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The uneven economic consequences of COVID-19: A structural analysis

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Introduction

The COVID-19 pandemic led to major economic adjustments, including an unprecedented temporary shutdown of parts of the economy and drastically increased unemployment, especially among young workers. To reduce this dramatic impact, the federal government increased transfers to affected households and firms. Meanwhile, the monetary policy rate reached the effective lower bound (ELB), and the Bank of Canada implemented unconventional measures. In this note we address two questions.

First, in terms of unevenness of unemployment, how unusual was the COVID-19 recession's impact on the macroeconomy and on consumption inequality and household vulnerabilities? We show that the unemployment rate was higher in the second and third quarters of 2020, especially among the younger cohort,[1] when compared with an average past recession.[2] However, starting in the fourth quarter 2020, the unemployment rates for the two age groups we study (younger than 35 and older than 35) are not significantly different from levels seen in previous recessions when controlling for the recession's size. Next, we use a structural model to show that this extra concentration of unemployment in younger households amplifies the overall economic consequences of the pandemic in terms of reduced output and consumption. This is because younger households are more likely to have limited access to (additional) credit and thus to cut consumption more in response to unemployment shocks. As a result, the extra rise in unemployment also temporarily increases consumption inequality and household vulnerabilities.

Second, what were the consequences of government initiatives and monetary policy actions overall and at the individual level? Using the model, we show that different fiscal and regulatory policy responses stimulate the economy and reduce consumption inequality and medium-term household vulnerabilities. Finally, we compare the base case where the ELB is binding with a scenario where the policy rate is not constrained from going negative. This would lead to more monetary stimulus, implying higher inflation, a smaller decline in output, less consumption inequality and lower household vulnerabilities in the medium term. However, the amount of debt issued to new homebuyers increases in the short term.

A COVID-19 scenario with economically diverse households

A structural model with economically diverse households

To study the interactions between the economy as a whole, economically diverse households and various government policies (fiscal, monetary and regulatory), we use the structural model of Kuncl and Ueberfeldt (2021). The uneven impact of the COVID-19 shock makes

[1] We define younger cohort as younger than 35 years of age and older cohort as older than 35 year of age.

[2] We use a simple econometric model to make the average recession comparable with the current recession in terms of the decline in output.

standard New Keynesian models with their limited levels of economic diversity among households less suited to this task. Our model features a rich household sector in an otherwise standard New Keynesian framework with sticky prices, sticky wages and capital. Households in the model have a finite life expectancy and have different levels of income, wealth and homeownership. After joining the labour force, typical households work, consume and save for a down payment on a house. When they have enough savings, they borrow through a mortgage to finance the house purchase, leaving them with debt. Over time they repay the mortgage, become net savers and eventually retire. Throughout their lifetime, households face idiosyncratic unemployment and mortality risks. These differences imply that households respond differently to shocks. Households at or close to their borrowing limit have higher marginal propensities to consume (MPCs) out of transitory income than households with easy access to funds. Our model includes two household types with higher MPCs: young households entering the labour force and homeowners with high debt and no access to home equity.

The following features of the model are relevant when studying the economic implications of a shock like COVID-19:

- The effects of higher unemployment can disproportionately affect young and poor households.
- Young households are more likely to have limited access to (additional) credit and thus to adjust consumption more in response to spells of unemployment and government transfers. The uneven distribution of the shock across households therefore has aggregate implications.
- We can study the transmission of monetary policy thanks to the standard New Keynesian modelling framework.

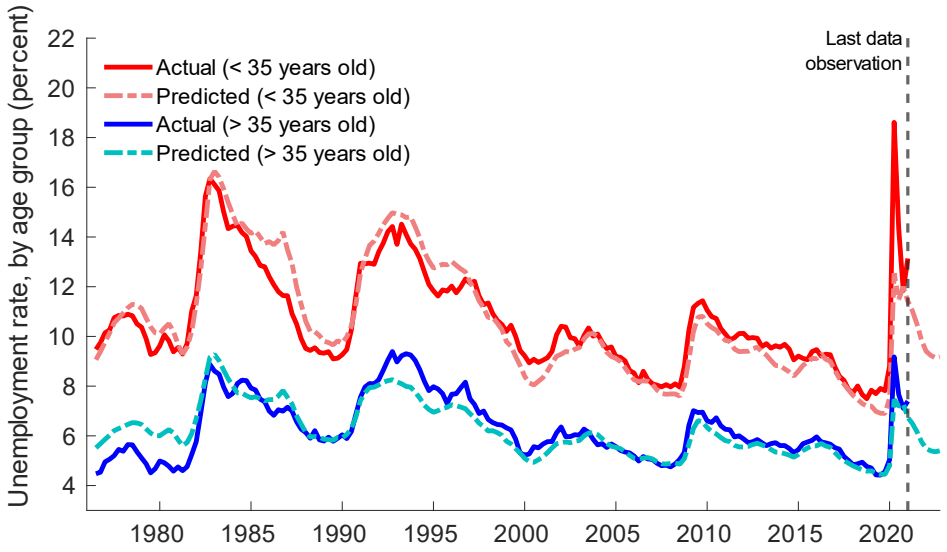
The COVID-19 scenario and policy responses

We implement the COVID-19 scenario in three steps. First, we introduce a greater likelihood of transition to unemployment to match the unemployment rate developments observed until the first quarter of 2021 and during past recessions. Importantly, the shock to unemployment is implemented unevenly, hitting younger and poorer households harder. This reflects the discrepancy in unemployment rates along the age and wealth distribution observed in the data and directly creates heterogeneity in the economic consequences of our COVID-19-style shock.

The unemployment rate of our younger (older) cohort matches the unemployment rate of the cohort below (above) 35 years of age reported in Statistics Canada's Labour Force Survey. For the period starting in the second quarter of 2021, we extend these series using the path from a simple regression model. The regression model estimates unemployment rates by age while controlling for the business cycle for the years 1976 to 2019. The model suggests that these rates were higher in the second and third quarters of 2020 than in a normal recession,

especially for the young. This fast increase in the unemployment rate is associated with the sudden shutdown of entire sectors of the economy, some of which are the largest employers of young Canadians.[3] But starting in the fourth quarter of 2020, the unemployment rates for both age groups are not significantly different from levels seen in previous recessions when controlling for recession size (**Chart 1**). Thus, using the model to project future unemployment rates by age group seems justified.

Chart 1: The young were more affected by unemployment, especially in 2020Q2–Q3 when unemployment rates were dramatically higher than they were in a recession of a similar size



Note: The dashed lines represent the fitted values from the regression.
Source: Statistics Canada Last observation: 2021Q1

Second, we explicitly model the impact of several important policy initiatives. For the Canada Emergency Response Benefit (CERB) and enhanced employment insurance (EI), we increase the unemployment benefits in the model. For the government-encouraged mortgage deferral program, we relax households' borrowing constraints.[4] We also match the increase in government deficits. Monetary policy rates in the base case follow a Taylor rule. To capture the effects of the policy rate at the ELB, we restrict the policy rate to remain at or above the ELB using monetary policy shocks.[5] Our base case does not consider unconventional monetary policy responses, but later we compare the base case with a scenario where policy rate changes are not limited by the ELB. **Table 1** summarizes some of the relevant economic

[3] Retail trade and accommodation and food services, which were among the hardest-hit sectors, are the two largest employers of Canadians younger than 35 years. Employment in these sectors has partially recovered, as businesses found ways to adapt to physical distancing limitations (e.g., curbside pickups and deliveries).

[4] See also MacGee, Pugh and See (2020) for an analysis of the impact of CERB on household consumption, and Bilyk et al. (2020) for the projection of the effects of CERB and mortgage deferrals on the financial health of the household sector.

[5] This approach does not allow for the non-linear amplification effects associated with a binding ELB. So, the results shown can be seen as an upper bound.

policies implemented in response to COVID-19 and provides detail on which aspects of these policies the model captures and how it does this.

Finally, using demand and supply shocks, we match the output and inflation data for the first three quarters of 2020 and the projections in the January 2021 *Monetary Policy Report* (Bank of Canada 2021) for the period from the fourth quarter of 2020 to the second quarter of 2021.[6]

Table 1: Understanding the COVID-19 scenario

	Economic impact	How was it included?	What is missing?
Explicitly included			
Monetary policy stimulus	Positive implications for income, inflation and output	Monetary policy stimulus subject to the effective lower bound is part of the endogenous model response.	Quantitative easing and forward guidance
Canada Emergency Response Benefit (CERB) and enhanced Employment Insurance (EI)	Income support to households	The EI replacement rate within the model is increased.	Heterogeneous impact of CERB and enhanced EI within the group of unemployed households
Mortgage deferral	Positive effect on consumption and no defaults in the short term	Homeowners can take out a home equity line of credit equal to the amount of their mortgage payments.	
Government debt	Crowding out of private debt, higher taxes in the future	The government runs a deficit to finance the implementation of CERB and other programs.	
Implicitly included by matching the projection of the aggregates			
Partial lockdown	Some sectors could not operate; unemployment rate increased	The lockdown is reflected in the heterogeneous shock to the probability of becoming unemployed that fits micro unemployment data and in matching gross domestic product.	Differential firm sector effect
Canada Emergency Wage Subsidy (CEWS)	Positive effects on employment, consumption and output	CEWS is implicitly included in the output, inflation and unemployment rate responses.	Structural role for the program

[6] See Huynh et al. (2020) for an alternative measure of CPI inflation that reflects changing consumption baskets during the pandemic, which we abstract from in this analysis.

Dissecting the COVID-19 scenario

Uneven impact on households amplifies overall economic response

Our COVID-19 scenario matches the negative response of output and inflation over the period from the first quarter of 2020 to the first quarter of 2021, as reported in the January MPR (Bank of Canada 2021), and the uneven unemployment impact across age groups from the Labour Force Survey during past recessions.[7] This triggers endogenous responses in the model. To counteract the downturn, the policy rate falls drastically and becomes constrained by the ELB (**Chart 2**). Nevertheless, the recession generates a large negative impact on consumption and labour supply. The shock also implies an increase in household vulnerabilities, measured by the rise in the amount of debt issued to new homebuyers and the share of the population with a high debt-to-income (DTI) ratio.[8] Consumption inequality, measured by the Gini coefficient, increases in the first half of 2020 due to higher unemployment rates. Later, consumption inequality decreases as the impact of higher unemployment rates is offset by government policy initiatives and the effect of a persistent negative demand shock. The latter shock makes unconstrained households, who on average have relatively higher levels of consumption, save more and consume less, thus reducing consumption inequality (**Chart 3**).

The uneven nature of the lockdown shock amplifies the recession and slows the recovery

As mentioned, young and poor households were disproportionately affected by the pandemic. They were more likely to face unemployment and rely on government support. However, younger cohorts are more prone to lose employment in any recession. To assess the unique nature of the COVID-19 shock, we create a counterfactual scenario in two steps. First, we use data on past recessions to determine the increases in unemployment rates for different age groups during an average recession. However, the current decline in output was unprecedented. So, we have to employ a simple econometric model to predict the age-unemployment dynamics while controlling for the output decline. Second, we replace the actual unemployment rates by age with those that would have prevailed in an average past recession as constructed in the first step. We then implement these rates in our structural model by altering the shocks to the unemployment transition probabilities, while keeping other shocks unchanged. From this we obtain the endogenous response of aggregate variables that would have prevailed had this been an average, albeit larger, recession (**Chart 2**). Any difference in output between the two scenarios therefore reflects the special nature of this COVID-19 shock relative to past recessions.

[7] The output, inflation and unemployment rate series embody government policy responses as well as the most recent economic developments and their likely evolution.

[8] Cateau, Roberts and Zhou (2015, 52) show that the "incidence of mortgage arrears increases significantly for households with DTI ratios between 250 and 350 percent, with even sharper increases for households with DTI ratios above 350 percent." These households are highly vulnerable to income shocks, forcing them to either reduce consumption drastically, sell their home or default on their debt.

Chart 2: The overall economic consequences in the COVID-19 benchmark simulation and in the counterfactual where the unemployment rates increase as in an average past recession: the specific response of unemployment to the COVID-19 pandemic amplifies the trough of the recession

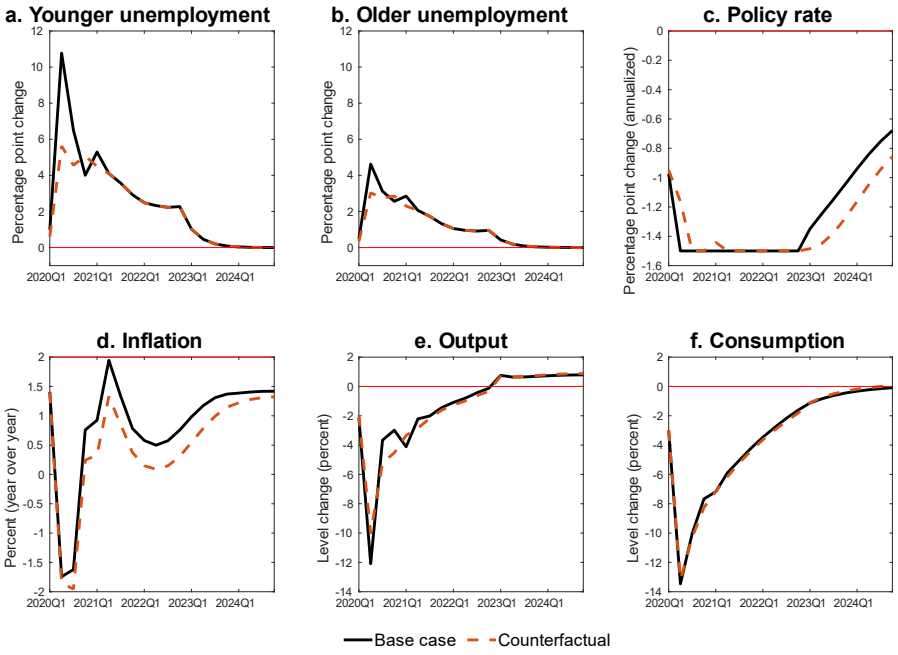
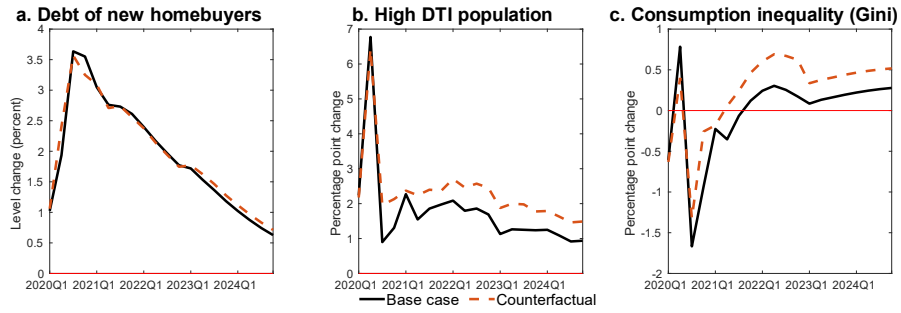


Chart 3: The COVID-19 shock increases consumption inequality and household vulnerabilities



Relative to the counterfactual, the unemployment rate during the pandemic increases significantly more during the second and third quarters of 2020 for both age groups, but more so for the younger cohort. We see that the special nature of the shock has worn off by the first quarter of 2021. Subsequent limitations on social contacts during the new wave of COVID-19 in January 2021 had a relatively weak impact on unemployment rates, likely because many businesses adapted better to these limitations. We assume that this shift to a normal recession continues for unemployment rates from then onward (**Chart 2**). While unemployment rates shift to a normal pattern given the size of the recession, they remain very high. It is worthwhile mentioning in this context that our model does not consider additional inequality factors (e.g., job scarring effects or skill-biased progress in the digitalization of the economy) that could imply a more persistent increase in inequality and warrant an even more protracted policy stimulus.

Our counterfactual helps us understand how different the impact of this recession was across households, including its additional overall consequences.

The special response of unemployment rates to COVID-19, relative to an average past recession, significantly amplifies the impact of the shock on output and consumption in the short term (see **Chart 2**). Younger and poorer households are more likely to be constrained in their ability to borrow and so reduce consumption more in response to a decline in income due to unemployment. In our model, poorer households are also more likely to work longer hours; therefore, their unemployment reduces labour supply more and puts upward pressure on wages. An unemployment shock mostly affecting younger and poorer households thus acts as a negative shock to both demand and supply. The supply channel dominates, and the overall effect on inflation is positive, that is, inflation drops less in the base case. Due to a binding ELB in both scenarios, the monetary policy stimulus is the same, and therefore inflation remains higher in the base case over the medium term.

The uneven impact of COVID-19 increases household vulnerabilities and inequality

The more uneven impact of unemployment during COVID-19 amplifies in the short term the increase in consumption inequality and in household vulnerabilities measured by the share of households with high DTI ratios (**Chart 3**). Intuitively, a higher unemployment rate leads to income losses. Households with borrowing capacity react to this by increasing their debt. Young and poor homeowners react by cutting their consumption relatively more because they have less access to (additional) credit. However, over the medium term, consumption inequality and vulnerabilities are lower in the base case. This is because the unemployment rates become the same in the two scenarios after the first quarter of 2021, and younger and poorer households who tend to be borrowers benefit from relatively higher inflation in the base case. Higher inflation reduces the real household debt outstanding, the share of households with high DTI ratios, and consumption inequality because inflation redistributes wealth from richer savers holding nominal bonds to poorer borrowers.

Government-organized income support initiatives worked as planned

We use our model to analyze the aggregate and distributional consequences of three income support initiatives: CERB, enhanced EI and mortgage payment deferrals. As expected, these initiatives stimulate output, consumption and inflation (**Chart 4**). Their overall economic effects mimic a policy rate cut, which helps reduce pressures associated with the ELB. So, there is less need for monetary stimulus, resulting in a somewhat earlier departure of the policy rate from the ELB.

Chart 4: Government initiatives stimulate the economy

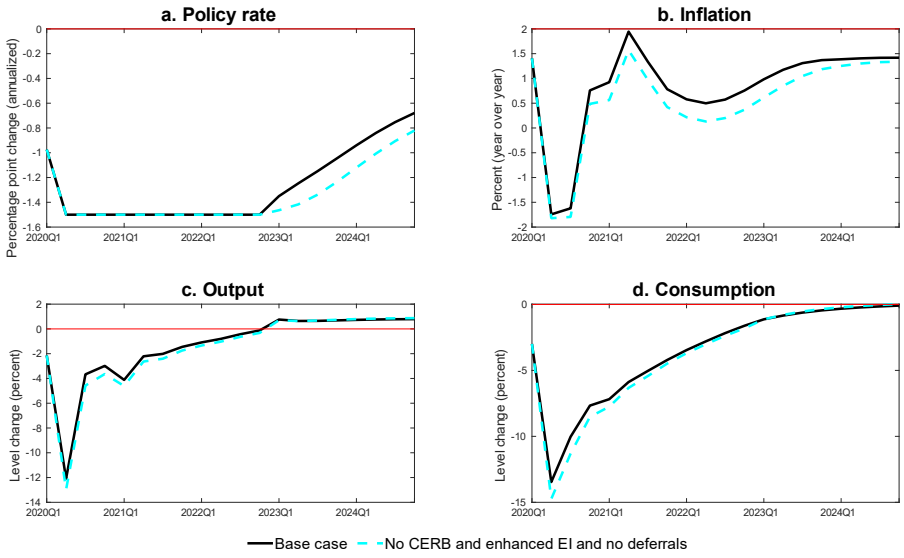
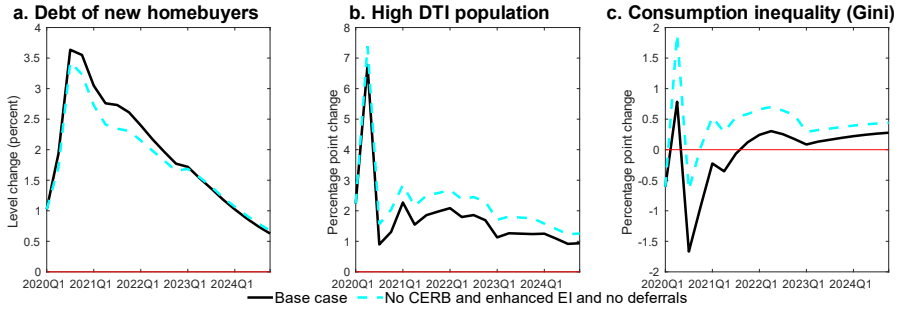


Chart 5: The policies persistently reduce inequality and household vulnerabilities



Government initiatives increase the debt issued to new homebuyers in the short term. By providing a better safety net in case of future unemployment, they make homeownership more attractive for first-time homebuyers, which is reflected in higher house prices and larger mortgages. At the same time, government initiatives persistently reduce the share of households with high-DTI ratios for two reasons. First, higher inflation lowers the real debt of existing homeowners. Second, higher transfers to unemployed households increase their incomes, thus reducing their DTI ratios (**Chart 5**).[9] These policies therefore reduce vulnerabilities in the medium term.

The policies also reduce consumption inequality. As the policy-makers intended, the main beneficiaries of these initiatives are poorer households. Poor homeowners' access to (additional) credit is more limited, so, without these policies, they would cut consumption considerably during unemployment spells. The rise in unemployment benefits or the option to tap into their home equity significantly mitigates the drop in consumption for these households during the pandemic. Since some renters have limited borrowing capacity, they

[9] These effects dominate the direct increase of nominal debt from the use of mortgage deferrals.

also increase their consumption in response to CERB and enhanced EI. As well, renters indirectly benefit from mortgage deferrals due to their positive effect on wages.

Both the larger rise in unemployment, especially among the younger cohort, and the unprecedented government initiatives are specific features of the COVID-19 recession. Contrasting the aggregate and distributional implications of both (Charts 3–5), we find the following. The special government initiatives were timely and more than offset the decline in total consumption and the increase in consumption inequality caused by the larger increases in unemployment. This is because government initiatives were targeted and benefited specifically budget-constrained unemployed households who would otherwise have had to cut consumption considerably. At the same time, these policies did not make up for the lost output due to the larger increase in unemployment because the benefits did not bring back jobs in the sectors of the economy that were shut down. Also, the higher public debt used to finance benefits reduced private capital investment.

The costs and benefits of more monetary stimulus

To assess the benefits from monetary stimulus, we use an alternative scenario where interest rates follow a Taylor rule, ignoring the ELB. This implies a larger monetary policy stimulus in the short term and a faster normalization of policy rates in the medium term. One might think of this as unconventional monetary policy fully offsetting the effects of the ELB constraint.

More monetary stimulus results in a milder recession and persistently lower vulnerabilities and consumption inequality

More stimulus results in a smaller decline in output and consumption and higher inflation (**Chart 6**). Lower policy rates make borrowing cheaper and increase the debt issued to new homebuyers in the short term. At the same time, higher income and inflation reduce the share of households with high-DTI ratios. Household vulnerabilities are therefore lower in the medium term despite the short-term debt increase for new homebuyers. Finally, more stimulus persistently decreases consumption inequality (**Chart 7**).[10] While highly leveraged homeowners receive relatively more support from lower interest rates, richer households see their savings in nominal assets decrease because of higher inflation and lower returns.

[10] Lower inequality due to larger monetary stimulus could imply less need for aggressive fiscal transfers. An interesting question for future research is what the most efficient mix of policy responses would be in this type of recession.

Chart 6: Larger stimulus leads to a smaller recession and higher inflation

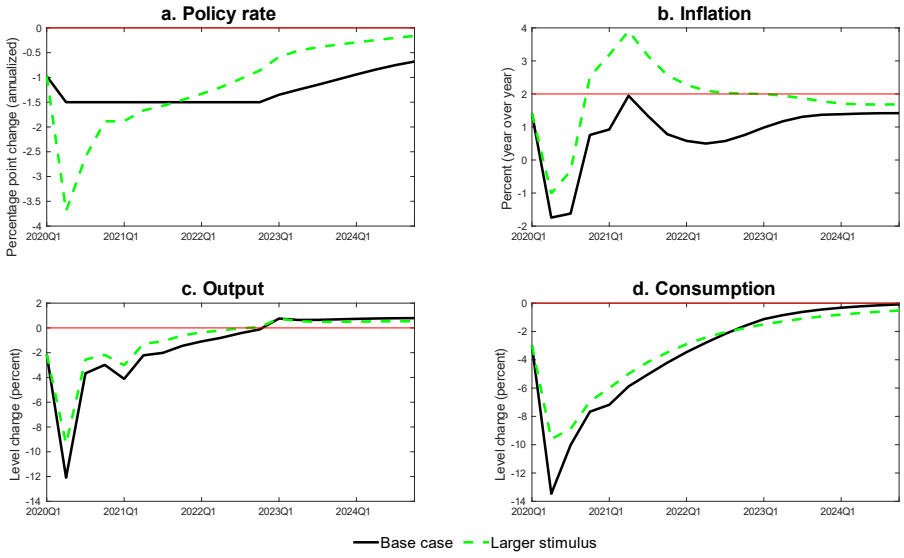
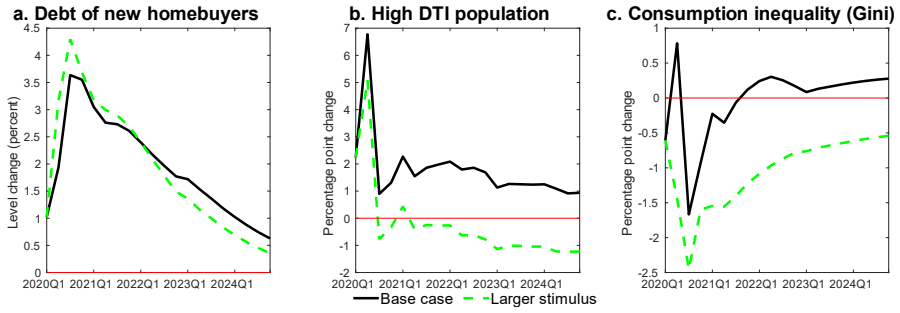


Chart 7: Larger stimulus lowers inequality and household vulnerabilities over the medium term



Conclusion

The COVID-19 recession created an unprecedented increase in unemployment rates, which in turn disproportionally affected younger and poorer households. We consider the resulting negative implications of the pandemic for the macroeconomy, household financial vulnerabilities and consumption inequality. Our analysis suggests that the timely and decisive government response, both fiscal and monetary, helped stimulate the economy and reduced household vulnerabilities and consumption inequality.

Two aspects, which we did not cover, deserve more attention. First, while we evaluated the effects of the recession on household vulnerabilities, we did not study the effects of the pandemic on household defaults, risk taking and the formation of expectations in the housing market.[11] Second, we showed that the specific response of unemployment to COVID-19 increased consumption inequality. However, the COVID-19 crisis might have

[11] See Emenogu, Hommes and Khan (2021), who study exuberance in local housing markets during the pandemic.

longer-lasting consequences. For example, some Canadians who are still unemployed might suffer from job scarring effects. These effects may in turn be related to structural changes triggered by skill-biased progress as the economy digitalized faster during the crisis than it would have otherwise.

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