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IMPACT OF FINANCIAL REPRESSION ON PRIVATE INVESTMENT IN A DSGE MODEL: A COMPARISON WITH CONVENTIONAL FISCAL POLICY TOOLS

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Motivation

The declining economic growth rate and the monetary policy limits are shifting the focus towards structural reforms and the fiscal policy. At the same time, if we turn to stimulating measures of the fiscal policy, we should finance these measures one way or another.

Increasing tax revenues or debt level are standard ways to finance government spending. That said, to a certain extent debt increase means deferred growth of the tax burden or some other source of revenue. Another source of budget revenues is financial repression. It is a set of regulatory measures imposed on the financial sector, which allows the government to artificially increase demand on its debt. Financial repression measures include restricting the free movement of capital, foreign exchange regulation, setting maximum deposit rates, etc. The listed measures distort the conditions of free competition so that the state can pay less return on its debt. [Reinhart, Sbrancia, 2015] call such savings on debt servicing a financial repression tax.

Following the idea of financial market liberalization, many states stopped resorting to financial repression measures as widely and openly as before the 1980s. Nevertheless, "classical" financial repression measures are still used in some developing countries nowadays [Jafarov, Maino, Pani, 2019]. An overview of more sophisticated financial repression measures that are now being used by the governments of various countries is presented in [Reinhart, 2012]. One of the examples mentioned is the cancellation of the privatization of a large state-owned bank in Japan, the one with a significant share of assets held in government bonds, in 2010. In addition, macroprudential regulation resemble financial repression to a certain extent: since macroprudential regulation creates additional demand for government bonds. Although the goal of macroprudential regulation is to ensure stability of financial markets, such second-order effects also occur.

A study of the impact of financial repression on the economy seems relevant in the context of the growing debt burden and the increasingly active role of the fiscal policy. Of special interest is the impact of financial repression on investments, which are an important source of economic growth. Studying the impact of financial repression on investments and the economy and comparing financial repression with distortionary taxation within the framework of the general equilibrium model allows answering the question of whether the "repression tax" hidden from the majority of economic agents is the preferred measure for financing the state budget deficit.

Moreover, it is important to note that the issue of how financial repression affects the operation of the financial market is relatively less studied. It is the activities of financial sector that are being restricted by financial repression. Recognition of peculiarities of functioning of the

financial market in the assessment of financial repression effects can significantly affect the results. This explains our interest in studying the effects of financial repression in a model where the financial sector is explicitly modelled and there is a fundamental reason for existence of financial intermediation.

Brief Literature Review

Several branches of financial repression literature are related to questions studied in this research. The first branch gives quantitative estimates of revenues from financial repression. [Giovannini, de Melo, 1993] use a sample of developing countries to assess the level of revenues from financial repression by comparing the return on domestic and external debt. They conclude that the average revenues from financial repression are 2% of GDP, but this figure can reach almost 6% for some countries. [Reinhart, Sbrancia, 2015] estimate revenues from financial repression in the postwar years in developed and developing countries and conclude that such revenues mainly lie between 1% to 5% of GDP per annum. Thus, the financial repression policy can be a source of significant state budget revenues.

The second branch of publications is comprised of studies researching the impact of financial repression on the economy, namely, economic growth, likelihood of crises, etc. For example, [Roubini, Sala-i-Martin, 1992] show that financial repression is one of the reasons for a lower level of development of Latin American countries. In this paper, the authors also propose a model where financial repression adversely affects the efficiency of financial markets, which reduces revenues from taxes on other sectors of the economy.

[Fry, 1997] concludes that deviation of the effective interest rate from its equilibrium level by 1 pp results in the reduction of economic growth by 0.5 pp. [Becker, Ivashina, 2017] come to a conclusion that during a crisis, an increase in debt relative to GDP significantly affects the likelihood of obtaining a loan by a company. [Jafarov, Maino, Pani, 2019] show on a cross-country panel that the existence of restrictions on interest rates reduces the economic growth rate by 0.4-0.7 pp.

[Jafarov, Maino, Pani, 2019] also pay attention to the impact of financial repression on the likelihood of a debt crisis. According to their results, financial repression reduces the likelihood of this event. [Lee, Shin, 2008] do not talk about financial repression in their paper, but they study the impact of financial market liberalization on the likelihood of twin crises. Liberalization does increase the likelihood of twin crises, but the overall effect on economic growth turns out to be positive.

A separate branch of publications is dedicated to the issues of optimality of financial repression. [Chari, Dovis, Kehoe, 2020] come to the following conclusion in a model with the

banking sector and the possibility of sovereign default. If a state cannot guarantee the absence of a default, financial repression may be optimal in a situation where it is necessary to significantly increase the government debt. In the presence of financial repression, default becomes too expensive for the state, and this raises the confidence that the state will adhere to its obligations. [Norkina, 2018] concludes that financial repression may be an optimal choice for a populist government. Optimality of financial repression is also studied by [Bencivenga, Smith, 1992; Espinosa, Yip, 1996; Bai, Qian, Wang, 2001; Gupta, 2008; Norkina, Pekarski, 2015; Mamedli, Norkina, 2019] among others.

In recent years, there has appeared a number of papers studying the effects of financial repression within the framework of DSGE models. An advantage of this kind of models over econometric studies is the fact that DSGE models allow analyzing the effects of financial repression without using the "all other things being equal" assumption. For example, [Kriwoluzky, Muller, Sheer, 2018] build a model with the banking sector based on [Gertler, Karadi, 2011]. This model describes the post-war US economy. They assess the impact of the financial repression policy on the debt-to-GDP ratio with and without the "all other things being equal" assumption. They conclude that the assessment of the liquidation effect (how much government debt decreased due to financial repression) is less without using this assumption than with it.

Another example of studying financial repression in the DSGE model is [Isakov, Pekarski, 2017]. The authors conclude that an increase in the share of government debt in total private sector assets lowers fiscal multipliers, while reducing the interest rate on government debt is associated with higher fiscal multipliers. [Funke et al., 2015] develop a DSGE model of the Chinese economy with regulatory restrictions on the interest rate dynamics. According to the results, such restrictions reduce the sensitivity of the economy and investment to monetary policy shocks. Regulatory restrictions also lead to an increase in corporate lending within the shadow banking sector.

The ability to assess the macroeconomic effects of financial repression to a greater extent using the general equilibrium concept determines our interest in studying financial repression within the framework of the DSGE model. That said, there is a number of issues that are not fully addressed by existing publications which use DSGE models to study financial repression.

For example, in the previously mentioned paper [Isakov, Pekarski, 2017] the financial market is modeled in a simplified manner. [Kriwoluzky, Muller, Sheer, 2018] and [Funke et al., 2015] describe the activities of financial intermediaries in more detail. At the same time, there remains the question of the importance of modelling the financial market features when analyzing the effects of financial repression. Robustness may be an advantage of a simpler model. On the other hand, if the financial market features are of great importance for the transmission of financial

repression, then this is an argument in favor of a more complex model with a detailed description of the financial sector.

Furthermore, most studies on financial repression examine only the direct channel of its impact on investments and the economy. Redistributing savings in favor of government securities, financial repression reduces the amount of funds that can be spent on private investment and capital formation. As a result, the level of economic development declines. In addition to this direct effect, financial repression can also reduce the efficiency of the financial market. Such hypothesis was put forward by [Roubini, Sala-i-Martin, 1992], which was mentioned earlier. However, models usually consider only the direct impact of financial repression on the economy given the complexity of modeling of this channel of financial repression effects on the economy.

Finally, the question of how financial repression affects the transmission of macroeconomic shocks remains relatively unexplored. As noted earlier, [Isakov, Pekarski, 2017] study the impact of financial repression on the effectiveness of the fiscal policy. However, the dynamics of the government debt rate is exogenous in this model: the government independently sets the debt rate and decides how much of the private sector savings should be directed to the acquisition of government bonds. At the same time, it is interesting to study how financial repression affects the transmission mechanisms of the fiscal policy, when the government can artificially increase demand for its bonds, but does not set the rate on government bonds directly (as in [Kriwoluzky, Muller, Sheer, 2018], [Chari, Dovis, Kehoe, 2020] among others).

The previously mentioned paper [Funke et al., 2015] is another study that addresses the impact of financial repression on the transmission of macroeconomic shocks. However, it only examines the constraints on the dynamics of interest rates.

In the meantime, by restricting private market activity, financial repression can affect how investment and the economy respond to changes in the economic situation. This noticeably distinguishes the financial repression policy from other ways to finance budget expenditure. For example, distortionary taxation usually does not have such a significant impact on the transmission of shocks.

Objectives of the dissertation research

The aim of this research is the analysis of the impact of financial repression on private investment and other macroeconomic variables taking into account two things: general equilibrium effects and the role of financial sector in mitigating information asymmetry problems between creditors and borrowers.

Objectives of this research are:

– Development of the dynamic general equilibrium model with financial repression and distortionary taxes (namely, consumption taxes, taxes on labour and taxes on capital), which takes into account the role of financial sector in mitigating information asymmetry problems between creditors and borrowers;

– Comparison of financial repression effects in the standard DSGE model and the model which takes into account the role of financial sector in mitigating information asymmetry problems between creditors and borrowers;

– Development of an approach to modelling the impact of financial repression on the efficiency of financial sector in mitigating information asymmetry problems between creditors and borrowers;

– Analysis of the impact of financial repression on private investment and other macroeconomic variables, taking into account the way financial repression affects the efficiency of financial sector in mitigating information asymmetry problems between creditors and borrowers;

– Estimation of financial repression multiplier and its comparison with tax multipliers;

– Analysis of the impact of financial repression on the transmission of main macroeconomic shocks.

Methodology

To solve the set tasks, we are developing a DSGE model, where the role of the financial sector is to mitigate the problem of information asymmetry between lenders and borrowers. The approach to accounting for this function of financial sector is based on [Bernanke, Gertler, Gilchrist, 1999], who suggested that the return of entrepreneurs who act as borrowers is subject to a non-systematic risk and the true return is observed only by the entrepreneurs themselves. The role of the financial sector lies in structuring a financial contract so as to minimize opportunistic behavior of borrowers and monitoring borrowers (which is costly). As will be shown in the study, accounting for this function of financial sector significantly affects the assessment of the macroeconomic effects of financial repression and the distribution of the negative effect of tightening regulatory measures between consumption and investment.

The model used in this research is based on [Christiano et al., 2011], who incorporate the approach of [Bernanke, Gertler, Gilchrist, 1999] into the DSGE model. At the same time, the model used by us has been substantially adjusted in accordance with the objectives of this study.

Thus, the economy is inhabited by two types of households: Ricardian households and non-Ricardian households. The model provides for two types of rigidities: price rigidities and wages

rigidities, which are modelled a la Rotemberg. The manufacturing sector is represented by three types of agents: firms producing final goods, firms producing capital and entrepreneurs mentioned earlier.

The financial sector (banks) are intermediaries between Ricardian households, who save a part of their income, and entrepreneurs, who attract external financing to carry out their activities.

The government implements the fiscal policy by setting tax rates on consumption, labor and capital and determining the level of public spending and transfers to households. The government also uses financial repression measures and requires the private sector to invest at least a certain share of its assets in government bonds (by analogy with financial repression modeling in [Chari, Dovis, Kehoe, 2020]). This share is high enough for financial repression to take place in the economy in the long run equilibrium: the private sector is forced to invest in government bonds more funds than it would like to in the absence of this regulatory constraint. The existence of such a restriction in the economy leads to a decrease in the return on government bonds. Hence, government can pay lower interest on its bonds.

Note that various macroeconomic shocks, which hit the economy, can lead to the fact that regulatory constraint on private sector becomes non-binding. To account for this, we use an approach suggested by [Guerrieri, Iacoviello, 2015] and introduce regulatory constraint to the model as an occasionally binding one. Also note that for the purposes of this study, we put aside any effects related to the external sector.

In the first chapter, the corresponding model is developed and calibrated using the parameters that are standard for the US economy. Then, two types of model are simulated: a full model and a model without financial frictions where all decisions about saving and investing (including all transactions with capital) are made by households. The comparison of the transmission mechanism of financial repression in the model without financial frictions and the model with a more detailed financial sector description makes it possible to conclude whether it is important to take peculiarities of functioning of the financial sector into account when analyzing the effects of financial repression.

Formulating the role of the financial sector in the economy in an explicit form allows us to turn to the problem of the impact of financial repression on the efficiency of the financial sector in mitigating the information asymmetry problem in the second chapter. In the literature, the spread between interest rates on loans and deposits arising in [Bernanke, Gertler, Gilchrist, 1999] due to monitoring costs is one of the indicators of the financial market development, which explains the differences in the level of economic development of countries, in the level of capital-to-GDP ratio, etc. (for example, see [Chakraborty, Lahiri, 2007], [Bento, Ranasinghe, 2020]).

Thus, the second chapter assumes that the monitoring costs are not entirely exogenous. Banks can invest in the development of the monitoring technology, be more efficient in carrying out monitoring, thus achieving a lower premium for external financing and a higher level of capital and output in the economy. To take this fact into account, we expand the model developed in the first chapter. The model is then simulated and the consequences of long-term and temporary tightening of financial repression are analyzed. This chapter also calculates cumulative fiscal multipliers to compare financial repression with other sources of budget revenues.

Chapter three brings up a question of how financial repression affects the transmission of macroeconomic shocks. This issue is solved by using the previously developed model and simulation of two versions of it: the full model with financial repression and the model without financial repression. Based on a comparison of the impulse response functions in the two versions of the model, we conclude how the presence of financial repression in the model changes the response of investment and other macroeconomic variables to shocks.

Main findings

Accounting for the role of financial sector in mitigating information asymmetry problems between creditors and borrowers can have a sizable impact on transmission of financial repression policy tightening. With financial frictions present, financial intermediaries guarantee that creditors receive a fixed nominal interest rate. Hence, when financial repression tightening takes place, this shock affects creditors and private consumption less substantially. In addition, sensitivity of investment to financial repression shock increases because in the model with financial frictions borrowing conditions depend on borrower's financial position.

To obtain this result, two types of DSGE models were compared: a standard medium-scale DSGE model with frictionless financial market and a DSGE model with financial frictions.

The analysis shows that there are two main differences in transmission of financial repression tightening between two models. Firstly, in the model with financial frictions problems of creditors (households) and borrowers (entrepreneurs) are separated. In the standard model without financial frictions all of the impact of financial repression on capital market is transmitted to households. In the model with financial frictions, it is not the case. Financial contract of the creditor assumes that nominal interest rate received by creditor is fixed. Hence, in the model with financial frictions the response of household consumption to financial repression tightening is lower in magnitude.

Secondly, in the model with financial frictions borrowing conditions depend on financial position of the borrower. Worse financial position of the borrower due to financial repression tightening leads to the higher external finance premium. It discourages private investment further.

Hence, in the model with financial frictions sensitivity of investment to financial repression tightening increases.

Model simulations show that quantitatively effects described above can be quite substantial. Hence, when analyzing the impact of financial repression on investment and overall economic activity, it might be important to account for peculiarities of functioning of the financial sector and model financial sector in greater detail.

Financial repression has a negative impact on the efficiency of financial sector in mitigating information asymmetry problems between creditors and borrowers since financial repression discourages financial sector investments in development of its efficiency. When analyzing the effects of permanent financial repression tightening this channel is rather important. At the same time if financial repression tightening is only temporary, this channel is neglectable in a linearized DSGE model.

This research proposes an approach to account for the way financial repression impacts efficiency of financial sector in mitigating information asymmetry problems between creditors and borrowers. In the model, the efficiency of financial intermediaries in solving the information asymmetry problem depends on the incentives of the financial sector to invest in the monitoring technology development. These incentives depend on certain characteristics of corporate credit market, including the size of this market. Financial repression reduces the size of the corporate credit market; hence, it discourages financial sector investments in development of its efficiency. It leads to an increase in external finance premium, a reduction in private investment, capital, and output.

According to the results obtained, long-term (permanent) tightening of financial repression has significant negative consequences and the decline in the efficiency of the financial market plays a noticeable role.

Short-term (temporary) tightening of financial repression does not have such a significant impact on the economy. Interestingly, the initial shock of financial repression, on the contrary, forces the financial sector to increase investments in monitoring due to the increased number of bankruptcies amid the economic downturn. However, in any case, with temporary tightening of financial repression, the channel of its influence on the efficiency of the financial market is insignificant.

If we compare temporary tightening of financial repression with the growth of distortionary taxes, then it is financial repression that is characterized by the maximum recession in the economy in the first quarters after the shock. However, results of fiscal multipliers estimation indicate that when a longer period is considered, financial repression is not worse than distortionary taxes. This is true unless the level of government debt in the economy is too large.

Using the developed DSGE model calibrated for US economy, financial repression and tax multipliers were calculated. According to the results obtained, on-impact multipliers indicate that the decline in output is the largest in case of financial repression tightening. However, cumulative multipliers show that if longer time period is considered, then financial repression is not worse than distortionary taxation. Additional model simulations indicate that the latter conclusion is valid only in a situation where the ratio between government debt and the amount of capital in the economy is not too high. If the government policy has resulted in a relatively high level of government debt, financial repression can be worse than distortionary taxation.

Financial repression affects transmission of main macroeconomic shocks through its impact on the response of private investment. In doing so, financial repression can both increase and decrease the magnitude of output fluctuations. The reason behind it is the link between government fiscal position and corporate credit terms which emerges in the presence of financial repression.

To analyze how financial repression affects transmission of main macroeconomic shocks, impulse response functions from the DSGE model with financial repression and the one without it were compared.

According to the results obtained, financial repression can significantly change the response of investment and amplify or dampen overall output response, depending on the type of the shock.

The presence of financial repression leads to the emergence of a link between the dynamic of government fiscal position and corporate credit terms. If the shock leads to an increase in budget deficit (for example, due to a decrease in revenues), then government needs to issue more debt. If government issues this debt without tightening of financial repression policy, effectively it means that government has to offer private sector better terms on its debt. Otherwise, private sector will not invest its funds in government bonds. The reduction in spread between government bonds and deposits (financial repression spread) leads to lower losses of private sector on its investments in government bonds. In the model used in this research all these gains are transmitted to entrepreneurs who receive better terms on their loan contracts. It stimulates private investment.

Hence, if shock leads to both a higher level of government debt and an increase in output, then the response of output is amplified. Otherwise, the response is dampened.

For example, financial repression lowers the sensitivity of output to monetary policy shocks. A contractionary monetary policy shock initially leads to an increase in investment, not a decline. In addition, financial repression increases the efficiency of fiscal policy. A positive government spending shock crowds-in private investment, hence, the response of output is higher in the presence of financial repression. Despite the fact that such responses are different from

results which can be obtained from classical New Keynesian models, in certain cases one can find empirical evidence which supports these responses of investment.

In addition, the results of the analysis indicate that when introducing financial repression to a DSGE model it might be important to provide for the reaction of government regulatory parameter to changes in government fiscal position and changes in economic activity. It might be crucial to correctly describe processes which are captured in the data.

Contribution

The contribution of this study lies in the expansion of the understanding of the impact of financial repression on private investment and the economy taking into account the specifics of functioning of the financial sector. Thus, the first chapter shows that extended modeling of the financial sector is important in assessing the consequences of financial repression. Standard models where all investment decisions (including ones related to transactions with capital) are made by one type of economic agents, households, may underestimate the negative impact of financial repression on investment.

The second chapter proposes an approach to take into account the impact of financial repression on the efficiency of the financial sector in solving the problem of information asymmetry in the DSGE model. An analysis of long-term tightening of financial repression has shown the role of this channel can be quite significant. At the same time, simulations of a linearized DSGE model show that this channel does not play a significant role when tightening of financial repression is temporary. As part of the analysis of budget revenue multipliers, it is shown that in the first year after the shock financial repression is characterized by stronger GDP decline than distortionary taxes. However, over longer horizons of analysis, financial repression can be an effective way to raise revenues. This conclusion is valid provided that the level of government debt in the economy is not too high.

Finally, chapter three analyzes the impact of financial repression on the responses of investment and other macroeconomic variables to a wide range of shocks that typically explain the business cycle dynamics in DSGE models. It has been revealed that in the presence of financial repression in the model, there arises an additional link between the state of the government budget and the terms of corporate lending. As a result, the investment dynamics depends on whether a particular shock leads to the accumulation of government debt. It is shown that in the presence of financial repression, a contractionary monetary policy shock can lead to an increase rather than a decrease in investment. Moreover, in the model with financial repression, private investments are not crowded out in response to the growth of public spending. Overall, financial repression can both increase and decrease sensitivity of the economy to shocks: if changes in government debt

and output in response to a shock are of the same direction, the presence of financial repression enhances the output response to the shock.

Scientific and Practical Significance

This study has shown that peculiarities of functioning of the financial sector play a significant role in the transmission mechanism of financial repression. There has also been developed an approach to modeling the impact of financial repression on the efficiency of the financial sector in solving the problem of information asymmetry within the DSGE model. Using this approach, it has been shown that tightening of financial repression in the long run does lead to a noticeable reduction in the efficiency of the financial sector, which negatively affects the investment and output dynamics. At the same time, temporary tightening of financial repression does not lead to a noticeable decrease in the efficiency of the financial sector.

In addition, as part of an analysis of the impact of financial repression on the response of investment and other variables to macroeconomic shocks, there has been described a mechanism according to which financial repression can lead to a fundamentally different investment response and both amplify and dampen economic fluctuations.

As for practical significance of the research, estimates of financial repression multipliers have been calculated and compared with several tax multipliers. These results can be considered when making economic policy decisions. Also, the analysis of the impact of financial repression on the transmission of economic shocks has demonstrated that financial repression could substantially affect the response of investment and other variables to shocks. Accounting for these effects might be quite important when analyzing business cycle dynamics in practice.

List of author's original articles

The results of this research were published in two Scopus indexed journals and an HSE Basic Research Program Working Paper (Series Economics):

1. Elkina M.A., Pekarski S.E. Financial Repression in a DSGE Model with Financial Frictions // HSE Economic Journal. 2020. Vol. 24. No 4. P. 475–502.

2. Elkina M.A. Financial Repression and Financial Sector Efficiency in General Equilibrium Model // Ekonomicheskaya Politika. 2021. Vol. 16. No 3. P. 44–81.

3. Elkina M.A. Financial Repression and Transmission of Macroeconomic Shocks in a DSGE Model with Financial Frictions // Working Paper WP BRP 246/EC/2021.

In addition, results of the research were presented on scientific seminars and Russian and international conferences:

–　XXII April International Academic Conference on Economic and Social Development (15.04.2021)

–　Scientific Seminars of the Centre for Macroeconomic Research of the Financial Research Institute of the Ministry of Finance of the Russian Federation (24.03.2021, 16.12.2019)

–　Fourth Russian Economic Congress (22.12.2020)

–　Scientific Seminar of the Department of Theoretical Economics of the National Research University Higher School of Economics (12.05.2020)

–　Scientific Seminars of the Doctoral School of Economics of the National Research University Higher School of Economics (28.02.2020, 15.03.2019)

–　62nd Russian Scientific Conference of the Moscow Institute of Physics and Technology (20.11.2019)

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