have no overdue payments as of February 1, 2020. Because our data record delinquency only at month-end, we proxy this rule using February 29, 2020, and classify as *eligible* those with fewer than 30 days past due and as *noneligible* those already delinquent at the end of January. This definition generates a quasi-natural experiment around a clearly defined threshold: two groups of

financially stressed households with similar observable characteristics, distinguished only by their eligibility for the moratorium. Since no debt suspension policies existed prior to March 2020 and assignment is predetermined relative to the March 22 announcement, anticipation effects are unlikely. To estimate the policy's impact, we employ an event-study Difference-in-Differences design that traces its causal effects on spending and inequality among distressed borrowers.

We find that eligible households suspended €232 more in mortgage payments than ineligible households. This liquidity relief translated into a substantial and persistent increase in consumption: eligible households spent an additional €297 over the second, third, and fourth quarters of 2020, with effects persisting into 2021. Importantly, we provide the first empirical evidence on the distributional effects of debt moratoria. Specifically, we document a slower rise in consumption and income inequality among eligible households following the implementation of the policy. This decline is driven by reduced dispersion within the eligible group, highlighting the potential of moratoria to mitigate rising disparities during economic crises.

While our empirical strategy provides a credible basis for causal inference, it identifies the average effects only locally and is therefore limited in external validity. For instance, can estimates derived from a specific COVID-era policy be generalized to non-pandemic contexts? Our approach captures intensive-margin effects—what about the extensive margin? How do the effects vary across population subgroups, such as renters versus owners, younger versus older households, or those without prior defaults? What are the distributional effects? Moreover, our estimates are partial equilibrium in nature, comparing households just above and below the eligibility threshold. This raises further questions: What are the general equilibrium effects? What are the long-run implications for bank balance sheets, given that the policy implicitly places the financial burden on lenders? What are the effects on income inequality on different groups of the society? And finally, what are the overall welfare effects of such interventions?

To address these questions, our second contribution is a dynamic general equilibrium model with heterogeneous agents, long-term mortgage contracts, and housing. More specifically, the model features households, banks, rental companies, firms, and a government sector, and incorporates key frictions such as default risk, liquidity constraints, uninsurable income risk, and housing transaction costs. Banks offer long-term, defaultable mortgage contracts to households and extend short-term credit to firms. Households face idiosyncratic income and employment shocks, while the government provides unemployment insurance and retirement benefits, financed through payroll taxation. The model is calibrated to Belgian micro and macro data and simulates the COVID-19 shock as a

temporary decline in productivity. It successfully replicates key moments of the Belgian economy during the pandemic period.

To validate the model, we compare the elasticity of consumption with respect to payment suspensions in both the model and the data, holding prices fixed in the model to isolate the direct effect. We verify that the model-implied elasticity falls within the empirical range, suggesting that the framework captures the observed consumption response to mortgage moratoria with reasonable accuracy.

We use the model to assess the macroeconomic and distributional consequences of the mortgage moratorium policy implemented as a one-year suspension of mortgage payments with interest accrual. We show that the policy substantially mitigates the adverse effects of the shock by reducing foreclosures, stabilizing house prices, and supporting consumption. General equilibrium effects significantly amplify these benefits—particularly for highly leveraged and low-wealth households. The policy also leads to a measurable decline in consumption inequality, with the largest gains concentrated among lower-income households. These results highlight the potential of mortgage moratoria as a fiscally neutral instrument for macroeconomic stabilization and redistribution during crises.

However, the model also shows that the effectiveness of mortgage moratoria critically depends on their scope. When the policy is broadened to cover all mortgage holders rather than being targeted to financially stressed households, its positive effects are overturned. Extending coverage generates only limited additional relief for unconstrained households but significantly erodes banks' balance sheets, as a much larger volume of loans temporarily ceases to generate cash flow. The resulting deterioration in bank net worth leads to tighter credit supply, higher lending rates, and ultimately lower wages and consumption. In this scenario, a policy designed to stabilize demand and reduce risk inadvertently backfires, underscoring that the benefits of moratoria hinge on targeting relief to households most vulnerable.

To assess the robustness and broader implications of mortgage moratoria, we conduct a series of counterfactual policy experiments. The benchmark policy—a one-year suspension of mortgage payments for households below a certain asset threshold—proves effective in stabilizing aggregate demand without imposing direct fiscal costs. We then compare this benchmark to extending the coverage by eliminating the asset threshold. Although the alternative policy provides more direct relief to a larger share of households, it significantly weakens bank balance sheets, leading to higher lending rates, reduced wages, and ultimately lower consumption and house prices.

We also explore the effects of extending the duration of the benchmark policy. While a two-period extension yields only marginal gains, a four-period extension reverses the

policy's benefits, again due to the adverse impact on the banking sector and resulting credit contraction. These findings highlight a key insight: policies that appear more generous to households may backfire if they undermine financial intermediaries, thereby dampening the overall effectiveness of the intervention. The analysis underscores the importance of accounting for general equilibrium effects and financial sector dynamics when designing stabilization policies.

2 Literature review

Our paper contributes to four strands of literature on macroeconomic policy and household behavior during crises.

First, we relate to the literature on fiscal stimulus and liquidity provision in downturns. Classic fiscal tools—such as direct transfers, tax rebates, and unemployment insurance—are known to stimulate demand (Johnson et al. (2006); Parker et al. (2013); Fagereng et al. (2021). More recent work evaluates the effectiveness and targeting of such measures during COVID-19 (Chetty et al. (2020); Hagedorn et al. (2023). In contrast to these public spending tools, we study a policy that expands household liquidity through payment deferral rather than transfers, with no direct fiscal cost. This positions our work alongside recent debates about the role of automatic stabilizers (McKay and Reis (2016)) and private-sector coordination mechanisms (Farhi and Werning (2016)).

Second, we contribute to a growing literature on credit relief. Several studies have examined loan forbearance and mortgage modification programs during the Great Recession, such as Home Affordable Modification Program (HAMP) in the U.S. (Agarwal et al., 2017; Ganong and Noel, 2020), which typically involved government subsidies or credit guarantees. Closer to our setting, Dobbie and Song (2015) analyze the macroeconomic effects of bankruptcy protection. Our work differs in two key respects: we study a purely private, opt-in moratorium policy implemented at scale, and we estimate both microeconomic and general equilibrium effects. Moreover, unlike bankruptcy or loan modification

programs, mortgage moratoria do not involve any debt forgiveness or write-downs.[1] More recently, as moratoria were widely implemented during the COVID-19 pandemic, a new literature has begun to emerge. Guler et al. (2024) and Önder et al. (2023) examine the effects of mortgage and corporate debt moratoria in Colombia, providing evidence from a developing-country context. Hatchondo et al. (2025) study payment suspensions for sovereign debt within a standard quantitative default framework. Dinerstein et al. (2023) evaluate the effects of the 2020 U.S. student loan moratorium. In contrast to these settings, our policy involved no debt forgiveness and targeted financially distressed individuals with recent delinquencies—highlighting both the design and distributional specificity of the intervention we study.

Third, our paper connects to research on the distributional impact of stabilization policies. A growing body of work explores how macro policies affect inequality through liquidity channels and market incompleteness (Kaplan et al. (2018); Broer et al. (2022)). We provide new evidence that a liquidity intervention targeted at mortgage borrowers—many of whom are liquidity constrained—can reduce both income and consumption inequality, even without transfers.

Finally, we build on structural macroeconomic models of heterogeneous agents with housing and financial frictions. Our framework extends prior work on quantitative models of housing with mortgage default, while introducing a novel moratorium policy experiment calibrated to Belgian data.[2] Importantly, we validate the model against micro-level reduced-form effects, and use it to uncover general equilibrium forces—via credit markets, house prices, and bank balance sheets—that amplify the impact of moratoria and to study the policy's distributional effects.

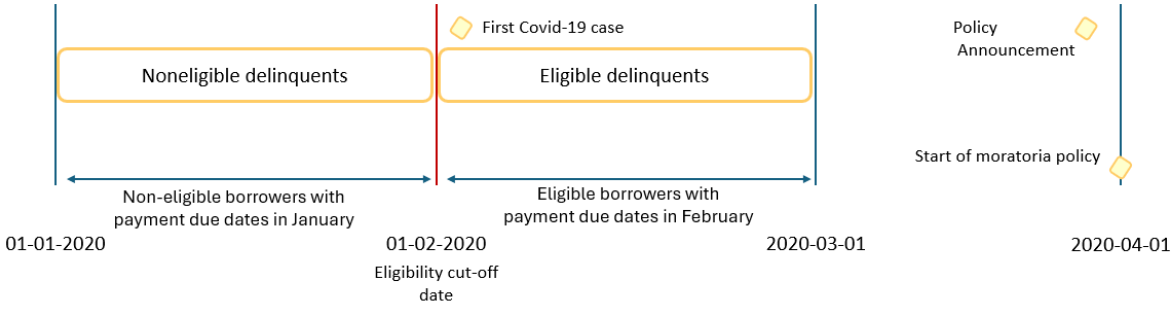
[1] In contrast to existing forbearance measures, mortgage moratoria offer a distinct form of credit relief that combines immediacy, simplicity, and fiscal neutrality. Unlike maturity extensions or interest rate reductions, which often require loan-level renegotiation and administrative complexity, moratoria can be implemented quickly at scale, either automatically or through simple opt-in mechanisms. Compared to grace periods or principal forbearance, moratoria typically provide larger and more front-loaded liquidity relief by pausing the entire payment stream, not just its interest or principal components. Crucially, moratoria do not entail any nominal debt forgiveness and usually generate no direct cost to the public sector. This contrasts with programs like the U.S. HAMP, which relied on significant fiscal transfers funded through the Troubled Asset Relief Program (TARP) to subsidize interest reductions and principal modifications. While HAMP targeted borrowers in distress and provided durable NPV relief, it was administratively burdensome, slower to scale, and fiscally costly. In contrast, moratoria shift the timing of payments without reducing their present value (at least contractually), providing rapid and broad-based liquidity support in times of crisis without distorting public finances. This makes them a particularly attractive policy tool for macroeconomic stabilization when timely demand support is needed, but fiscal space is limited.

[2] Prominent examples are Jeske et al. (2013), Guler (2015), Arslan et al. (2015), Corbae and Quintin (2015), Hatchondo et al. (2015), Chatterjee and Eyigungor (2015), Guren and McQuade (2021), Arslan et al. (2025)

3 Moratoria in Belgium

3.1 Policy Setup

Figure 1: Timeline of Debt Suspension Policy and Key Events



The moratorium policy in Belgium, enacted on March 22, 2020 by the National Bank of Belgium (NBB) and the Belgian Financial Sector Federation (Febelfin), aimed to provide additional liquidity to mortgage holders affected by the COVID-19 pandemic [3]. Introduced in phases, the initial stage permitted the deferral of capital and interest payments for up to six months but no later than October 30, 2020. In September, the government announced a three-month extension of the policy for clients already benefiting from it, extending coverage through December 2020. However, the total suspension period was capped at a maximum of six months.

The official eligibility rule required that borrowers have no overdue payments on loans, taxes, or social security contributions as of February 1, 2020. Because our dataset records delinquency only at month-end, we operationalize this rule using information as of February 29, 2020: households with fewer than 30 days past due at month-end are classified as eligible, while those already delinquent at the end of January are classified as noneligible. This empirical definition closely mirrors the official criterion but matches the frequency of our data. Importantly, the assignment rule is predetermined relative to the March 22 policy announcement, so our estimates are not contaminated by within-March behavioral adjustments or anticipation effects. Furthermore, the policy specifically targeted individuals with existing household loans on their primary residence and with less than €25,000 in their current, savings, and investment portfolios. Debt suspension was not granted automatically; rather, individuals who met the eligibility criteria were required to

[3] Official comprehensive information on the policy is provided by the National Bank of Belgium (NBB moratoria).

proactively contact their banks and request a moratorium on their mortgage payments. Once a request was accepted, the suspension was granted immediately. Following the suspension period, regular payments resumed, and the debt maturity was extended by the duration of the moratorium. To account for the deferred interest payments, monthly repayments were recalculated to ensure that the present discounted value of the mortgage remained unchanged. Additionally, banks were prohibited from imposing any extra fees or administrative charges. During the moratorium, the accrual of overdue payments was paused, and the overdue days were reset to zero.

Banks informed customers about this option, and the policy was also covered in local news media. The request for the payment suspension could be submitted via e-mail - by sending the required documents or personally at the bank branch. Eligible households could apply for the policy between April and September 2020.

3.2 Identification

Our identification strategy compares financially stressed borrowers who narrowly satisfy versus narrowly fail the moratorium eligibility rule. The official policy required borrowers to have no overdue payments as of February 1, 2020. Because our dataset records delinquency only at month-end, we approximate this rule using February 29, 2020: households with fewer than 30 days past due are classified as *eligible*, while those already delinquent at the end of January are classified as *noneligible*.[4] This design yields two groups of households with similar repayment difficulties, distinguished only by their status relative to the cutoff. In practice, both groups display very similar overdue patterns and financial stress, but only one qualifies for debt suspension. To validate this comparability, Appendix Appendix A presents descriptive statistics for eligible and noneligible households before the policy. Across spending, savings, debt, and demographics, we find no statistically significant pre-policy differences between the two groups.

3.3 Data

In this study, we use a highly granular, proprietary dataset comprising anonymized credit, transaction, and account records from BNP Paribas Fortis (BNPPF). BNPPF has around a quarter of the commercial banking market in Belgium. The BNPPF dataset contains daily transactions, demographics and end-of-month balances for more than 4 million Belgian retail clients ranging from 2012 to 2023 and covering all regions of the

[4]Due to the construction of the dataset, delinquency is observed only at the end of each month.

country. As in De Schryder et al. (2025) we assign each client to a household using a unique household identifier. Clients are grouped under the same household identifier if they either share a bank account or have reported a familial relationship to the bank. Information about familial relationships is obtained either through client self-reporting or via the annual requirement for clients to confirm their ID information, which includes recorded family relationships. This identifier thus encompasses both traditional households (e.g., parents and children) and economic households (e.g., cohabiting individuals). The household identifier is dynamic and updates when members change their domicile address, allowing for analysis at the household level. The dataset includes all transactions—debit card purchases, cash withdrawals, and wire transfers—along with comprehensive categorization of both income and spending. Income categories are particularly reliable due to legally mandated communication patterns for wage payments in Belgium Boudt et al. (2023). Expenditures are classified into 58 consumption categories following the United Nations' official Classification of Individual Consumption by Purpose (COICOP), allowing us to distinguish between durable, semidurable, non-durable goods and services. The richness of the dataset enables us to track household income and consumption patterns at a monthly frequency, while accounting for their level of liquid wealth and a wide range of potential confounders. Importantly for our study, the BNPPF dataset also includes loan-specific information such as loan size, interest rates, maturity, loan type, monthly payment amounts, and delinquency days (i.e., past due days on debt payments). Additional information is provided regarding whether the loan was subject to a temporary moratorium, as well as the duration of such a suspension. In the dataset, approximately 40,000 mortgages were subject to this policy during the COVID-19 pandemic in 2020. This represents approximately 5% of the total outstanding mortgages at BNPPF in 2020, a figure that closely aligns with the statistics reported by official authorities. Besides, the dataset contains various non-identifying individual information, including age, gender, region of residence, and household size. A more detailed description of the credit and transaction dataset is provided in the appendix of Boudt et al. (2022). They illustrate the representativeness of the data by showing that the distribution of income in the BNPPF dataset closely aligns with the definition used by the Belgian statistics institute (Statbel 2019).

In this analysis, we applied several transformations to the data. The consumption expenditures are calculated as a 6-month moving average to smooth high variance. Next, we aggregate consumption expenditure and mortgage payments into quarters. The individual data are identified and grouped at the household level. We also impose a positive consumption constraint. In details, to account for active account holders, we retain only

households with non-zero consumption expenditures between 2019 and 2021. It is crucial to acknowledge a key limitation of the dataset, as it does not encompass accounts belonging to households across different banks. Our final dataset is strictly balanced and consists of 1,173 households.[5]

3.4 Econometric Specification

We present the econometric framework used to estimate the intention-to-treat (ITT) effect. The ITT measures the effect of the eligibility to the policy irrespective of whether households received debt payment suspension in practice. The ITT outcomes are estimated using the event study Difference-in-Differences (DiD) approach between 2019Q1 – 2021Q4 controlling for the time and household fixed effects. The dependent variable, $(S_{i,t})$, denotes the set of variables of interest that are used in the analysis: consumption spending (separately for non-durables, services) and mortgage payments denominated in euros in quarter t for household i. Specifically, we estimated the following equation:

$$S_{i,t} = \beta^{ITT} \cdot T_{2020Q2\&3\&4} \cdot \text{Eligible}_i + \underbrace{\sum_{n=2019Q1}^{2020Q1} \omega_n \cdot T_{n,i} \cdot \text{Eligible}_i}_{\text{Pre-Policy Period Effects}} + \underbrace{\sum_{m=2021Q1}^{2021Q4} \beta_m T_{m,i} \cdot \text{Eligible}_i}_{\text{Post-Policy Period Effects}} + \eta_i + \lambda_t + \epsilon_{i,t} \tag{1}$$

The indicator $Eligible_i$ equals 1 if a household was eligible for the moratorium policy based on the eligibility criteria. The primary parameter of our interest β^{ITT}, measures the average ITT effect for the second and third and fourth quarter of 2020 jointly when eligible households could apply for the policy. The further interaction terms between the time dummies (T) and the eligibility dummy capture both the pre-and post-policy effects. The pre-policy effects provide evidence regarding the validity of the parallel trends assumption, while the post-policy effects reflect the persistence and medium-term impacts of the policy intervention. η_i includes household fixed effects controlling for persistent differences in mortgage payments/consumption across households. λ_t denotes the year-quarter time fixed effects for each quarter between 2019Q1 - 2021Q4. ϵ_t is an error term. The fourth quarter of 2019 is excluded to capture the differences in the outcome $S_{i,t}$ between eligible and non-eligible borrowers relative to the baseline difference observed in the period before

[5] Appendix B show evolution of trends in mortgage payments, expenditure for eligible and non-eligible borrowers.

the policy, unaffected by the impacts of COVID-19. The standard errors are clustered on the household level.

The DiD approach addresses several concerns. A potential concern is that other shocks coinciding with the pandemic could confound our estimates. In particular, one might worry that the onset of COVID-19 altered borrower behavior before the moratorium was introduced. However, the moratorium's eligibility rule was predetermined relative to the March 22 announcement, and we measure delinquency status at the end of February, as shown in the Figure 1. Thus, assignment into eligibility is determined before the policy was announced, and households could not adjust repayment behavior in anticipation. This design substantially reduces concerns about simultaneity or policy anticipation bias in our estimates.

A second concern may be that borrowers self-select for the policy. Households who anticipate the policy might change their repayment behavior to benefit from the payment deferral. However, considering the unprecedented outbreak of the COVID-19 pandemic, the absence of similar policies in the past in Belgium [6], and the early announcement of the conditions compared to other countries [7], we can safely assume a low probability of anticipation by the borrowers in this case.

An important assumption of the DiD approach states that eligible and non-eligible borrowers would not exhibit significant differences in the absence of the policy. To test this, we analyze whether the two groups have statistical differences in consumption and spending trends before the policy implementation. Appendix B presents the evolution of means of consumption and mortgage payments before, during and after the debt suspension policy was implemented. The trends for all outcome variables clearly show parallel behavior before the policy was implemented and notable changes during and after the program. Our quantitative findings also support the lack of statistically significant differences in pre-policy periods, supporting the validity of the assumption of parallel trends (Appendix C). In other words, there were no differences in mortgage payments, expenditures, saving balances and household characteristics between eligible and non-eligible before moratoria policies were implemented.

[6]The first lockdown was announced by the National Security Council on Thursday 12 March

[7]Belgium was one of the first countries among over 70 that introduced the policy to launch support in March. For an overview of moratorium policies in different countries, we refer to Guler et al., 2024

4 Empirical Results

4.1 Impact on Household Balance Sheets

We estimate intention-to-treat effects of eligibility for debt suspension. Table 1 presents estimated intention-to-treat effects following the methodology described in section 3.4 including the pre-policy period (2020Q1), during the debt suspension policy, and for the four quarters following its termination (2021Q1–2021Q4). [8]

First, we assess the impact of eligibility on mortgage payments. During the policy period, eligible households reduced mortgage payments relative to noneligible peers. After the program ended, mortgage payments converged across groups.

Next, we examine changes in consumption spending. The results show a significant increase in expenditures on non-durables and services. Specifically, eligible borrowers spent approximately €296 more on average than non-eligible households during the policy period. When disaggregated by type of expenditure, the effect is primarily driven by an increase in spending on services. Moreover, this effect appears to persist over time, remaining statistically significant in the first quarter of 2021.

The intention-to-treat effect evaluates the benefits of the policy only locally and lacks external validity. Therefore, our causal estimates are subsequently used to assess the accuracy of the predictions generated by the quantitative model.

4.2 Impact on Inequalities

In this section, we examine the distributional effects of the moratoria policy. Figure 2 illustrates the Gini coefficient over time for income and consumption expenditures between eligible and non-eligible households. For income, prior to the implementation of the policy, the Gini coefficient fluctuated between 0.42 and 0.45, with no substantial difference between eligible and non-eligible households, indicating similar levels of income inequality across groups. During the policy period, the Gini coefficient declines markedly for both groups, suggesting a temporary compression in income inequality. However, in the quarters following the policy's expiration, inequality increases sharply among non-eligible households, while remaining relatively stable for the eligible group. This divergence highlights the potentially protective effect of eligibility to the policy, even for those who were eligible but did not take up.

[8] The table D2 presents the quarter-by-quarter disaggregated findings during the policy was implemented. Notably, while the magnitude of the estimated parameters in the first quarters of the policy period is statistically insignificant, it remains similar.

Table 1: Estimated Intention-to-Treat Effects of Moratoria Policy

	Mortgage Payments	Nondurables& Services	Nondurables	Services
ITT_{2020Q1}	103.67	112.84	20.97	143.12
	(144.28)	(100.72)	(35.45)	(96.31)
$ITT_{2020Q2\&3\&4}$	-231.58**	296.81*	36.82	249.10*
	(115.94)	(162.19)	(61.76)	(150.04)
ITT_{2021Q1}	-95.91	390.18*	89.93	306.31
	(155.72)	(208.77)	(78.02)	(193.65)
ITT_{2021Q2}	-178.70	400.11	98.62	265.07
	(140.81)	(221.51)	(82.73)	(200.11)
ITT_{2021Q3}	-236.26	332.67	100.21	259.64
	(193.70)	(225.70)	(86.43)	(199.82)
ITT_{2021Q4}	-145.21	397.50	113.52	288.52
	(144.50)	(225.10)	(84.20)	(204.86)
Time FE	Yes	Yes	Yes	Yes
HHs FE	Yes	Yes	Yes	Yes
Households	1215	1215	1215	1215

Authors' calculations. The estimated parameters represent the effect of the moratorium policy on household spending and mortgage payments between 2019Q1-2021Q4. Authors' calculations. 2019Q4 is the reference period not affected by policy and Covid-19 pandemic. All variables are in euros deflated by the CPI index. Consumption expenditures are calculated as a 6-month moving average. Mortgage payments refer to quarterly payments on existing loans originated before the policy. All columns control for households and time-fixed effects. Standard errors, clustered at the household level, are in brackets. Asterisks indicate significance levels: *.1, **.05, ***.01.* ∗ ∗.01.

Figure 2: Evolution of Gini index for eligible and noneligible households

(a) Gini index for income

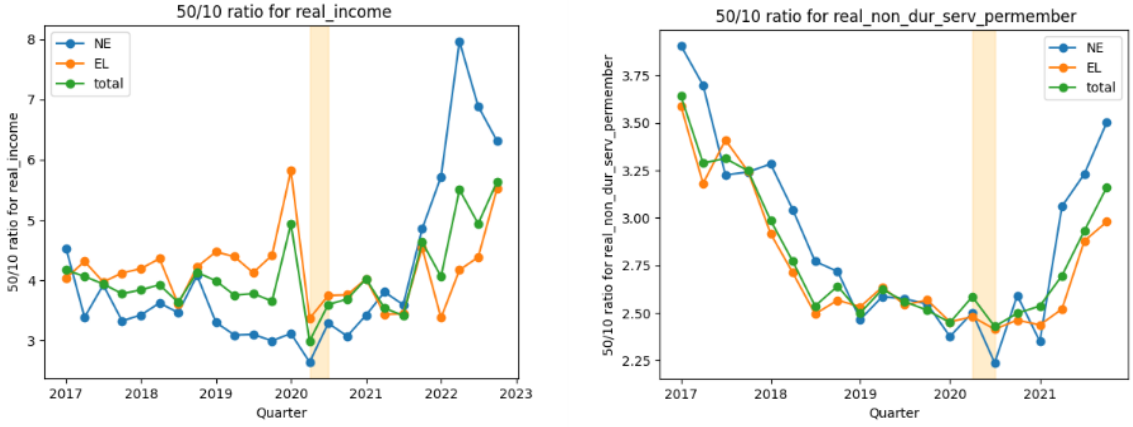
(b) Gini index for consumption

The legend distinguishes between three groups: El – eligible households (treated and non-treated), NE – non-eligible households, and Total – the entire sample, including both eligible and non-eligible households. Income is an aggregated measure of real total income received on the bank account. Consumption represents the sum of non-durable and services consumption as describe in section 3.3. Gini coefficient equals 1 represents perfect inequality.

Additionally, Figure 3 presents the evolution of the 50th-to-10th ratio, defined as the ratio between the median and the bottom 10th percentile of the income and consumption distributions. This measure captures changes in inequality at the lower end of the distribution. Prior to the policy, we observe parallel trends in the 50th-to-10th ratio for both income and consumption across eligible and non-eligible households, supporting the comparability of the two groups.

Following the policy period, however, the income 50th-to-10th ratio rises sharply for non-eligible households, indicating that the increase in inequality is driven primarily by a deterioration at the lower end of the income distribution. In contrast, the increase in the consumption 50th-to-10th ratio for non-eligible households is more modest, suggesting a smaller shift in consumption inequality among low-income individuals.

Figure 3: Response of Mortgage debt Across Different Groups



(a) 50th-to-10th percentile ratio for income

(b) 50th-to-10th ratio for consumption

4.3 Discussion

The empirical results reveals that eligible households largely opted to decrease their mortgage payments. Interestingly, this effect was predominantly driven by those households that did not formally enroll in the program but still chose to suspend their monthly payments during the moratorium period. This behavior, which can be described as "as-if treated," may be explained by several factors. First, some eligible households may not have been fully aware of the debt suspension option. Although the policy was widely disseminated through media and communicated by banks, there remains the possibility that certain borrowers did not receive or fully understand the message. Additionally, given

that this was the first widespread introduction of such a policy, some borrowers may have been hesitant to formally engage with the program due to concerns over uncertainty or mistrust of the new system. Notably, while participation in the policy did not negatively affect credit scores, less-informed households could have deterred from enrolling.

The empirical results highlight the stimulating effect of the policy on consumption patterns. Borrowers redirected the suspended payments toward increased consumption. Simply being eligible to the policy appears to increase borrowers expenditure relative to the noneligible once. This finding suggests that the moratorium may have served not only as a financial relief mechanism but also as an indirect stimulus to consumption.

The lack of an immediate consumption response in the first quarter of the policy's implementation can be attributed to the restrictions imposed during the pandemic. As governments, including Belgium, enacted social distancing measures and lockdowns to curb the spread of COVID-19, households faced limited opportunities to spend on non-durable goods and services. However, once these restrictions were lifted, there was a notable rebound in consumption, particularly in services.

Additionally, the findings highlight the distributional importance of debt payment relief policies. By offering households the option to suspend debt payments, the policy prevent further widening of income distribution among eligible households. In contrast, for non-eligible households—who did not have access to this financial buffer—the gap between lower 10th percentile and median income strongly increased in the post-policy period. This suggests that eligibility alone, even without full take-up, played a protective role in mitigating income inequality.

5 Quantitative Model

Why a quantitative model? While our empirical estimates provide credible evidence on the causal effects of mortgage payment suspensions, they are inherently partial equilibrium in nature. That is, the design compares households narrowly around the eligibility threshold, holding prices, wages, and credit conditions constant. This allows us to isolate local, intensive-margin behavioral responses, but it abstracts from potential general equilibrium feedback effects. For instance, moratoria may influence house prices, bank balance sheets, and credit supply—mechanisms that are muted in our empirical setting but could significantly amplify or dampen the aggregate impact. To capture these economy-wide interactions and extend our analysis to the full population, we now turn to a state-of-the art dynamic general equilibrium model with heterogeneous agents and financial frictions.

An important ingredient of our framework is modeling banks explicitly and we assume that banks take this moratorium policy as a one-time non-recurrent policy in line with our event-analysis in Section Appendix E where we find no evidence that banks repriced loans, changed the amount of mortgage granted or altered maturities following the introduction of moratoria within a one-week and two weeks windows. This suggests that banks did not internalize the policy as a recurrent risk, consistent with our modeling of moratoria as a one-time intervention.

The economy consists of five sectors: households, financial intermediaries (banks), rental companies, firms, and government. There is no aggregate uncertainty, but individuals are subject to idiosyncratic income shocks. These shocks lead to heterogeneity in income, wealth, housing tenure and mortgage debt across households. We study the effects of debt policies in response to unexpected and persistent shocks to the economy. Perfect foresight is assumed along the transition.

5.1 Households

There is a continuum of households who are all born identical and with zero wealth. They all have finite and deterministic life J. They work in the initial $J_R < J$ periods and enjoy retirement in their remaining life-time.

Households derive utility from consumption and housing services and can choose between renting or owning a house of their desired size.

$$E_0 \sum_{t=0}^{J} \beta^t u(c_{t,j}, s_{t,j}),$$

where β is the discount factor, c_j is consumption, and s_j is the housing services of an age j household.

Households supply labor inelastically during working age and earn the market wage w per their labor efficiency. When they retire, they receive fixed retirement benefits as a function of their labor efficiency at the time of retirement. Retirement benefits are financed through proportional labor income taxes, τ_r, on working age households. Labor efficiency before retirement is subject to idiosyncratic shocks. The log of labor efficiency includes a deterministic component $f(j)$, which only depends on age, and a stochastic component z_j, which is an AR(1) process. Households are also subject to unemployment shocks during working age. Unemployed individuals receive $\lambda < 1$ fraction of their potential labor income when unemployed. Unemployment shock is modeled as an age and income dependent shock. Unemployed individuals receive reemployment shock to enter the labor

market. We also assume that individuals receive means-tested benefits if their total assets (including their current labor income) are below a threshold $\bar{\omega}$ as defined in equation 4. Unemployment benefits and means-tested safety transfers are financed through taxes on working-age individuals including both employed and unemployed.

Thus, a household's labor income $y(j, z_j)$ can be summarized by

$$y(j, z_j) = \begin{cases} w\,(1 - \tau_u - \tau_r)\exp(f(j) + z_j), & \text{if employed \& } j < J_R \\ w\,(1 - \tau_r)\,\lambda \exp(f(j) + z_j), & \text{if unemployed \& } j < J_R \\ w y_R(z_R), & \text{if } j \geq J_R \end{cases} \tag{2}$$

$$z_j = \rho z_{j-1} + \varepsilon_j, \quad \varepsilon_j \sim i.i.d. \quad N(0, \sigma_\varepsilon^2),$$

where w is the wage per efficiency units of labor, τ_r is the social security tax rate, τ_u is the tax rate to finance unemployment benefits and means-tested transfers, and $y_R(z_R)$ is a regressive pension benefit system conditional on the realization of labor efficiency z_R upon retirement.

Housing Choices: Upon experiencing an income shock, households make decisions regarding their housing tenure —whether to rent or own— in addition to their consumption and savings choices. The sole financial investment available to them is mutual funds, which yield a return denoted by r_k.

To obtain housing services, households may choose to rent or purchase a home. Renters pay an endogenous rental rate p_r per unit of housing services s. Alternatively, households can acquire housing services through homeownership, financed via long-term, defaultable mortgages. The terms of these mortgages are endogenously determined by financial intermediaries, who price them based on household-specific default risk.

Homeowners retain the flexibility to remain in their homes or transition back to renting, either by selling their property or defaulting on their mortgage obligations. They may also refinance their mortgage at any time, which is treated equivalently to initiating a new mortgage. Furthermore, households can adjust their housing consumption by upgrading or downsizing—selling their current home and purchasing another.

Homeownership entails several transaction costs. The purchase price of a home is p_h per unit of housing. To finance this, households may obtain a mortgage, which involves two types of origination costs: a fixed fee φ_f (e.g., attorney, appraisal, and title fees), and a variable fee φ_m, calculated as a fraction of the mortgage principal. Selling a home also

incurs a cost, with sellers paying a fraction φ_s of the sale price, primarily due to real estate agent commissions.

Houses depreciate over time, requiring homeowners to spend a fraction δ_h of the home's value on maintenance each period. Given the risk of default, lenders incorporate a risk premium into the mortgage origination price.

While mortgage default is permitted, it carries significant consequences. Households that default become inactive renters, temporarily barred from homeownership and required to rent. These households regain eligibility to purchase a home with probability π in each subsequent period.

Mortgage Payments: Mortgages are modeled as long-term financial contracts. Following Arslan et al. (2025), we assume that mortgage balances amortize by the end of the life-cycle which implies the maturity of the mortgage as the remaining life of the individual. Then, given a mortgage interest rate r_ℓ, the periodic mortgage payment m is computed by the standard formula which equates the present discounted value of the mortgage payments to the mortgage principal at the origination:

$$m = d\frac{r_\ell}{1 + r_\ell - (1 + r_\ell)^{j-J}} \tag{3}$$

where d denotes the current mortgage principal, j is the current age of the individual and J is the terminal age of the individual. This formulation implies that mortgage principle follows as:

$$d' = (d - m)(1 + r_\ell)$$

Although mortgage default risk varies across households due to ex post heterogeneity, we simplify the model by computing the amortization schedule using the risk-free mortgage rate r_ℓ, rather than household-specific interest rates. This approach, consistent with Arslan et al. (2025), Hatchondo et al. (2015), and Kaplan et al. (2020), avoids introducing an additional state variable.

Importantly, household-specific default risk is reflected in the mortgage pricing at origination rather than in the interest rate itself. In effect, all households pay upfront points to reduce their mortgage rate to the common risk-free mortgage rate r_ℓ.

Value Functions: At any given time, households can be in one of three housing statuses: homeowner, active renter, or inactive renter. The distinction between active and inactive renters lies in their access to homeownership. Active renters are eligible to purchase a

home, whereas inactive renters are temporarily barred from doing so. A homeowner transitions to inactive renter status upon defaulting on a mortgage. Inactive renters regain eligibility to become active renters with probability π each period.

The household's state is represented by the vector $\theta \equiv \{\omega, z, j, d, h\}$, where: ω is current cash-on-hand, z is labor efficiency, j is age, d is outstanding mortgage debt (if any), h is house size (set to zero for renters).[9]

The central decision problem is that of an active renter considering a home purchase. We denote this household's value function as V^{rh}. Upon choosing to buy a home, the household accesses the mortgage market and selects a mortgage amount d', which determines the mortgage price at origination, $q^m(\theta)$, a function of the household's current state θ.

The purchaser's problem is formulated as:

$$V^{rh}(\theta) = \max_{c,d',h',a' \geq 0} \left\{ u(c, h') + \beta \mathbb{E} V^h(\theta') \right\}$$

subject to the constraints:

$$\begin{aligned} c + p_h h' + \delta_h p_h h' + \varphi_f + a' &= \omega + d' \left(q^m(\tilde{\theta}) - \varphi_m \right) + \bar{y} I(\theta) \\ \omega' &= w'(1-\tau) y(j+1, z') + a'(1 + r_k') \\ d' &\leq p_h h' (1 - \kappa) \end{aligned}$$

where $\tilde{\theta} \equiv \{d'; a', h', z, j\}$, , p_h is the unit price of housing, δ_h is the maintenance cost as a fraction of house value, φ_m is the variable cost of mortgage origination, φ_f is the fixed cost of mortgage origination, κ is the minimum down payment requirement (i.e., households must finance at least a fraction κ of the house value themselves). I is an indicator function for the safety benefits and is defined as

$$I(\theta) = \begin{cases} 1 & \text{if } \omega \leq \bar{\omega} \ \& \ y(j,z) \leq \bar{y} \\ 0 & \text{o.w} \end{cases} \tag{4}$$

5.2 Mutual Funds

Mutual funds serve as the owners of both the goods-producing firms and rental companies. They raise capital by borrowing from households and allocate these funds to operate

[9] For renters, both d and h are zero, as they do not own property.

the firms and rental enterprises. The interest rate at which mutual funds borrow from households is denoted by r_k.

5.2.1 Firms

A perfectly competitive firm produces final output by combining rented capital K and hired labor N. The rental rate of capital is r_k, and the wage per unit of labor efficiency is w. Capital depreciates at a constant rate δ_k.

Following Arslan et al. (2025), we introduce two key deviations from the standard firm problem. First, firms are required to finance a fraction ζ of their wage bill through borrowing from financial intermediaries. Second, firms not only choose the quantity of labor but also determine the utilization rate u of each worker.

The firm's optimization problem is given by:

$$\max_{K,N,u} \; \mathbb{Z}K^{\alpha}(Nu)^{1-\alpha} - (r_k + \delta_k)K - (1 + \zeta r_{\ell})\, wN,$$

where $\mathbb{Z}$ denotes aggregate productivity, and the wage per efficiency unit of labor is defined as:

$$w = \bar{w} + \vartheta \frac{u^{1+\psi}}{1+\psi}.$$

Here, $\bar{w}$ represents the base wage, while the second term captures the additional wage cost associated with increased worker utilization. The parameter $\psi > 0$ ensures convexity in the cost of utilization, which in turn guarantees global concavity of the firm's problem.

5.2.2 Rental Companies

Rental companies are the owners of rental housing units. They actively participate in the housing market by buying and selling these units—both from households and among themselves. The portion of their housing stock not sold is rented out to households at a per-period rental rate p_r per unit. Each unit incurs a maintenance cost κ, and the housing stock depreciates at a rate δ_h.

In addition, rental companies face a quadratic adjustment cost when changing the size of their rental supply. Let H_r denote the current rental housing stock and H_r' the next-period stock. The dynamic optimization problem of a representative rental company

is given by:

$$(1+r_k)V^{rc}(H_r) = \max_{H_r'} \left\{ (p_r - \kappa - p_h) H_r' + (1-\delta_h)H_r - \eta \frac{(H_r - H_r')^2}{2} + V^{rc}(H_r') \right\},$$

where r_k: return on capital, p_h: price of housing, η: parameter governing the magnitude of adjustment costs, $V^{rc}(H_r)$: value function of the rental company.

In equilibrium, the return on rental housing must equal the return on capital, r_k. This condition yields the rental pricing equation:

$$p_r = \kappa + p_h + \eta p_h (H_r' - H_r) - \frac{(1 - \delta_h + \eta(H_r'' - H_r'))p_h'}{1 + r_k},$$

where H_r'' is the housing stock two periods ahead, and p_h' is the expected future housing price.

5.3 Financial Intermediaries

Following Arslan et al. (2025), we consider an environment populated by infinitely many stand-alone, risk-averse financial intermediaries operating in a perfectly competitive market. These intermediaries seek to maximize the present discounted value of their dividend streams. They borrow from the international capital market at the exogenous interest rate r_t and extend credit in two forms: long-term mortgages to households and loans to goods-producing firms.

The optimization problem faced by a representative intermediary is:

$$\max_{L_{t+1}, B_{t+1}} \sum_{t=0}^{\infty} \beta_L^t \log(d_t^B),$$

subject to the constraints:

$$\begin{aligned} d_t^B + L_{t+1} &= \omega_t + B_{t+1}, \\ \omega_{t+1} &= L_{t+1}(1 + r_{\ell,t+1}) - B_{t+1}(1 + r_{t+1}), \end{aligned}$$

where d_t^B denotes dividends, ω_t is the intermediary's net worth, B_{t+1} represents borrowing from the international market, and L_{t+1} is total lending to households and firms.[10]

[10] Although the lending portfolio is more nuanced in practice—due to household heterogeneity and varying default risks—the assumptions of no aggregate risk and the law of large numbers imply that intermediaries earn identical returns across loans. This justifies the aggregation of the loan portfolio, as shown in Arslan et al. (2025).

Consistent with Gertler and Kiyotaki (2010), we assume that intermediaries may default at the beginning of a period by diverting a fraction ξ of their total assets. In the event of default, they are restricted to investing at the risk-free rate r_t. Departing from Gertler and Kiyotaki (2010), we model a small open economy—reflecting Belgium's financial openness—where banks can access international borrowing. While banks do not default in equilibrium, the threat of default imposes an endogenous leverage constraint:

$$(1-\phi_{t+1})(1+r_{\ell,t+1})L_{t+1} \geq (1+r_{t+1})B_{t+1},$$

with ϕ_t defined recursively as:

$$\phi_t = \xi^{1-\beta_L}\left(\frac{1+r_{t+1}}{1+r_{\ell,t+1}} - (1-\phi_{t+1})\right)^{\beta_L}.$$

If asset diversion is not permitted (i.e., $\xi = 0$), the spread between the lending rate $r_{\ell,t}$ and the borrowing rate r_t collapses, preventing banks from accumulating net worth.

5.4 Government:

The government runs two separate programs: (i) a pay-as-you-go pension system and (ii) safety nets. As part of the pension system, social security taxes are collected from working-age employed households and redistributed to retirees. Safety net program has two functions. First, it distributes a certain amount, $\bar{y}$, to households who have cash-on-hand below a threshold, $\bar{\omega}$, and income below $\bar{y}$. Second, it provides unemployment insurance to the unemployed households, modeled as constant fraction of potential income of the household. We assume both programs are on a balanced-budget. Pension system is funded through taxes on all working-age households whereas safety net program is funded through taxes only on employed households.

$$\begin{aligned}
\sum_{j<J_R}\sum_{z}\tau_r y(j,z)\pi_j(z) &= \sum_{j\geq J_R}\sum_{z} y_R(j,z)\pi_j(z) \\
\sum_{j<J_R}\sum_{z}\tau_u y(j,z)\pi_j^e(z) &= \sum_{j<J_R}\sum_{z}\lambda y(j,z)\pi_j^u(z) + \int_\theta \bar{y} I(\theta) d\Gamma(\theta)
\end{aligned}$$

where $\tau_r y(j,z)$ denotes the social security tax paid by individuals of age j with income shock z, $y_R(j,z)$ represents the pension income received by retirees with income shock z, $\pi_j^e(z)$ is the measure of employed individuals of age j experiencing income shock z, $\pi_j(z)$ is the measure of all individuals of age j experiencing income shock z, and Γ is the cumulative distribution of individuals over the state variable θ.

5.5 Equilibrium Conditions

Labor Market In equilibrium, total labor demand N_t must equal the effective labor supply from the working-age population. Since the total working-age population is normalized to 1 and the unemployment rate is exogenous and denoted by u_t, we have:

$$N_t = 1 - u_t.$$

Asset Market The total financial assets held by households, A_t, must equal the total demand for assets in the economy. This includes firms' capital demand K_t and the value of assets held by rental companies, denoted by $V_t^{rc}(H_{t-1}^r)$, which represents the present discounted value of their profits:

$$A_t = K_t + V_t^{rc}(H_{t-1}^r).$$

Loan Market Let $\Gamma_t(\theta)$ denote the distribution of all outstanding mortgages at the beginning of period t, and let $\ell_t(\theta)$ represent the mortgage loans held by financial intermediaries at that time. The loan market clearing conditions are:

$$\begin{aligned} \ell_t(\theta) &= \Gamma_t(\theta), \\ L_{t+1} &= \zeta w(\bar{w}_t, u_t) + \int_\theta p_t(\theta)\Gamma_t(\theta) + \bar{L}, \end{aligned}$$

where $\zeta w(\bar{w}_t, u_t)$ captures firm loan demand as a function of average wages and unemployment, $\bar{L}$ is the constant volume of loans to international borrowers.[11]

The first equation ensures that the representative financial intermediary holds the equilibrium mortgage portfolio. The second equation implies that the intermediary is indifferent between lending to firms or households, and it determines the equilibrium lending rate $r_{\ell,t+1}$.

Housing Market Total housing supply is fixed and must equal total housing demand:

$$\begin{aligned} H &= \int_\theta h_t(\theta)\, d\Gamma^h(\theta) + H_t^r, \\ H_t^r &= \int_\theta h_t(\theta)\, d\Gamma^r(\theta), \end{aligned}$$

[11] These loans are included to match the composition of bank balance sheets in Belgium. Their demand is assumed to be constant and is not modeled explicitly.

where Γ^h is the conditional distribution of homeowners, Γ^r is the conditional distribution of renters.

The first equation determines the equilibrium house price p_t^h, while the second determines the rental price p_t^r.

6 Model Calibration

A model period is a year. The model is calibrated to Belgium targeting the averages of 2010 to 2019.[12] Tables 2 and 3 present externally set and internally calibrated parameters under the columns labeled External and Internal respectively.

Table 2: Externally Set Parameters

Parameter	Explanation	Value
σ	risk aversion	2
α	capital share	1/3
ρ_ε	annual persistence of income	0.82
σ_ε	annual std of innovation to AR(1)	0.22
φ_h	selling cost for a household	7%
φ_e	selling cost for foreclosures	25%
φ_f	fixed cost of mortgage origination	2%
φ_m	variable cost of mortgage origination	0.75
δ_h	annual housing depreciation rate	2.5%
π	annual prob. of being an active renter	14%
$\bar{H}$	housing supply	1
ψ	wage curvature	2
κ	down payment requirement	0
ζ	share of wage bill financed	100%
δ_k	annual capital depreciation rate	10%
δ_0	income elasticity of job separation shock	0.15%
δ_1	age elasticity of job separation shock	3.08
$\bar{s}_{21}$	job separation rate at 21	3%
$\bar{s}_{65}$	job separation rate at 65	0.1%
λ	unemployment benefit rate	0.5

Demographics and Preferences: We assume individuals are born into the economy at the age of 25, work until age 64, retire at age 64 and die at age 84. We assume that households

[12] We provide the sources of the data for the moments in the Appendix.

receive utility from consumption and housing services captured by the following Cobb-Douglas utility specification:

$$u(c,s) = \frac{\left(c^{1-\gamma}s^{\gamma}\right)^{1-\sigma}}{1-\sigma}.$$

Following the literature, we set $\sigma = 2$, which implies an elasticity of intertemporal substitution of 0.5. We calibrate γ to match the share of housing services in GDP as 15 percent and the discount factor β to match the capital-output ratio of 2.

Income Process: We set the deterministic component of labor efficiency such that labor income grows doubles from age 25 to 55 and drops by 10% between age 55 and 65. We normalize the average efficiency for the working population is 1. Following Menzio et al. (2016), we set the unemployment shock, $s_j(z_k)$, to include an age-dependent component and a stochastic component that depends on labor efficiency: $s_j(z_k) = \bar{s}_j + \delta_0 z_j$.[13] Following Jarosch and Pilossoph (2019), we also assume that when the individual is hit by an unemployment shock, the labor efficiency drops by 15% replicating the well-known job scarring effect of unemployment. We set the unemployment benefit replacement rate as 50% consistent with the practice in Belgium. As part of the safety program, we set the income limit for safety program, $\bar{y}$, to 25% of average income, and asset limit, $\bar{\omega}$, to 50% of average income.

We, then, set the annual persistency of the income process as 0.82 and standard deviation of the innovations to the log of the labor efficiency as 0.22 so that the stochastic part of the log of the implied labor income process (including the unemployment spells) has an annual persistency 0.9 and standard deviation 0.2. The retirement system is modeled as in Guvenen and Smith (2014), where we set the average level of the benefits so that the social security tax is set to 12.5%.

Housing Markets: Housing transactions and mortgage issuances are costly. We set the selling cost of the house, φ_h, as 7% to replicate the typical real-estate agent cost and moving costs for a seller. The price discount for foreclosed properties, φ_e is set to 25%. The fixed cost of mortgage origination, φ_f, is set to 2% of the annual output, which corresponds to

[13] We set $\delta_0 = 0.0015$ implying 0.15 percentage point decline in job separation probability as income doubles. We, then, assume an exponential decline in the age-dependent component to match the life-cycle profile of unemployment risk. Particularly, we assume that the monthly job separation rate follows $\bar{s}_j = \bar{s}_{65} + (\bar{s}_{21} - \bar{s}_{65})\left(\frac{65-j}{44}\right)^{\delta_1}$ with $\bar{s}_{21} = 0.03$, $\bar{s}_{21} = 0.001$. Then, we simulate the monthly labor transitions over a year to compute the annual transition probabilities. We set δ_1 to generate unemployment rate of 5.5% among the working age population.

2% annual output. These costs represent the typical title costs, attorney fees, appraisal fees charged at the time of mortgage origination. The variable cost of mortgage origination, φ_m, is set to 0.75%, which represents typical lender's fees. The minimum downpayment to get a mortgage, ϕ, is set to 0, which allows for loan-to-value ratio up to 100% at the mortgage origination.

The probability of an inactive renter to become an active renter, π, is set to 14% to replicate the fact the default credit flags stay on the credit history, on average, around 7 years. The housing depreciation rate, δ_h, is set to 2.5%. We normalize the total housing stock, $\bar{H}$, to be 1. We use the minimum house size, $\underline{h}$, to match the homeownership rate of 71%.

Financial Sector: We calibrate the discount factor of the financial intermediaries, β_L, to match an annual lending premium $r_\ell - r$ of 1.5%, financial intermediaries' asset seizure rate, ξ, to match leverage ratio of 10, borrowing rate of the financial intermediaries, r_t, to match the mortgage debt to annual GDP ratio of 0.5.

Production Sector: The capital share in production, α, is set to $1/3$ and the capital depreciation rate, δ_k, is set to 10%. As described in Arslan et al. (2025), the curvature in the wage function, ψ, is the inverse of the Fisher elasticity in an equivalent formulation of the problem with GHH preferences on the household side. Given the low Frisch elasticity estimated in the micro studies. we set $\psi = 2$ implying a Frisch elasticity of 0.5. We, then, calibrate ϑ to match a utilization rate of 1 in the steady-state. We assume $\zeta = 1$ implying the firms need to finance the whole wage bill from the financial intermediaries. We normalize the aggregate productivity of the firms, $\mathbb{Z}$, to 1.

Rental Companies: We set $\eta = 1$ implying fairly segmented owner-occupied and rental market as suggested by Greenwald and Guren (2021). We calibrate the rental maintenance cost, κ, to match the house price to rental price ratio of 9 consistent with Belgium data.

7 Model Results

Table 4 presents the fit of the model. The model matches all the targeted moments. Although all parameters affect each moment, there is a clear relation between each calibrated parameter and one of the calibrated moments which help us match the moments perfectly.

We employ the structural model to quantify the full impact of Belgium's mortgage debt moratorium policy. As discussed in Section 4, our empirical model captures only partial

Table 3: Internally Calibrated Parameters

Parameter	Explanation	Value
β	discount factor	0.96
$\underline{h}$	minimum house size	0.85
r	bank borrowing rate	4.5%
γ	weight of housing services in utility	0.13
κ	rental maintenance cost	0.05
ξ	bank seizure rate	0.20
β_L	bank discount factor	0.82

equilibrium effects and therefore does not reflect the full impact of the policy. To address this limitation, we turn to our structural framework, which incorporates both partial and general equilibrium dynamics.

Table 4: Calibrated Moments

Moment	Data	Model
Capital to GDP ratio	2.0	2.0
Housing services share in GDP	0.15	0.15
Homeownership Rate	0.71	0.71
Mortgage Debt to GDP ratio	0.5	0.5
House Price to Rent ratio	9.0	9.0
Mortgage Premium	1.5%	1.5%
Bank Leverage	10	10

To simulate the economic environment in Belgium around 2020, we introduce an unexpected, temporary productivity shock. This shock follows an AR(1) process with an annual persistence parameter of 0.6. We calibrate the shock to produce a 6% decline in aggregate output, which corresponds to a 5% reduction in aggregate productivity. We then re-solve the model, this time incorporating the debt suspension policy as implemented in Belgium, to assess its broader macroeconomic effects.

7.1 Benchmark Results

We begin by examining how an exogenous aggregate productivity shock propagates through the economy. Figure 4 illustrates the response of key macroeconomic variables to an unexpected 5% decline in aggregate productivity. This initial shock reduces aggregate output on impact. Although capital and labor inputs are fixed at the time of the shock,

firms can adjust labor utilization rates. This endogenous adjustment amplifies the shock, resulting in a 6% decline in output, consistent with the model's calibration.

The combined decline in productivity and labor utilization reduces labor demand, leading to a 6% drop in wages. Lower labor income diminishes household purchasing power, which in turn reduces nondurable consumption, demand for housing services, and savings. Aggregate nondurable consumption falls by 2.5%, while household assets decline by just over 3%. The contraction in housing demand causes house prices to fall by 2.5%, which increases the foreclosure rate by approximately 0.5 percentage points.

Rising foreclosures erode the value of banks' assets, reducing their net worth by 6%. Although this decline in bank net worth tightens credit supply, the contraction in credit demand—driven by weaker housing demand—dominates. As a result, lending rates decrease slightly, by about 50 basis points.

7.2 Debt Suspension Policy

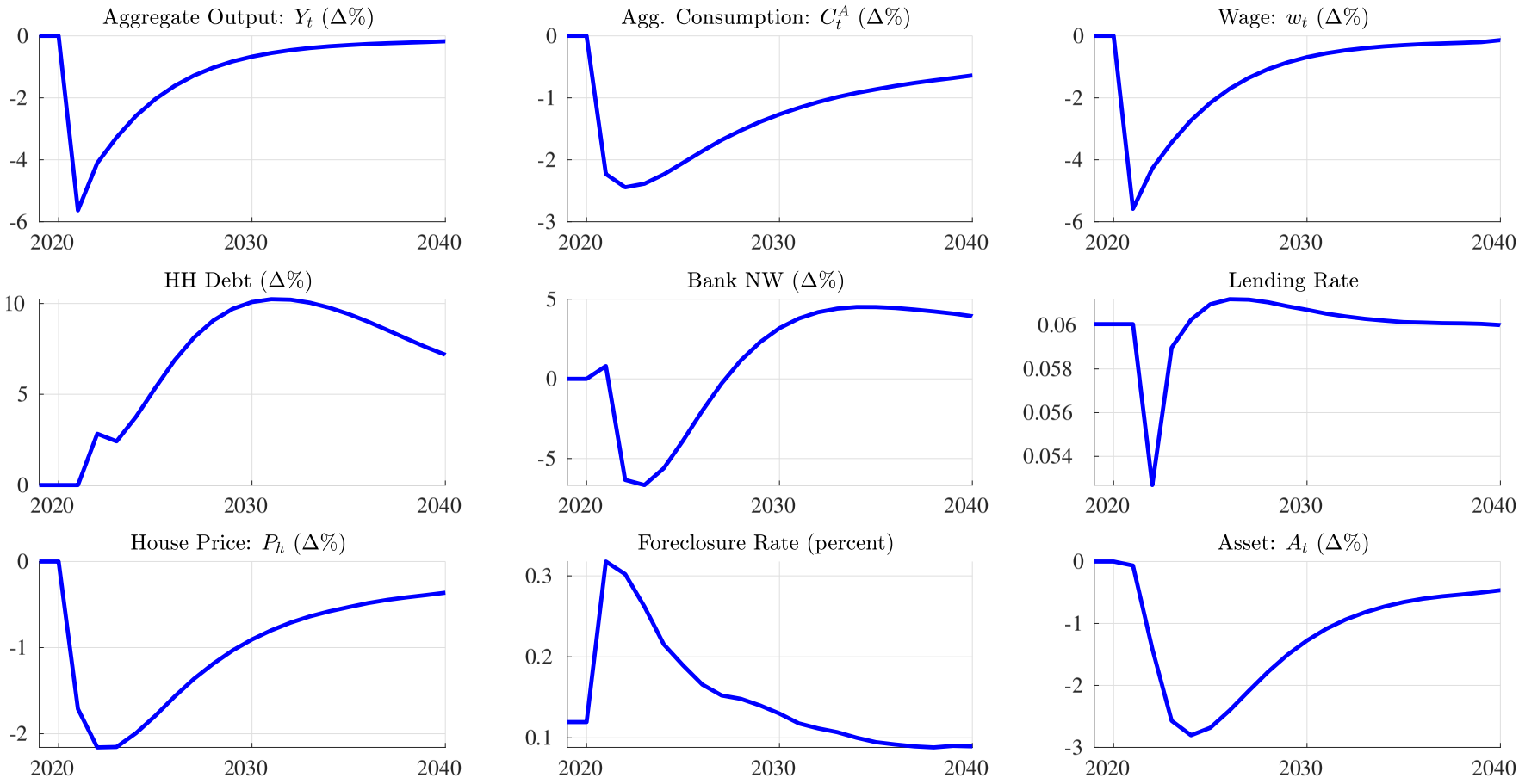
Next, we analyze the implementation of a mortgage debt moratorium policy, modeled after the program introduced in Belgium in 2020. In our framework, the government suspends mortgage payments for one period for borrowers whose cash-in-hand (sum of current assets and income) is less than 60% of average household income at the time of the shock. This threshold is chosen to reflect the actual policy, which restricts eligibility for households with the total movable assets in current and savings accounts and in an investment portfolio to be less than EUR 25,000.[14] Consistent with the real-world policy, the moratorium applies only to existing mortgage holders, and interest continues to accrue on the principal during the suspension period. In the data, 12.6 billion Euros of mortgage debt, which corresponds to 6% of outstanding mortgage debt in Belgium in 2020 was covered by the policy. In the model, this ratio is 7.5%, which closely matches the size of the policy in the data.

Figure 5 compares the evolution of key macroeconomic aggregates with and without the policy intervention. The most immediate effects are observed in mortgage debt and foreclosure rates. By alleviating liquidity constraints, the policy prevents at-risk households from defaulting, thereby reducing foreclosures. This decline in foreclosures mitigates bank losses, as more mortgages remain performing assets on bank balance sheets. As a result, bank net worth increases relative to the benchmark scenario.

The improved financial position of banks leads to a more moderate contraction in credit supply, allowing lending rates to decline more than in the absence of the policy. This

[14] Average household income in Belgium in 2020 was EUR 43,600.

Figure 4: Benchmark Results



The figure displays the response of the aggregate economy to an unexpected 5% drop in aggregate productivity.

reduction in lending rates raises the market value of bank-held assets, further strengthening bank balance sheets and reinforcing the downward pressure on lending rates. Lower borrowing costs help cushion the decline in wages and support household purchasing power. Consequently, aggregate consumption and house prices experience smaller declines under the debt moratorium policy. This suggests that the policy stimulates aggregate demand, while facilitating financial stability.

7.3 Validation: Empirical vs. Model-Implied Elasticities

To facilitate comparison between our empirical estimates and the predictions generated by the quantitative model, we compare the elasticity of consumption with respect to payment suspensions both in the model and the data.

Computation of Elasticity Measures

Elasticity measure provides a scale-free measure of responsiveness that enables an assessment of the model's ability to replicate the observed empirical sensitivity.

Definition: Formally, we define the consumption elasticity as

$$\varepsilon_c = \frac{\frac{\Delta c}{\bar{c}}}{\frac{\Delta m}{\bar{m}}},$$

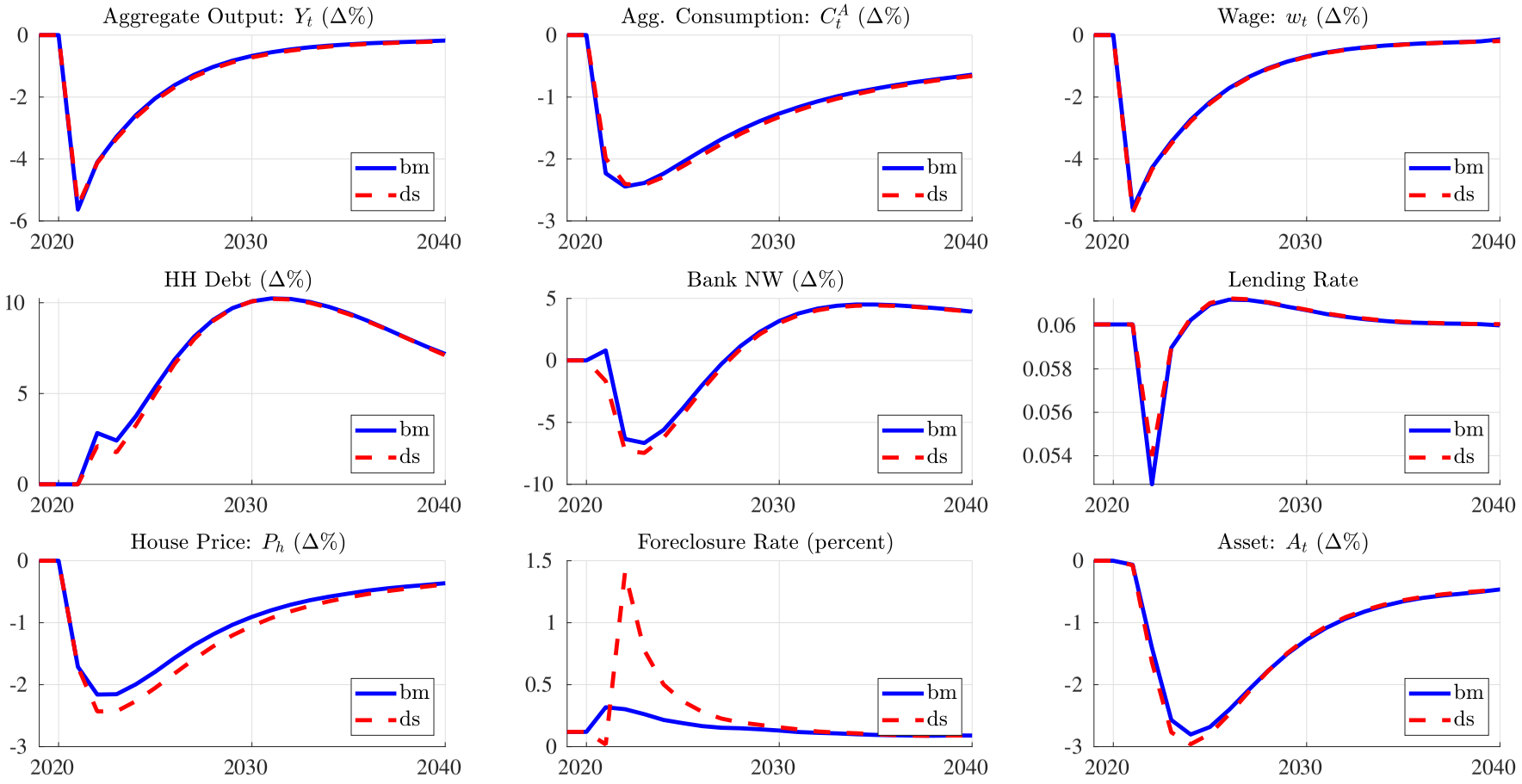
where Δc denotes the average change in nondurable and services spending in the second, third, and fourth quarters of 2020—quarters following the policy intervention—while $\bar{c}$ is baseline consumption. Similarly, Δm denotes the change in mortgage payments induced by the policy, and $\bar{m}$ is the average payment level in 2019. This elasticity captures the percentage change in consumption per one-percent change in mortgage payments.

Empirical elasticity calculation: Using our empirical estimates, we find that a 1% reduction in mortgage payments increases consumption by approximately 0.52%. Specifically, we compute:

$$\varepsilon_c = \frac{\frac{298.15}{7066.49}}{\frac{-231.58}{2844}} = -0.52.$$

Model elasticity calculation: In the quantitative model, we conduct an analogous experiment by simulating two economies that differ only in the presence of the policy

Figure 5: Debt Suspension



The figure compares the responses of the aggregate economy to an unexpected 5% drop in aggregate productivity with and without the debt suspension policy described in the main text. The solid blue line plots the benchmark economy (labeled as "bm") and the dashed red line plots the economy with debt suspension policy (labeled as "ds").

intervention without general equilibrium effects[15]. Then, we compute the elasticity for the mortgage holders who are eligible for the policy by taking the ratio of . This calculation yields

$$\varepsilon_M = -0.11$$

This implies that, within the model, a 1% reduction in borrowing costs increases consumption by approximately 0.11%.

Interpretation: The discrepancy between the data and the model stems from partial repayment by some mortgage holders in the data, reflecting incomplete compliance with the moratorium. In contrast, the quantitative model assumes full compliance, such that mortgage payments fall to zero upon the policy's introduction. Consequently, the true elasticity in the data lies between 4% (298.15/7066.49) and 52%, and the model-implied elasticity falls within this range. These results indicate that the elasticity implied by the model is of a comparable order of magnitude, suggesting that the quantitative framework captures the responsiveness of consumption to payment suspensions reasonably well. Remaining differences can be attributed to simplifications inherent in the model environment or heterogeneity in household responses not captured by the quantitative formulation.

7.4 General Equilibrium Effects

Comparison of the benchmark economy and the economy with the debt suspension includes both partial equilibrium and general equilibrium effects. The empirical evidence we provide in Section 4 measures only the partial equilibrium effects as the effect of the policy on the equilibrium prices will be muted due to the empirical design. As we show in Figure 5, debt suspension policy lowers the drop in house prices and wages, and increases the drop in the lending rate. To highlight the significance of the general equilibrium effects, we solve the economy with debt suspension policy by feeding all the prices (house prices, wages, lending rates, rental prices, capital rental rate) and taxes as in the benchmark economy and solve for the transition.

Figure 6 plots the comparison of the changes in consumption, mortgage debt, financial assets, home-ownership rate and foreclosure rate across the benchmark economy, the economy with debt suspension policy, and the economy with debt suspension policy and benchmark prices. The figures show that general equilibrium effects amplify the effects of the policy. The policy not only has direct effects on household level variables,

[15]To mimic the empirical setup, we run the counterfactual with debt suspension policy by keeping all the prices (house prices, rents, wages, lending rates) as in the benchmark economy

but also mitigates the negatives effects of the policy on consumption, foreclosure and homeownership rates by lowering the decline in house prices and wages.

The consumption in the benchmark model drops by 2.2%. The direct effect of the policy lowers the drop in consumption to 2.1%. However, fully accounting the general equilibrium effects lowers the drop in the consumption to 2.0%. Similarly, foreclosure rate increases by 0.2 percentage point in the benchmark model. The foreclosure rates drop to -0.1 percentage point through its direct and full effects. In conclusion, the full effects of the policy have substantially different effects than the direct partial equilibrium effects of the policy.

Figure 6: General Equilibrium Effects

(a) Consumption (b) Mortgage Debt (c) Financial Assets

(d) Foreclosure Rate (e) Homeownership Rate

The figure plots the comparison of the household responses of consumption, mortgage debt, financial assets, foreclosure and homeownership rates across different economies. In each figure, the left bar shows the response in the benchmark economy. The middle bar shows the response in the economy with debt suspension policy. The right bar shows the response in the economy with debt suspension policy with benchmark prices.

7.5 Heterogeneous Effects of the Policy

While the debt suspension policy alleviates liquidity problems and mitigates the adverse effects of the shock, it has heterogeneous effects across the population. Figures 7 and

8 illustrate these heterogeneous responses for consumption and foreclosure, respectively. The results highlight that the aggregate averages mask substantial variation: vulnerable groups such as renters, young households, and the low-wealth bear the largest burdens from the shock, and they also benefit most from the policy.

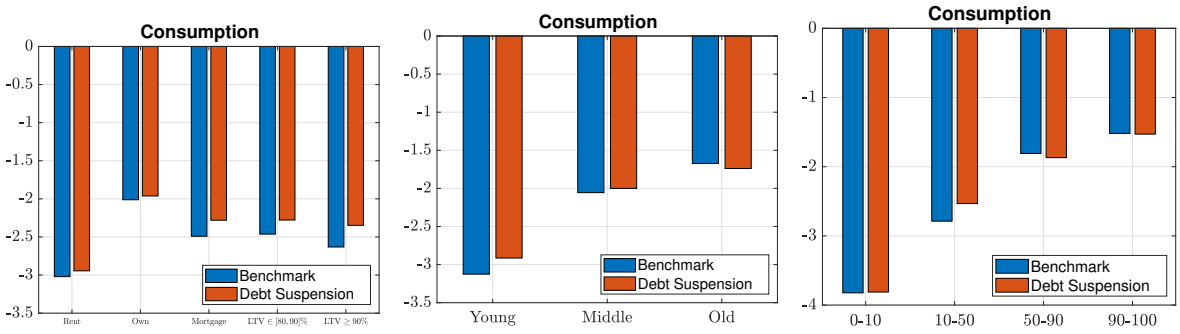
Consumption. Figure 7 plots the heterogeneous consumption responses to the shock and the policy. On average, consumption falls by 2.2%, but this masks considerable heterogeneity.

- *Housing status.* Renters face the sharpest decline (around 3%), followed by mortgage holders (2.5%), while outright owners are less affected (about 2%). Among mortgage holders, those with loan-to-value ratios above 90% experience declines exceeding 2.6%, reflecting acute liquidity constraints. The moratorium has negligible effects on outright owners and almost no effect on renters, but it substantially cushions high-LTV borrowers.

- *Age.* Young households lose over 3% of consumption compared to less than 2% among the old. The policy increases consumption of the young by roughly 0.2%, compared to less than 0.1% for older households.

- *Net worth.* Households in the bottom decile of the wealth distribution experience nearly a 4% drop in consumption, while those in the top decile lose less than 1.5%. The largest gains from the policy accrue to households in the 10–50th percentiles, who are most likely to hold mortgages, whereas benefits for the very poor and the very wealthy are minimal.

Figure 7: Heterogeneity in Consumption Response



(a) Housing Status (b) Age (c) Net Worth

The figures compare the percentage deviation of consumption during the bust period in the economy with debt suspension policy and the benchmark economy across individuals with different characteristics.

Foreclosure. Figure 8 documents the heterogeneous impact of the COVID-19 shock and the mortgage moratorium policy on foreclosure rates.

- *Housing status.* Mortgage holders are the most exposed to foreclosure risk, as they carry debt obligations that may become unsustainable in the face of income shocks. The model

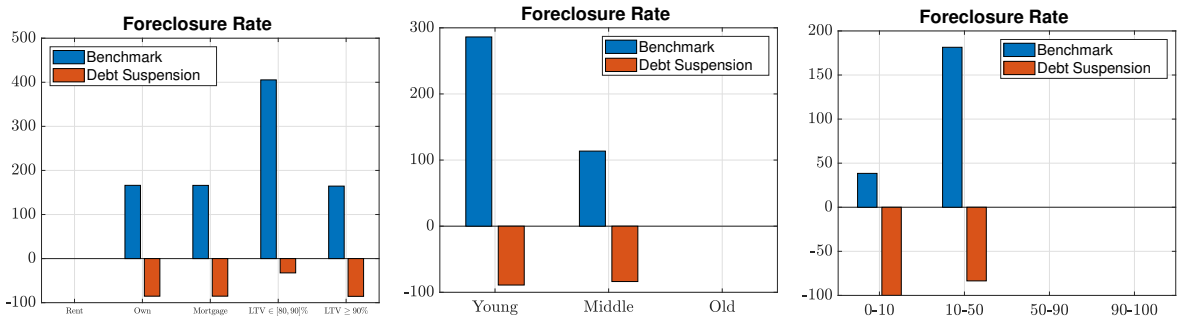
predicts a pronounced increase in foreclosures among these households in the absence of policy. The moratorium sharply reduces foreclosure among mortgage holders, illustrating that the intervention is well-targeted.

- *Age.* Younger households experience the largest increase in foreclosure risk due to limited asset accumulation and high leverage early in life. The policy substantially mitigates this risk for the young, while it has little effect on older households who already have lower debt and more wealth.

- *Net worth.* The steepest increases in foreclosure rates occur among low-wealth households, many of whom hold high-LTV mortgages. The policy significantly dampens this surge, while wealthier households face little foreclosure risk even without intervention.

Taken together, the two figures underscore that the policy's benefits are highly progressive and heterogeneous. Mortgage moratoria do not eliminate risk or fully offset the consumption losses of all households, but they disproportionately protect those most vulnerable: the young, the low-wealth, and households with high-LTV mortgages. By preventing concentrated distress at the bottom of the distribution, the policy enhances both financial stability and aggregate demand. Next, we will study its effects on inequality.

Figure 8: Heterogeneity in Foreclosure Response



(a) Housing Status (b) Age (c) Net Worth

The figures compare the percentage deviation of foreclosure during the bust period in the economy with debt suspension policy and the benchmark economy across individuals with different characteristics.

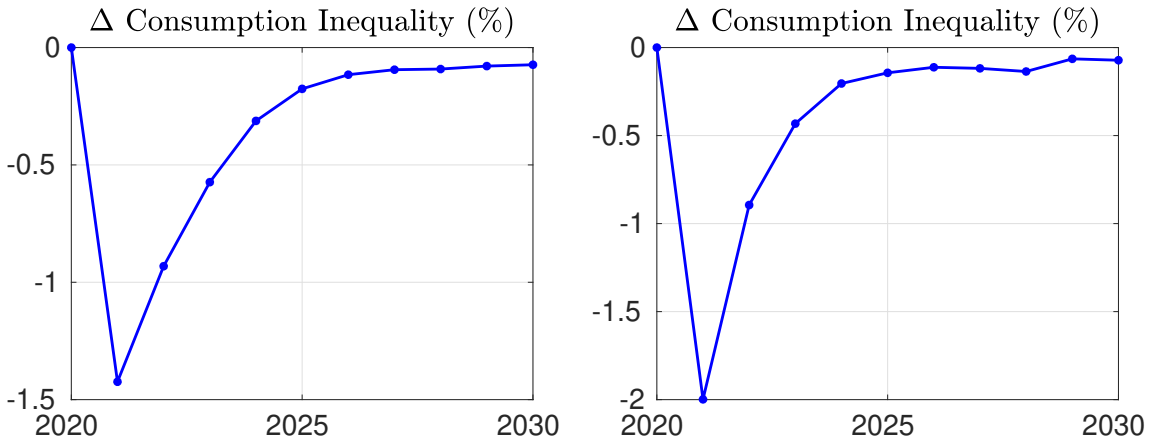
7.6 Inequality

As discussed in Section 4.2, the policy reduces consumption inequality among eligible individuals. To examine this effect within the model, we classify individuals with mortgages exceeding 90% loan-to-value (LTV) in the steady state as "eligible." We then compare

the consumption patterns of this group in both the benchmark economy and the economy with the debt suspension policy.

Figure 9 illustrates the percentage deviation in consumption inequality under the debt suspension policy relative to the benchmark. The left panel shows the variance of consumption, while the right panel presents the 50th-to-10th percentile ratio of the consumption distribution. Both metrics indicate a consistent outcome: the debt suspension policy significantly reduces consumption inequality, particularly at the lower end of the distribution, where its effects are most pronounced.

Figure 9: Consumption Inequality



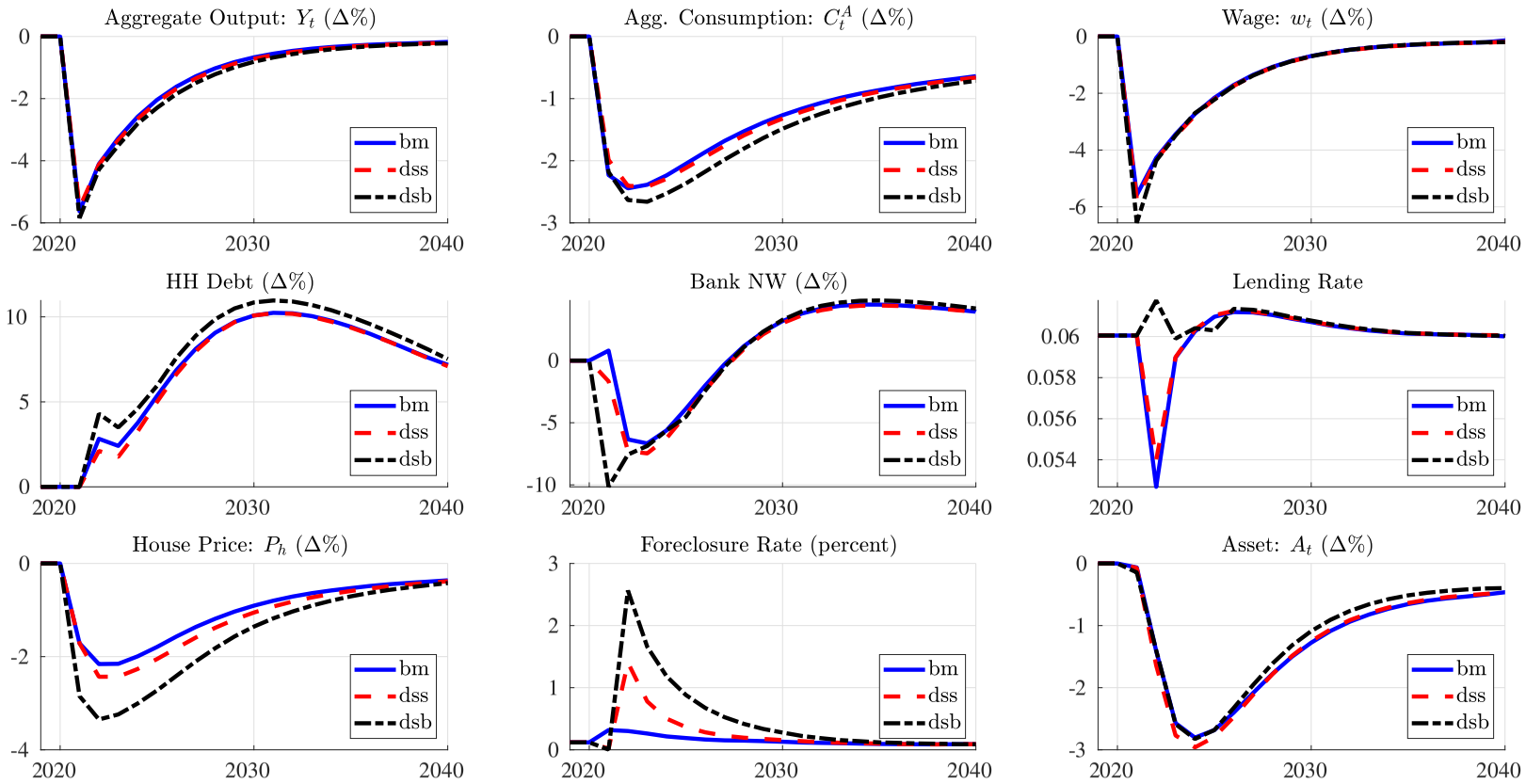
(a) Variance (b) 50/10 Ratio

The figures compare the percentage deviation of the consumption inequality among the distressed individuals (those who have mortgages with more than 90% LTV) in the economy with debt suspension policy compared to the benchmark economy without the policy. Inequality is measured as the variance of consumption on the left and ratio of the 50th to 10th percentile of consumption distribution on the right.

7.7 Counterfactual Policies

Expanding Coverage: The benchmark debt suspension policy is restricted to households with total assets below a specified threshold. Under this criterion, only 6% of households qualify for the policy, and the total amount of mortgage debt covered represents 7.5% of the outstanding mortgage debt. Importantly, the policy incurs no direct fiscal cost, as mortgage interest continues to accrue during the suspension period. Consequently, it imposes no immediate financial burden on any agents in the economy. However, as demonstrated in previous sections, it serves as an effective demand stabilizer, mitigating the adverse effects of the shock.

Figure 10: Policy Comparison



The figure compares the responses of the aggregate economy to an unexpected 5% drop in aggregate productivity with and without the debt suspension policy described in the main text. The solid blue line plots the benchmark economy (labeled as "bm"), the dashed red line plots the economy with benchmark debt suspension policy (labeled as "dss"), long dashed black line plots the economy with alternative debt suspension policy which allows all mortgage holders to qualify.

We now examine a counterfactual policy in which the eligibility criteria are removed, allowing all mortgage holders to benefit. Under this scenario, 95% of mortgage holders receive support, and 91% of the outstanding mortgage debt is covered by the policy[16].

As shown in Figure 10, expanding the coverage has adverse effects on the economy. The positive impacts on output and consumption observed under the benchmark policy are reversed. This negative outcome is primarily driven by the deterioration of banks' balance sheets. The decline in bank net worth leads to higher lending rates, which in turn increase production costs and reduce wages, while also raising borrowing costs for households. These combined effects suppress consumption and housing demand, ultimately resulting in lower house prices and reduced consumption.

Policy Duration While the benchmark debt suspension policy is short-lived, it still generates significant positive effects on the aggregate economy. A natural question arises: does extending the duration of the policy amplify its benefits?

To explore this, we consider two extended versions of the debt suspension policy: one lasting two periods and another lasting four periods. Figure 11 presents the comparative results. Extending the policy to two periods yields only marginal additional benefits. However, a four-period extension reverses the policy's positive effects. As with the alternative policies discussed earlier, a prolonged suspension period significantly weakens bank balance sheets, leading to a contraction in credit supply. This credit tightening results in lower wages and reduced housing demand, which in turn depresses aggregate consumption and house prices. Thus, a policy intended to stimulate the economy ends up amplifying the negative effects of the initial shock.

7.8 Discussion of the Quantitative Results

Our findings suggest that mortgage moratoria can be effective tools for stabilizing demand and mitigating the adverse effects of economic shocks. However, this raises an important question: if such policies are beneficial, why are they not more widely implemented?

One plausible explanation lies in concerns about moral hazard. A key limitation of our analysis is that the mortgage moratorium is modeled as an unexpected, one-time intervention. Agents in the economy do not anticipate the policy, and therefore do not adjust their behavior in advance. In reality, if households and banks expect such policies to

[16]Households that pay off their mortgage debt—either by selling their homes or defaulting—do not benefit from the policy.

be implemented in future downturns, their behavior could change in ways that our model does not capture—potentially leading to riskier borrowing or lending practices.

Despite this limitation, our analysis highlights important dynamics arising from the interaction between household and bank balance sheets. As demonstrated through the counterfactual scenarios, the positive effects of debt suspension policies on households can be offset—or even reversed—by their negative impact on banks. This underscores the importance of considering the broader financial system when designing and evaluating stabilization policies.

8 Conclusions

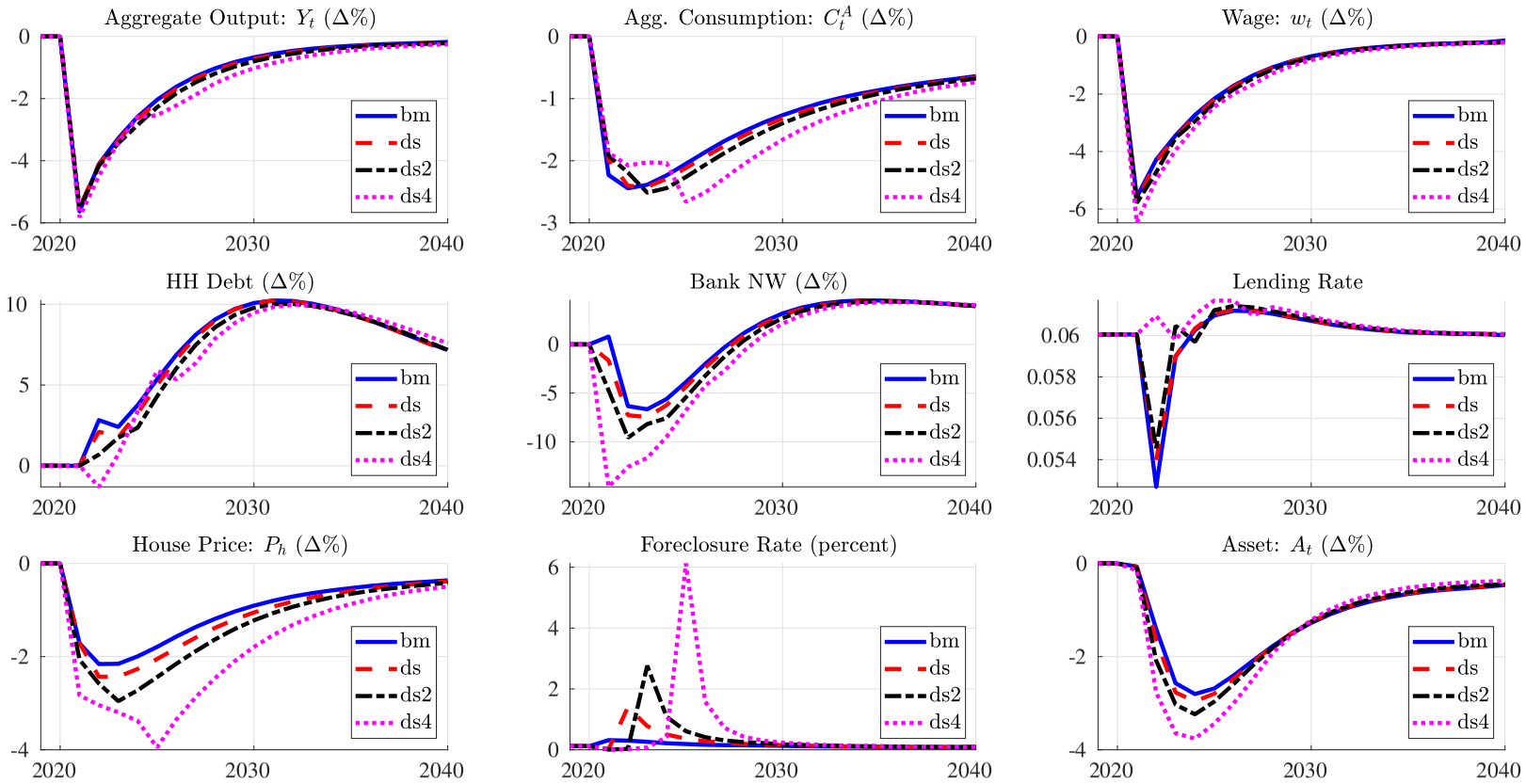
We study the macroeconomic and distributional effects of a large-scale mortgage moratorium introduced during the COVID-19 crisis in Belgium. Using high-frequency credit and transaction data from the country's largest bank, and exploiting a sharp eligibility cutoff based on delinquency status, we identify the causal effect of payment suspension on household behavior. Eligible borrowers reduced their mortgage payments, and exhibited a delayed but sustained increase in consumption—particularly on services—once pandemic-related restrictions eased.

Importantly, we document that eligibility for the moratorium muted the rise in income and consumption inequality during the crisis, highlighting the potential of debt relief to serve as a redistributive instrument even in the absence of full policy take-up. These effects are concentrated among financially constrained and low-wealth households.

To assess the broader implications of such a policy, we develop a heterogeneous-agent general equilibrium model with long-term, defaultable mortgages and income risk. The model replicates the empirical response of consumption to mortgage relief and reveals that general equilibrium feedback—through housing markets, wages, and bank balance sheets—significantly amplifies the effects. Mortgage moratoria not only stabilize household balance sheets but also reduce foreclosures, mitigate declines in house prices, and support aggregate demand, all without direct fiscal transfers. However, broad coverage dilutes these benefits by weakening banks' balance sheets and reducing consumption.

Taken together, our findings show that mortgage moratoria can act as powerful, fiscally neutral macro-stabilizers. By reallocating liquidity across time and households without increasing public debt, they offer a targeted and timely policy instrument for responding to large adverse shocks. These findings suggest that in future crises, policymakers can consider moratoria as a fiscally neutral complement to standard fiscal and monetary tools.

Figure 11: Debt Suspension Duration



The figure compares the responses of the aggregate economy to an unexpected 5% drop in aggregate productivity with and without the debt suspension policy described in the main text. The solid blue line plots the benchmark economy (labeled as "bm"), the dashed red line plots the economy with one period debt suspension policy (labeled as "ds"), long dashed black line plots the economy with two periods debt suspension policy (labeled as "ds2"), and dotted pink line plots the economy with four periods debt suspension policy (labeled as "ds4").

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Appendix A Household Pre-policy Financial and Demographic Characteristics

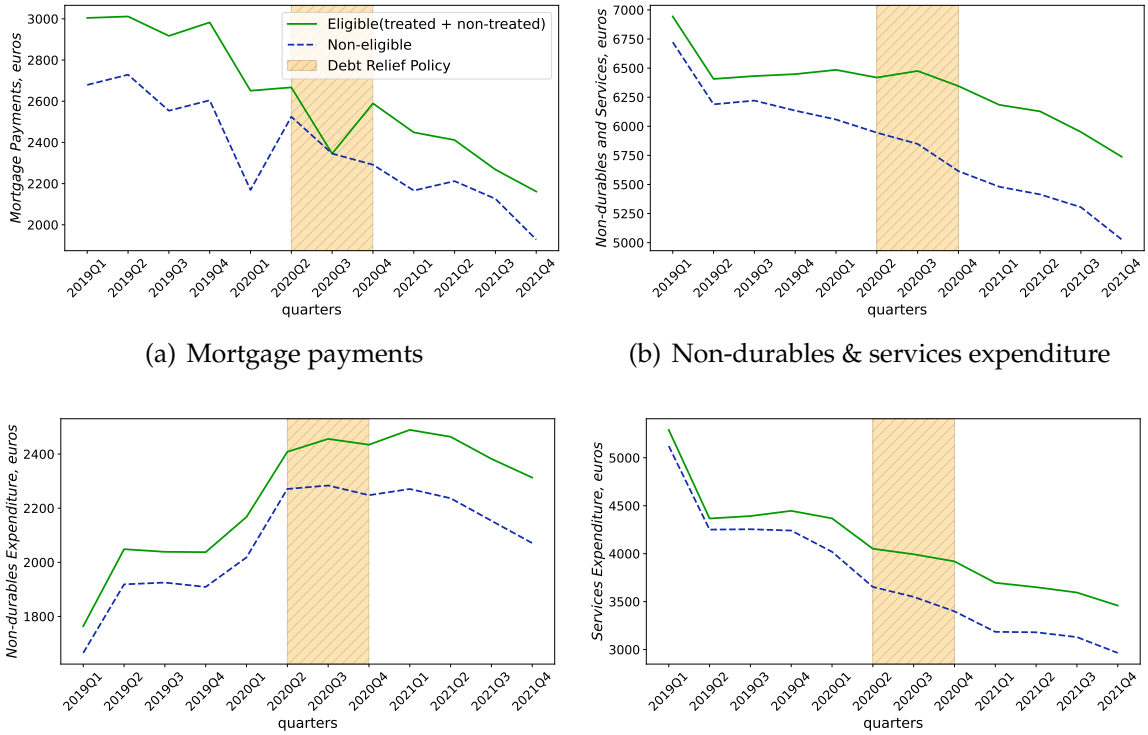
Table A1: Summary Statistics

	Eligible						Non-eligible						
	Mean	Std. Dev.	p^{25}	p^{50}	p^{75}	No. obs.	Mean	Std. Dev.	p^{25}	p^{50}	p^{75}	No. obs.	t-stats of Δ
Expenditure													
Non-durables & services	7254.56	8314.71	2486.98	5590.11	8603.09	873	6630.20	5205.68	3259.20	5125.90	8368.89	342	1.56
Non-durables	2382.7	3005.02	980.58	1868.80	2945.11	873	2081.10	190116	921.55	1679.75	2754.60	342	1.68
Services	4871.85	7257.38	1772.39	3415.14	5918.00	873	4549.57	4824.85	1601.35	3118.38	5576.76	342	1.65
Cash Withdrawal	1211.85	2306.97	16.18	574.67	1479.59	873	1084. 23	1458.025	107.07	574.27	1351.57	342	1.14
Personal Account													
Savings account balance	3753.91	6228.45	0.31	97.30	1845.18	871	4435.17	6434.39	0.1	54.02	1598	342	-0.26
Total saving balance	5082.05	21386.06	111.27	833.35	3779.39	871	4749.50	186945.06	254.92	886.30	3189.33	342	0.53
Income													
Income	8888.85	7490.20	3602.77	8083.50	12372.60	873	8135.86	6133.27	3580.46	7664.63	11647.69	342	1.8
Demographic													
Household size	2.23	1.13	1	2	3	844	2.28	1.19	1	2	3	328	-0.52
Oldest age	44.53	9.57	38	44	51	844	44.99	9.81	38	45	52	342	-0.69
Wallonia region	0.26	0.44	0	0	1	844	0.25	0.43	0	0	1	328	0.35

Authors' calculations. Characteristics of households in the eligible and non-eligible group, measured in 2019Q4. All variables are adjusted to CPI inflation. Variable *Oldest age* corresponds to the age of the oldest member in the household. The variable *Wallonia region* represents a fraction of households living in the Wallonia region. The last column presents the results of independent samples t-statistics measuring the statistical significance of means. T-critical value at 5% significance level equals 1.96.

Appendix B Trends in Mortgage Payments, Consumption

Figure B1: Evolution of average mortgage payments, savings balance and consumption expenditure in euros



(a) Mortgage payments

(b) Non-durables & services expenditure

(c) Non-durable goods spending

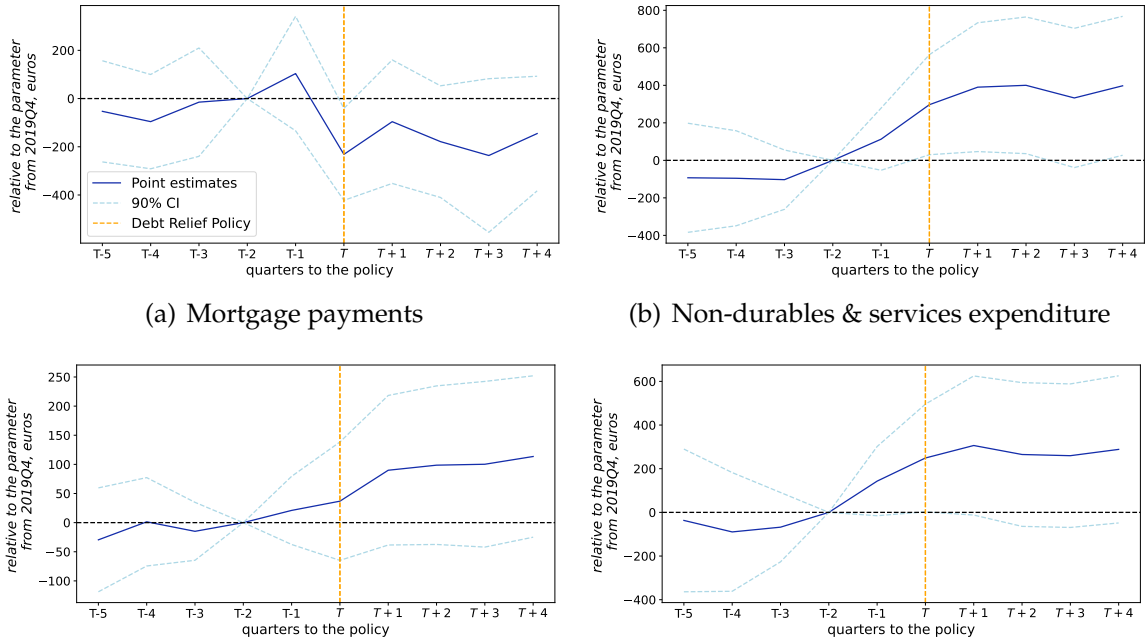
(d) Services

Authors' calculations. The charts present comparison of trends of quarterly average mortgage payment in euros and consumption expenditures between eligible and noneligible borrowers between 2019Q1-2021Q4. All variables are expressed in euros deflated by CPI index. Consumption expenditures are calculated as the 6-month moving average. Mortgage payments refer to the quarterly payments on debt that originated before the policy implementation.

Appendix C Parallel Trend Assumption

The charts display the estimated coefficients from equation 1 across all periods. The last quarter of 2019 is used as the baseline period, instead of 2020Q1, to avoid any confounding effects related to the onset of the COVID-19 pandemic. For all outcome variables, there are no statistically significant coefficients prior to the policy implementation, suggesting no meaningful differences between eligible and non-eligible borrowers before the intervention. This supports the validity of the parallel trends assumption.

Figure C2: The ITT effects of mortgage moratoria



(a) Mortgage payments

(b) Non-durables & services expenditure

(c) Non-durable goods spending

(d) Services

Authors' calculations. All variables are expressed in euros deflated by the CPI index. Consumption expenditures are calculated as the 6-month moving average.

Appendix D Quarterly Breakdown of Intention-to-Treat Results

Table D2 presents a breakdown of the estimated intention-to-treat effects from the main analysis. Quantitatively, the results are robust and consistent with those reported in Table 1 in Section 4.

Table D2: Estimated Intention-to-Treat Effects of Moratoria Policy

	Mortgage Payments	**Nondurables& Services**	**Nondurables**	**Services**
ITT_{2020Q1}	103.67	112.84	20.97	143.12
	(144.28)	(100.72)	(35.45)	(96.31)
$ITT_{2020Q2\&Q3}$	-307.12**	236.65	26.20	122.54
	(121.42)	(159.79)	(62.50)	(1146.14)
ITT_{2020Q4}	-80.50	417.13**	58.06	193.28*
	(142.62)	(187.83)	(70.42)	(108.24)
ITT_{2021Q1}	-95.91	390.18*	89.93	186.13
	(155.74)	(208.77)	(78.03)	(115.93)
Time FE	Yes	Yes	Yes	Yes
HHs FE	Yes	Yes	Yes	Yes
Households	1215	1215	1215	1215

Authors' calculations. The estimated parameters represent the effect of the moratorium policy on mortgage payments and household spending between 2019Q1-2021Q4. Authors' calculations. 2019Q4 is the reference period not affected by policy and Covid-19 pandemic. The rest of the parameters for 2021 are omitted for clarity. All variables are in euros deflated by the CPI index. Consumption expenditures are calculated as a 6-month moving average. Mortgage payments refer to quarterly payments on existing loans originated before the policy. All columns control for households and time-fixed effects. Standard errors, clustered at the household level, are in brackets. Asterisks indicate significance levels: *.1, **.05, ***.01.* ∗ ∗.01.

Appendix E Event Analysis: Did Banks Take the Policy as One-time

Table E3 presents the results of our analysis investigating whether banks/market perceived the moratoria policy as a one-time intervention or priced in the risk of recurrence. If the policy were anticipated to recur, we would expect the announcement to significantly alter interest rates, maturities, or loan amounts to reflect this new risk. The table shows the movement of these key variables in the one-week and two-week windows surrounding the March 22nd policy announcement. The T-test results provide no statistical evidence that banks repriced loan rates, adjusted mortgage amounts, or altered maturity terms following the moratoria's introduction. We find no repricing around the announcement, consistent with banks treating the policy as a one-off intervention.

Table E3: Summary Statistics and Balance Tests for Event Studies

	1 week window			2 weeks window		
Variable	Control	Treated	T-test	Control	Treated	T-test
			Interest Rate			
Mean	1.31	1.48		1.30	1.40	
Std. Dev.	0.38	0.49		0.38	0.38	
N	38	25		85	52	
T-test (p-value)			0.129			0.115
			Maturity			
Mean	11.93	11.95		12.23	11.59	
Std. Dev.	5.14	6.46		5.48	5.80	
N	38	25		85	52	
T-test (p-value)			0.987			0.354
			Loan Amount			
Mean	172,008	120,080		160,604	100,848	
Std. Dev.	271,982	168,997		221,345	128,924	
N	38	25		85	52	
T-test (p-value)			0.398			0.071

Notes: This table presents descriptive statistics and Welch's two-sample t-test results for the variables used in two separate event studies. Control group represents the pre-moratoria, and Treated represents the post-moratoria. The null hypothesis for the t-tests is that the means between the two groups are equal.

Appendix F Estimates Eligible Non-treated Borrowers vs. Non-eligible

This exercise aims to disentangle the effect of the main results. The estimations in the table are re-run, excluding very few households that participated in the debt suspension. We show that the effect from the main results is mostly driven by eligible non-treated households.

Table F4: Estimated Intention-to-Treat Effects of Moratoria Policy

	Mortgage Payments	Services & Non-durables	Non-durables	Services
ITT^{T-1}_{2020Q1}	-96.566	105.26	12.27	66.21
	(145.46)	(101.70)	(35.72)	(83.18)
$ITT^{T}_{2020Q2\&3}$	-217.91*	214.46	10.74	152.46
	(121.64)	(161.33)	(63.19)	(133.38)
ITT^{T+1}_{2020Q4}	-68.07	393.01**	49.32	295.15*
	(143.98)	(188.81)	(71.36)	(156.82)
ITT^{T+2}_{2021Q1}	-96.44	374.96*	82.37	289.55*
	(157.11)	(210.51)	(79.21)	(165.67)
ITT^{T+3}_{2021Q2}	-192.54	393.37*	91.47	263.64
	(142.04)	(223.22)	(83.66)	(175.00)
ITT^{T+4}_{2021Q3}	-160.24	329.00	91.59	243.78
	(194.91)	(227.94)	(887.41)	(178.21)
Time FE	Yes	Yes	Yes	Yes
HHs FE	Yes	Yes	Yes	Yes
Households	1173	1173	1173	1173

Authors' calculations. The estimated parameters represent the effect of the moratorium policy on mortgage payments and household spending between 2019Q1–2021Q4. The rest of the coefficients are omitted intentionally for clarity. 2019Q4 is the reference period not affected by policy and Covid-19 pandemic. All variables are in euros deflated by the CPI index. Consumption expenditures are calculated as a 6-month moving average. Mortgage payments refer to quarterly payments on existing loans originated before the policy. All columns control for households and time-fixed effects. Standard errors, clustered at the household level, are in brackets. Asterisks indicate significance levels: *.1, **.05, ***.01.

Appendix G Household Value Functions

Appendix G.1 Active Renters

An active renter has two choices: to continue to rent or purchase a house, that is, $V^r = \max\left\{V^{rr}, V^{rh}\right\}$ where V^{rr} is the value function if she decides to continue renting and V^{rh} is the value function if she decides to purchase a house. If she decides to continue to rent, she chooses rental unit size s at price p_r per unit, makes her consumption and saving choices, and remains as an active renter in the next period. After purchasing a house, she begins the next period as a homeowner. The value function of an active renter who decides to remain as a renter is given by

$$V^{rr}_j(\omega, z) = \max_{c,s,a' \geq 0} \left\{ u(c,s) + \beta E V^r_{j+1}(\omega', z') \right\} \tag{G1}$$

subject to

$$\begin{aligned} c + a' + p_r s &= \omega \\ \omega' &= w'(1-\tau)\, y(j+1, z') + a'\left(1 + r_k'\right), \end{aligned}$$

where ω is the beginning-of-period cash-on-hand, $p_r s$ is the rental payment, r_k is the return to savings, and w is the wage rate per efficiency unit of labor. The expectation operator is over the income shock z'.

Appendix G.2 Inactive Renters

Inactive renters are not allowed to purchase a house because of their default in previous periods. However, they can become active renters with probability π. Since they cannot buy a house, they only make rental size, consumption, and saving decisions. The value function of an inactive renter is given by

$$V_j^e(\omega, z) = \max_{c,s,a' \geq 0} \left\{ u(c,s) + \beta \left[\pi E V_{j+1}^r(\omega', z') + (1-\pi) E V_{j+1}^i(\omega', z') \right] \right\} \tag{G2}$$

subject to

$$\begin{aligned} c + a' + p_r s &= \omega \\ \omega' &= w'(1-\tau)\, y(j+1, z') + a'\left(1 + r_k'\right) \end{aligned}$$

Appendix G.3 Homeowners

The options of a homeowner are: 1) stay as a homeowner, 2) refinance, 3) sell the current house (become a renter or buy a new house), or 4) default. The value function of an owner is given as the maximum of these four options, that is, $V^h = \max\left\{V^{hh}, V^{hf}, V^{hr}, V^{he}\right\}$, where V^{hh} is the value of staying as a homeowner, V^{hf} is the value of refinancing, V^{hr} is the value of selling, and V^{he} is the value of defaulting (being excluded from the ownership option). A stayer makes a consumption and saving decision given his income shock, housing, mortgage debt, and assets. Therefore, the problem of the stayer can be formulated as follows:

$$V_j^{hh}(\omega, h, d, z) = \max_{c,\omega' \geq 0} \left\{ u(c,h) + \beta E V_{j+1}^h\left(\omega', h, d', z'\right) \right\} \tag{G3}$$

subject to

$$\begin{aligned} c + \delta_h p_h h + a' + m &= \omega \\ \omega' &= w'(1-\tau)\, y(j+1, z') + a'\left(1 + r_k'\right) \\ d' &= (d-m)\left(1 + r^*\right) \end{aligned}$$

where m is the mortgage payment following the amortization schedule determined in equation 3.

The second choice for the homeowner is to refinance, which also includes prepayment. Refinancing requires paying the full balance of any existing debt and getting a new mortgage. We assume that refinancing is subject to the same transaction costs as new mortgage originations. So, we can formulate the problem of a refinancer as

$$V_j^{hf}(\omega, h, d, z) = \max_{c,d',a' \geq 0} \left\{ u(c,h) + \beta_i E V_{j+1}^h(\omega', h, d', z') \right\} \tag{G4}$$

subject to

$$\begin{aligned} c + d + \delta_h p_h h + \varphi_f + a' &= \omega + d' \left(q^m(d'; a', h, z, j) - \varphi_m \right) \\ \omega' &= w' (1-\tau) y(j+1, z') + a' \left(1 + r_k'\right) \\ d' &\leq p_h h (1 - \varrho) . \end{aligned}$$

The third choice for the homeowner is to sell the current house and either stay as a renter or buy a new house. Selling a house is subject to a transaction cost that equals fraction φ_s of the selling price. Moreover, a seller has to pay the outstanding mortgage debt, d, in full to the lender. A seller, upon selling the house, can either rent a house or buy a new one. Her problem is identical to a renter's problem. So, we have

$$V_j^{hr}(\omega, h, d, z) = V_j^r(\omega + p_h h(1 - \varphi_s) - d, z) .$$

The fourth possible choice for a homeowner is to default on the mortgage, if she has one. A defaulter has no obligation to the bank. The bank seizes the house, sells it on the market, and returns any positive amount from the sale of the house, net of the outstanding mortgage debt and transaction costs, back to the defaulter. For the lender, the sale price of the house is assumed to be $(1 - \varphi_e) p_h h$. Therefore, the defaulter receives $\max\{(1 - \varphi_e) p_h h - d, 0\}$ from the lender. The defaulter starts the next period as an active renter with probability π. With probability $(1 - \pi)$, she stays as an inactive renter. The problem of a defaulter becomes the following:

$$V_j^h(\omega, d, z) = \max_{c,s,a' \geq 0} \left\{ u(c,s) + \beta_i E \left[\pi V_{j+1}^r(\omega', z') + (1-\pi) V_{j+1}^i(\omega', z') \right] \right\} \tag{G5}$$

subject to

$$\begin{aligned} c + a' + p_r s &= \omega + \max\{(1 - \varphi_e) p_h h - d, 0\} \\ \omega' &= w' (1-\tau) y(j+1, z') + a' \left(1 + r_k'\right) \end{aligned}$$

The problem of a defaulter is different from the problem of a seller in two ways. First, the defaulter receives $\max\{(1 - \varphi_e) p_h h - d, 0\}$ from the housing transaction, whereas a seller receives $(1 - \varphi_s) p_h h - d$. We assume that the default cost is higher than the sale transaction cost, that is, $\varphi_e > \varphi_s$, the defaulter receives less than the seller as long as $(1 - \varphi_s) p_h h - d \geq 0$ (i.e., the home equity net of the transaction costs for the homeowner is

positive). Second, a defaulter does not have access to the mortgage in the next period with some probability. Such an exclusion lowers the continuation utility for a defaulter. In sum, since defaulting is costly, a homeowner will choose to sell the house instead of defaulting as long as $(1 - \varphi_s)\, p_h h - d \geq 0$ (i.e., net home equity is positive). Hence, negative equity is a necessary, but not sufficient, condition for default in the model. Therefore, in equilibrium, a defaulter gets nothing from the lender.