# Household Financial Distress and Economic Policy Implications

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**Abstract.** This paper studies the economic impact of the current global economic downturn on the household sector. Household budgets can be negatively affected by declines in nominal wages and increases in unemployment. We empirically test this effect for the small open emerging economy. As a result of a lack of individual data on household finances, micro data are simulated. Our analysis clearly shows that there is a significant additional decline in consumption related to an increase in household default rates and unemployment. We find that potential household insolvencies have important implications for the financial system as well as for the macroeconomy.

**Keywords:** credit cycle, households' distress, insolvency, household default, aggregate consumption

**JEL:** G28, G32, G33, G38

## 1. Introduction

There are numerous studies that address household financial distress. Some investigate the main drivers of the insolvency risk and try to link them to the macroeconomic environment while others focus on the effects of adverse macroeconomic scenarios on household consumption. Of note is that only a few studies discuss the household credit cycle as a whole. The lack of research on this issue is largely related to insufficient household statistics on structured balance sheets and consumption.

The ongoing economic crisis has a negative effect on household balance sheets and can cause financial distress. This paper aims to assess the impact of the economic recession on a household's finances by taking their debt burden into account and evaluating the negative feedback on the aggregate economy via reduced consumption. This is of particular importance from the government's perspective, as household insolvencies can significantly reduce government revenue and increase the need for social spending.

## 2. Related Literature

A number of studies address the issue of household insolvency and focus specifically on the main drivers. The recent financial turmoil and subsequent economic recession provide additional incentive for creditors as well as regulators to deal with the issue. Four main streams of research can be identified. The first looks at household default prediction, using a traditional insolvency framework. Peter and Peter (2006) investigate the main drivers of household default. DeVaney and Lytton (1995) focus on household insolvency through the application of a predictive model and the use of financial ratios to identify insolvent households. Herrala and Kauko (2007) present a micro simulation model of household distress. The second focuses on the impact

of household defaults on the financial sector within a stress test framework for evaluating the potential negative effects of adverse macroeconomic scenarios e.g. Jakubík, Schmieder (2008) or Jiménez, Saurina (2006). The third focuses on the optimal legal framework to deal with individual insolvencies e.g. Li and Sarte (2006). The fourth addresses the credit cycle and consumption among others e.g. Seeling (1998), McCallum (1988), Tudela, Young (2005), Chakrabarty, Schmalenbach and Jeffrey (2006), Berben, Bernoth and Mastrogiacimo (2006), Barrel, Davis and Pomerantz (2006).

# 3. Theoretical Framework

Households are usually affected by an adverse negative economic scenario with some time lag, but the impact is more persistent than in the corporate sector. As a consequence of an economic crisis, firms reduce production to cope with declining aggregate demand. To do so, they need to reduce the labour force or decrease wages. However, the wages are usually "downward sticky"; so that firms need to make employees redundant. Alternatively, they could reduce the variable part of salaries such as bonuses or other benefits. As employees become unemployed they also become dependent on social benefits. Moreover, if they are indebted they are not able to cover their current payments with their current income. Thus, if they are not able to find employment, the only solution is to use their savings. In the end this provides a temporary solution that postpones their insolvency.

## 3.1. Single-household Mortgage Default

To investigate household insolvency, Elmer and Seelig (1998) consider a three period pure exchange model with no taxes. We can further focus on the situation of an adverse macroeconomic shock and its impact on household income. In this model framework, the consumer must at least cover the debt obligations in both periods. We could assume a shock to income holding interest rate and house prices constant. If an individual cannot meet his obligation, he can still sell owned real estate in order to avoid default. However, he will default if the value of his equity does not cover his debt obligation.

This simple framework can help us to understand the basic default trigger based on the shock to income. But in practice things are more complicated, as mortgages can have different maturities, which imply different annuities, and a mortgage is usually paid back in fixed monthly instalments. We also need to calculate disposable income as income purged of living costs. Moreover, Herrala, Kauko (2007) define household distress as a situation where the increment in household surplus (income diluted by debt service payment), via the incurrence of new debt, is smaller than the minimum level of consumption. They assume that households can temporarily sustain consumption by taking more debt or running down their stocks of liquid assets.

## 3.2. Impact of Adverse Scenario on Aggregate Consumption

From the creditor's point of view, a precise estimation of future household default is one of the most challenging issues. On the other hand, the objective of financial regulators is to assess the future course of the economy and the potential threat to financial stability. Households' inability to meet their financial obligations results not only in higher default rates and losses for the financial sector but also as in a significant decline in household consumption, which has a negative effect on the aggregate economy. To estimate this impact we can use a simple Keynesian framework. However, in the case of a significant increase in household default rates, there is an additional feedback effect of household insolvency on aggregate consumption. To better estimate the impact of a decline in disposable income on consumption, we can simply divide consumers into two groups and constructed aggregate consumption as a weighted average of defaulted [proportion d] and non-defaulted [(1-d)] consumers. Then, aggregate consumption can be expressed as

$$C = dC_d + (1-d)C_n \qquad (1)$$

where $C_d$ denotes consumption of the defaulted and $C_n$ non-defaulted households. Using this formula, the decline in consumption in response to the decline in disposable income or GDP can be derived. Using the Keynesian formula, we assume that consumers reduce their consumption proportionally to the decline in disposable income, which corresponds to the decline in GDP. If we further assume that disposable income of

the defaulted household group is equal to zero in the limit, then their consumption is equal to the autonomous consumption related to the necessary living expense:

$$C = dC_d + (1-d)C_n = d * C_0 + (1-d)(C_0 + cY) = C_0 + (1-d)cY \qquad (2)$$

In the case of an adverse macroeconomic scenario, GDP or disposable income declines and the household insolvency rate increases. Aggregate consumption is influenced by both these effects. If we further take into account that the marginal propensity to consume could significantly differ for the unemployed and employed consumers, we can reformulate equation for the aggregate consumption as

$$C = C_0 + (1-d)(uc_U Y + (1-u)c_E Y) \qquad (3)$$

where $c_U$ and $c_E$ are the marginal propensity to consume for the unemployed and employed consumers and $u$ is the unemployment rate. In the case of an adverse macroeconomic scenario, we need to also take into account, together with the change in GDP and the change in household default rate, the change in the unemployment rate, to calculate the effect on aggregate consumption. Formally, after some derivation we obtain the formula (4).

$$\Delta C = (1-d)[u(c_U - c_E) + c_E]\Delta Y + [(c_U - c_E)(\Delta u - d\Delta u - \Delta du - \Delta d\Delta u) - \Delta dc_E](1+\Delta)Y \qquad (4)$$

Formula (4) reveals that, with a significant difference between marginal propensities to consume for unemployed and employed consumers, a change in the unemployment and default rates can have a marked impact on the change in aggregate consumption.

## 4. Available Data

The limiting factor in modelling household insolvencies is usually the availability of the appropriate data. To estimate the household default rate we would need to know more about the distribution of income and the debt burden across the population. Furthermore, we would need an estimate of the necessary living expenses as well as information on interest rates on loans to households. We empirically tested the transmission channels for the Czech Republic as a small open and emerging economy. Unfortunately, the relevant data are not available in this case.[2] We have neither micro data nor sufficient information on the income distribution. Thus we make a simplifying assumption to deal with this problem.

The Czech Statistical Office is the main data source for Czech household statistics. Apart from that, the Czech National Bank provides some additional statistics on the aggregate bases such as household financial assets, banking and non-banking loans to households. Moreover, the average bank interest rates on consumption and housing loans to household are published by the Czech National Bank. Some additional characteristics of the mortgage markets can be obtained from Fincentrum Hypoindex. However, micro data are available only from the Czech Statistical Office. These statistics are based on household surveys and include some characteristics of households. In connection with household insolvency, they provide information on household net income but not on characteristics of the debt burden except for binary (yes/no) information such as whether the given households have mortgages. Moreover, the debt burden related to consumer loans is not covered by these statistics. Another serious disadvantage is the relatively long lag; for example, the latest statistics are based on information collected in the year before the last complete year. This lack of appropriate statistics causes difficulties in making estimations.

## 5. Empirical Results

To evaluate the impact of the economic crisis on the household sector, we focus mainly on the income transmission channel that was most important for the Czech economy in the post-crisis period.

Due to the lack of micro data on household balance sheets[3], we employ aggregate data from a bank credit registry and a one factor model to link the household insolvency to key macroeconomic variables (see model

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[2] The appropriate data can be obtained from credit registers or household surveys for some countries.
[3] Although we have information on the historical distribution of household net income, the rest of the statistics are available on the aggregate level only.

specification e.g. in Jakubik (2007), Rösch, Scheule (2007). These data include total recent past-due loans, which was used to proxy the credit default rate. The indicator for household credit risk was calculated based on new 3-month past-due loans. However, the only short time series for the household sector covered the period 3Q/2007-3Q/2009. Although these data were available at monthly frequency, for some macroeconomic variables, such as GDP growth, only quarterly data were available. In order to estimate the model on the basis of such a short time series, we used monthly data and linear interpolation for GDP growth and its components such as consumption. The model was calibrated by maximising a likelihood function. In line with economic theory, we considered macroeconomic variables which can drive household insolvency and whose forecasts are published by the Czech National Bank . Automatic selection based on stepwise regression minimising residual sum of squares was used to find the combination of variables with the greatest prediction power and optimal time lag. Moreover, we ensure that coefficients have signs in line with economic theory. Our final non-linear model is able to explain relatively well the historic household default rate pattern. According to our results, Czech household default rates can be explained by lagged real GDP growth, changes in the unemployment rate, lagged nominal wage growth and changes in interest rates (see equation (5) and Table 1, where the lags are in quarters and $\psi$ denotes the cumulative normal distribution function).

$$df_t = \psi(c + \beta_1 gdp_{t-4} + \beta_2(u - u_{t-1}) + \beta_3 w_{t-1} + \beta_4(r_{t-3} - r_{t-4}))$$

(5)

Table 1: Macroeconomic model for Czech household sector

| Description of variable corresponding to estimated coefficient | Notation | Estimate | Standard error | Pr>\|t\| |
|---|---|---|---|---|
| Constant | $c$ | -2.127 | 0.015 | <.0001 |
| Real GDP growth ($\beta_1$) | $gdp_{t-4}$ | -0.028 | 0.003 | <.0001 |
| Change in unemployment ($\beta_2$) | $u - u_{t-1}$ | 0.012 | 0.004 | 0.009 |
| Nominal wage growth ($\beta_3$) | $w_{t-1}$ | -0.012 | 0.001 | <.0001 |
| Change in interest rate ($\beta_4$) | $r_{t-3} - r_{t-4}$ | 0.034 | 0.007 | 0.0001 |

Note: The lag length is in quarters.

Our results showed that lagged real gross domestic product growth negatively affects default rates. Moreover, a decrease in lagged nominal wage growth, an increase in the unemployment rate and an increase in lagged interest rates each have positive effects on household insolvencies. Our model captures both the asset and liabilities side of households' balance sheet. While unemployment and nominal wages impact household income, interest rates influence household financial costs. Real GDP is used as a proxy for factors affecting disposable income not covered by the previously mentioned indicators. Household financial distress or default can be defined as a situation where a debtor is not able to service its outstanding debt. In such case, the household's disposable income is negative.

Nevertheless, the model based on individual data is usually able to better explain household defaults. Peter and Peter (2006) identify five groups of mortgage default determinants that relate to the following: income, credit history, macroeconomics, borrower location, and demographics. They pointed out that although the most important cause of mortgage default is a fall in household income, the other factors may also be important for future default estimation.

## 5.1. Impact on Aggregate Consumption

The recent economic crisis was manifested in increasing unemployment. Using formula (4), we can estimate the impact on aggregate consumption for different negative changes in economic growth measured by GDP. The proportion of defaulted households can be obtained as the product of default rate and share of household with debt burden. According to a survey by the Czech Statistical Office, 20% of households are repaying mortgage loans and 10% consumer loans. We do not know how many households with mortgage loans are also repaying consumer credit at the same time. We assume that 25% of Czech households have some debt burden. According to some studies, the marginal propensity to consume (MPC) can differ for unemployed and employed consumers. Thomson, Chung and McKibbin (2009) empirically tested MPC for

households worried and not worried about their future job and pointed out that MPC significantly differs for these two groups. If we further express change in consumption as a ratio to GDP, we can obtain formula (6).

$$\frac{\Delta C}{Y} = (1 - dk)[u(c_U - c_E) + c_E]\frac{\Delta Y}{Y} + [(c_U - c_E)(\Delta u - dk\Delta u - \Delta dku - \Delta dk\Delta u) - \Delta dkc_E](1 + \frac{\Delta Y}{Y}) \quad (6)$$

where parameter k corresponds to the share of consumers with some debt burden. and d corresponds to household default rate (we assume d = 0.5, which corresponds to default on banking loan portfolio to households at the end of 2009). Our analyses suggest that the impact of the macroeconomic shock on GDP can be stronger than the impact of the original shock. However, within our simple theoretical framework, we assume that households do not expect the macroeconomic shock. Hence, they have not adjusted their consumption prior to the shock.

## 6. Conclusion

The economic downturn arguably makes it less likely that households will be able to repay their loans. Household budgets can be negatively affected by declines in nominal wages and increases in unemployment. This effect was empirically tested for the Czech economy. Our analysis describes two basic mechanisms causing the increase in household insolvency: a decline in nominal wages and an increase in unemployment. As a result of a lack of micro data on Czech household finances, the extent of their financial distress due to adverse macroeconomic shocks cannot be directly evaluated. However, with some simplifying assumptions, micro data were simulated and the impact of macroeconomic shocks on the household sector assessed. Alternatively, the macroeconomic approach utilizes a simple Merton-type one-factor model. Our analysis of a potential slump in nominal wages during 2010 suggested that under the extreme scenario the budgets of about 30% – 50% of households with debt burdens would be in deficit if their nominal incomes were to decrease by more than 10%. This corresponds to roughly 7% - 12% of the total Czech population.

The crucial second part of the empirical analysis deals with the estimation of aggregate consumption. Our relatively simple theoretical model showed the extent to which an unexpected increase in the household default and unemployment rates cause an additional decline in consumption, which is reflected in an economic slump. We illustrate that the impact of the change in unemployment on the size of that effect positively depends on the difference between the marginal propensities to consume for employed and unemployed consumers. Our analysis, based on the derived relationship for aggregate consumption, showed that for the Czech economy e.g. a 4 percentage point increase in the default rate and a 3 percentage point increase in unemployment rate cause an additional decline in GDP of roughly 2 percentage points. If we do not take this effect into account, the expected decline in economic growth can be significantly underestimated. The study clearly shows the importance of the transmission channel via household balance sheets for the economy, which is usually not taken into account in macroeconomic and monetary policy models. Such omission of feedback effects on household consumption may produce a bias in economic policy making.

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