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Macroeconomics implications of female entrepreneurs facing financial frictions to access to credit: a DSGE Model approach in Cameroon

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Abstract

This research assesses the effects of financial frictions faced by female entrepreneurs on macroeconomics performances in Cameroon. We address this important issue, using a Dynamic Stochastic General Equilibrium model with financial micro-foundations. The model features two sectors such as, a production sector dominated by female entrepreneurs and a production sector dominated by male entrepreneurs. Financial frictions appear because entrepreneurs face collateral constraint when borrowing from the banking sector. The steady state and the calibration analysis demonstrate that the female sector is labor-intensive whereas male sector is capital intensive. But, when female sector are granted loans as much as the male sector, it performs better in term of value-added in GDP. The benchmark analysis reveals the complementary role of both sectors in sustaining economy activity when the conjuncture slumps. The Scenarios analysis emphasizes the expansionary effect of the loosening financial constraint, with female entrepreneurs acting as main driver of the economy activity. Thus, institutional frameworks that relax collateral constraints, grant exemptions for enormous requirements, enforce properties right law, and promote transparency and credit-information sharing can make big inroads in alleviating borrowing constraints, increasing financial inclusion and enhancing macroeconomic outcomes.

JEL Classification: *C11, C61, D21, E32, E44, O11*

Keys Words: Female Entrepreneurs, Financial Frictions, Macroeconomics Implications, DSGE Model, Cameroon.

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1. Introduction

Female entrepreneurs still faced financial frictions in accessing to credit in Cameroon, despite progress made towards achieving gender equality.[1] The constraints of gender credit access refer to both endogenous factors and exogenous factors (Fondo and Mbaye 2010; Oluwu 2012; Esta 2013).

Endogenous constraints due to female are first related to their financing capabilities to undertake an activity. The existence of information asymmetry related to the different types of entrepreneurship within financial institutions reduces accessibility to credits for female. Most of societies in Africa are patriarchal and the man hold the property of the family and it can easily improve the guarantee process. So it is difficult for female to use the wealth of the family as collateral without the agreement of their husband. In addition, a specific socio-cultural constraint is the number of children each female entrepreneur has. There is a positive relationship between the number of child of a female and a risk of default. The commercial banks take into account this default risk in the evaluation of the loans contracts related to hazard moral and adverse selection. The hazard moral reveals the choice done by female entrepreneur. Their choice is based on the family's vital needs where the priority is given to the well being of their children (Asiedu and al. 2012; Ifelunini and Wosowei 2013; Damiano and Mwakubo 2014; Wekwete 2014).

Exogenous constraints are directly related to the rigidity of the banking sector in granting credit in developing countries. This rigidity is explained by the conditions imposed by banks on the one hand and the time of acquisition of the credit on the other hand. In fact, female entrepreneurs are easily engaged in agricultural and commercial sectors. Despite the fact that their activities are small in term of capital assets and remain in a start-up development process, a minimum capital is required to develop them. Nonetheless female entrepreneurs' equities are insufficient and

[1] Progress towards achieving gender equality at the global level include the Convention on the Elimination of all forms of Discrimination against Women (CEDAW) of 1991; the Global Platform for Action; the Beijing Declaration of 1995; the Millennium Development Goals (MDG); the 1994 International Conference on Population and Development (ICPD). At the regional level, the African Union Protocol of the Rights of Women in Africa adopted in 2005. At the National level, the preeminence role-plays by women, in the Cameroon Growth and Employment Strategy Paper of 2009.

they usually need credit to finance those activities. Banks, to protect themselves against risk of default related to female entrepreneurs type of activities, require high interest rate in exchange for loans. Moreover, the time, which elapses between the demand for loans and their supply by banks, is sometimes very long when the borrowers are female entrepreneurs (Bird and Sapp 2004; Asiedu and al. 2012; Angelucci and others 2013; Seguino and Were 2014).

Overall, Cameroon's authorities have done enough this last decades to achieve gender equality and have succeeded in the area of education, health, employment and political participation.[2] Hence, the ratio of girls to boys' enrollment at the primary level is one of the Millennium Development Goal (MDG), which is likely to be attained by 2015 in Cameroon. However, local traditional practices continue to restrict female's access to factors of production. Due to inequitable inheritance practices, very few female owns land, particularly in rural areas. Moreover, female are not fully entitled to use, enjoy or sell their property without their husband's consent. Those factors restrict female entrepreneurs' capacity to offer guarantees and get access to bank loans. Although female have the freedom to establish their own businesses, the Commercial Code allows husbands to end up their wives' commercial activity by simply notifying the clerk of the commerce tribunal of their opposition based upon the family's interest (Fonjong 2001; Evou et al. 2006; Kuepie et al. 2013). Efforts to alleviate female entrepreneurs financial frictions matter therefore to macroeconomics outcomes and economic development. As result, the proposed research seeks to answer the following questions:

How does female entrepreneurship financial constraint affects macroeconomic outcomes in Cameroon?

What type of financial sector reform is needed to overcome this constraint for broader macroeconomic performances and economic development in Cameroon?

[2] Cameroon's Constitution upholds the principle of gender equality. Cameroon ratified the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) in 1994. In 2005, Cameroon also ratified the Optional Protocol to the Convention, which came into effect in the same year.

2. Literature review

The literature that studies macroeconomic implications of financial frictions emerges right after the great depressions. In the one hand, authors highlight the prominence of financial frictions and the intrinsic instability of the financial system (Fisher 1933; Keynes 1936; Gurley and Shaw 1955; Minsky 1957; Kindleberger 1978). In the other linking, they emphasized the core implication of financial stability for monetary economics (Patinkin 1956; Tobin 1969). Recently, the mid-2007 global financial crisis renewed the role of financial frictions as the foremost driver of business cycle fluctuations (Brunnermeier et al. 2012). Hence, economist recognized that financial sector imperfections are relevant not only to explain economic developments and the impact of financial shocks on real economy, but also to design appropriate stabilizations policy (Calza et al. 2009; Gerali et al. 2010; Iacoviello and Neri 2010; Brzoza-Brzezina and Kolasa 2012).

The financial frictions are empirically documented by two alternatives approaches. The first approach is the External Finance Premium version, which represents the Price of Loans based financial frictions. The second approach is the Collateral Constraints version, which represents the Quantity of Loans based financial frictions (Brzoza-Brzezina and Kolasa 2012). The literature offers different micro-foundations for different financing frictions. The first micro-foundation is the costly state verification framework of Townsend (1979) where the basic friction is due to information asymmetry about the future payoff of the project. The second micro-foundation is the quantity-rationing framework as in Stiglitz and Weiss (1981) for non-collateralized credit. The third micro-foundation is the incomplete markets framework of Hart and Moore (1994) for collateralized constraints.

The External Finance Premium version of financial frictions grounds its micro-foundation from the costly state verification of Townsend (1979), because monitoring a loan applicant is costly, which drives an external finance premium between the

lending rate and the risk free rate[3]. This version originates from the seminal paper of Bernanke and Gertler (1989). The model of Bernanke and Gertler (1989) reveals that temporary shocks have a much stronger persistence through feedback effects of tightened financial frictions. Thus, negative shocks to entrepreneurs net worth increase the financial frictions and force the entrepreneurs to invest less. As result, the level of capital and the entrepreneur net worth decline in the following period. Subsequently, this decline leads once more to decrease investment and lower net worth in the following periods. However, this original model uses a framework where agents lived only for two periods. Carlstrom and Fuerst (1997) further developed this model by considering agents who are infinitely lived. They demonstrates that the endogenously agency cost could potentially alter the business-cycle dynamics, because agency-cost model replicates the empirical facts that output growth displays positive autocorrelation at short horizons. The fact that households delay the investment decisions until agency costs are at their lowest motivates the hump-shape output growth behavior. Agency cost fall with time because the productivity shock increases the return to internal funds, which in turn redistributes wealth from households to entrepreneurs. However, the shift in the supply of capital caused by the lower net worth of entrepreneur also leads to a higher price of capital. This increase in price has a dampening effect on the propagation of the net worth shock. Nevertheless, the amplification effect of shocks is inexistent in the Carlstrom and Fuerst (1997) model. Bernanke et al (1999) made thus several changes to the Carlstrom and Fuerst (1997) model to capture the complete dynamic of the New-Keynesian framework. The Bernanke et al (1999) model becomes thus the workhorse financial accelerator model in the 2000s. Authors introduce nonlinear capital adjustment costs in the model, which are the driving force of the amplifications effects. In fact, similarly Bernanke and Gertler (1989) model and Carlstrom and Fuerst (1997) model, shocks to entrepreneurs net worth are persistent, but the particularity in the Bernanke et al (1999) model is the amplification effect of the shock. Hence, following a negative shock to entrepreneur net worth, the decrease in aggregate

[3] The costly state verification of Townsend (1979) arises from the standard information asymmetry problem where the borrower or entrepreneur has private information about its performance contrast to lender or bank that does not have any information. To obtain this information, the lender should pay a monitoring cost, which justifies an external finance premium for the borrower.

capital reduces the price of capital due to the convex adjustment costs. This lower price further decreases entrepreneur net worth, amplifying the original shock. Overall, the three models, such as, the Bernanke and Gertler (1989) model, the Carlstrom and Fuerst (1997) model and the Bernanke et al (1999) model, do not solve the complete dynamic of their models. Instead they log-linearized the model around the steady state and study the impulse response of the endogenous variable in the linearized model. Consequently the baseline Bernanke et al (1999) New Keynesian model has been generalized during last decade in several directions, such as, to emphasize the prominence role of financial accelerator mechanism (Greave 2008; Christensen and Dib 2008; Queijo Von Heideken 2009; Gilchrist et al 2009), to analyze the role of financial frictions during the Great depression (Christiano et al. 2003), to study business cycle implication of financial frictions (Christiano et al. 2010), to provides an endogenous explanations for steady state differentials between lending and money market rates (Goodfriend and McCallum 2007), to derive optimal monetary policy in the presence of time-varying interest rate spreads in a simple model with heterogeneous households and bank capital channel (Badarau and levieuge 2011).

The Collaterals Constraints version of financial frictions grounds its micro-foundation from the incomplete markets framework of Hart and Moore (1994), because the amount of credit issuance by lenders to entrepreneurs is limited through collaterals constraints. This second version of financial frictions have been introduced by the innovative paper of Kiyotaki and Moore (1997), where a model is constructed to capture how credit constraints interact with aggregate economic activity over the business cycle. Agents are heterogeneous in terms of their rate of time preference, which divides them into lenders and borrowers. The financial sector intermediates between these groups and introduces frictions by requiring that borrowers provide collateral for their loans. The need of collateral is motivated by the absence of contract enforcement in the economy and collateral constraint is set exogenously. Authors highlighted that, the dynamic interaction between financing constraints and assets prices is a powerful transmission mechanism by which the effect of shocks persists, amplify, and spill over to other sectors. The strand of literature following Kiyotaki and Moore (1997) has stressed the relevance of the link between the value of borrower's collateral and their access to funds in amplifying the economy's response to shocks. Iacoviello (2005) extended the seminal model of Kiyotaki and

Moore (1997) by introducing balance sheet channel. In a DSGE framework with households, banks and entrepreneurs each facing endogenous borrowing constraint, he assesses how repayment shocks undermine the flow of funds between savers and borrowers in the recent recession. Iacoviello and Neri (2010) go forward by introducing housing as collaterals. If act they introduced an ad hoc collateral constraint into a DSGE model with two households where impatient households borrow from the patient households against their housing wealth used as collateral, in order to study the role of housing market shocks on the economy. However, the exact form of the collateral constraint is not derived based on the optimal actions of agents and the model dos not leave space for household's default. Gerali et al. (2010) and Brzoza-Brzezina and Makarsi (2010) use DSGE models with collateral constraints and monopolistic competition in the banking sector to examine the impact of financial frictions on monetary transmission and a credit crunch scenario. Carlstrom et al. 2010 study the linear quadratic optimal monetary policy in DSGE model in which risk-neutral entrepreneurs pay some of their workers after production and must therefore commit some collateral to back the promised wages. Brunnermeier and Sannikov (2011), Jeanne and Korinek (2010), Mendoza (2010), advanced the development of Collateral Constraints by allowing for occasionally rather than eternally binding collateral constraints. Guerrieri and Iacoviello (2014) use a non-linear DSGE model where occasionally binding collateral constraints on housing wealth drive an asymmetry in the link between housing prices and economy activity. The key result is that as collateral constraints become slack, expanding housing wealth makes a small contribution to consumption growth. All these developments leave no doubt that a successful macroeconomic model that aims at capturing the salient features of the business cycle should be able to account for financial frictions developments and the linkages between these features with the rest of the economy. The collateral constraint version of financial frictions improves in many areas the business cycle properties than external finance premium version and is more suitable for DSGE model with financial frictions (Chari et al. 2007; Brzoza-Brzezina et al. 2011; Brzoza-Brzezina and Kolasa 2012).

Overall, the study of macroeconomics implications of financial frictions is exclusively based on DSGE models. The framework can be Real Business Cycles (RBC) approach

or New-Keynesian approach depending of the objective of the research. The type of financial frictions can be External Finance Premium version or Collaterals Constraints version, depending of the context of the studied economy. Nevertheless, all the previous models until now mainly focus on the heterogeneity of households, or the heterogeneity of financial system or banking sector. None of the models put emphasize on entrepreneur side. This research would goes beyond this limit by highlighting the entrepreneur heterogeneity, and specifically by introducing gender issue in the financial frictions. To the best of our knowledge this is the first attempt to develop a DSGE model with financial frictions in Africa, namely in Cameroon.

3. Methodology: a DSGE Model with Gendered Financial Frictions

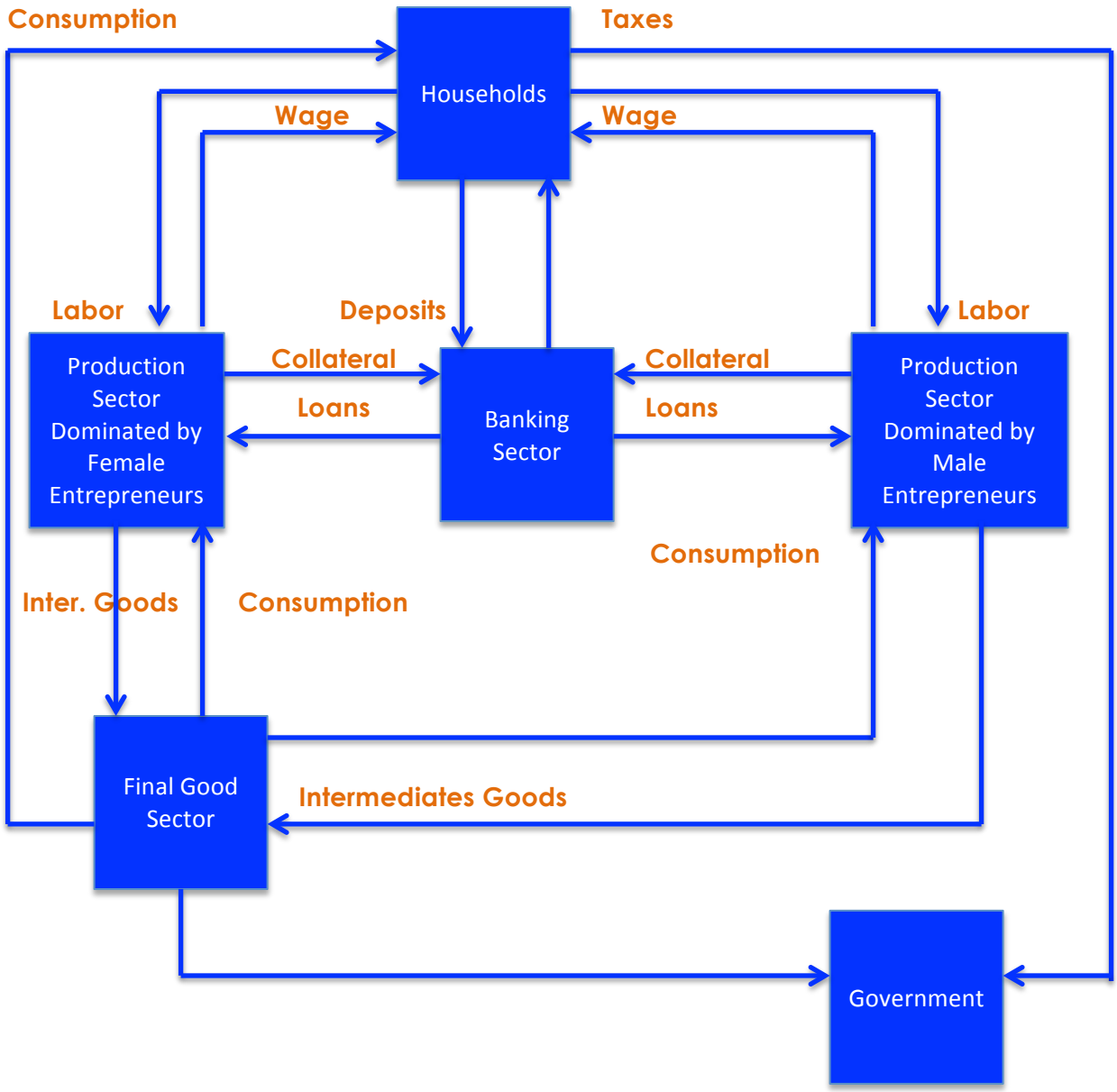
This research uses a Dynamic Stochastic General Equilibrium (DSGE) model with financial micro-foundations to analyze the problem of gendered-specific financial frictions and its macroeconomic implications in Cameroon. The model grounds its analytic framework from the Real Business Cycle (RBC) approach (Cooley and Hansen 1989; Stadler 1994; Carlstrom and Fuerst 1997; Kiyotaki and Moore 1997; Gertler and Kiyotaki 2010; Gilchrist and Zakrajcek 2011).

The general features of the model are as follows. First, gender issues are introduced in the model via heterogeneity in production. The model features two sectors, and we interpret the first as being populated by female entrepreneurs and the second by male entrepreneurs. Second, while both sectors are financially constrained, the one populated by male entrepreneurs is less constrained and the one populated by female entrepreneurs is more constrained. Third, our model's financial sector is characteristic of African economies, and is dominated by the banking sector, that financed entrepreneurs' operations via bank loans that are sourced through households' deposits. Fourthly, this financial intermediation process between banks and entrepreneurs is subject to financial frictions that affect how much entrepreneur can borrow. Finally, households supply labor to both sectors and use their wages, as well as dividends from bank to consume, save and pay government taxes, (as shown in the flow chart of Figure 10 in Appendix).

In the model, financial frictions appear because both types of entrepreneurs face a collateral constraint when borrowing from the bank and credit limits are affected by the quantity and the value of this collateral.[4] In turn, the collateral's value can be affected by the size of the credit limits. Thus dynamic interaction between credit limits and collateral is a powerful transmission mechanism by which the shocks affecting the financial sector spillover to the real sector. Specifically, since physical capital are used as collateral to obtain loans and as inputs to produce intermediate goods, a transitory shock that reduces the productive capacity of entrepreneurs, also reduces their ability to borrow and forces them to cut back on their investment expenditures and, thus, on their demand for capital. This situation would have huge repercussion in their activities even in the upcoming periods. They would earn less revenue, their production would more falls, and, again because of credit constraints, they would further reduce investment. For the development of the model, we use a simplified framework including representative agents.

[4] The collateral constraints model improve in many areas the business cycle properties than the external finance premium (Kiyotaki and Moore 1997).

Figure 1: The pictogram of the Theoretical DSGE model



3.1. Households

A continuum of infinitely-lived households obtains utility from consumption c_t^H and labor supply n_t. Their intertemporal optimization problem is to maximize lifetime utility function:

$$U_0 = E_0 \sum_{t=0}^{\infty} \varpi_t \beta_H^t \left(log c_t^H + \vartheta_t log(1 - n_t) \right). \quad (1)$$

Here ϖ_t stands for a preference shock affecting the marginal utility of households, β_H denotes the household's discount factor and ϑ_t represents a preference shock affecting the marginal utility of the labor supply.[5]

Households allocate their labor to two production sectors of the economy: the composite labor index, n_t, thus consists of hours worked in the production sector dominated by female entrepreneurs, n_t^F, and in the sector dominated by male entrepreneurs, n_t^M, following the CES aggregator:

$$n_t = \left[(1 - \theta_H)^{\frac{1}{\tau}} (n_t^F)^{\frac{\tau-1}{\tau}} + \theta_H^{\frac{1}{\tau}} (n_t^M)^{\frac{\tau-1}{\tau}} \right]^{\frac{\tau}{\tau-1}}, \quad (2)$$

Where θ_H stands for the share of employment in the production sector dominated by male entrepreneurs and $1 - \theta_H$ therefor is the share of employment in the production sector dominated by female entrepreneurs. In addition, τ is the elasticity of substitution between the two productions sectors for labor supply.

This form of labor market specification is justified by the way we capture the concept of representative agent in the model. The assumption of representative agent does not literally means that one household divide its work time in both sectors; rather it is meant to represent a situation where a continuum of agents coexist but these different agents are sufficiently similar that treating them as the same introduce no first-order problems. In such a context, equation (2) is simply interpreted as reflecting the presence of heterogeneity, mainly related to skills or education in the case of Cameroon, that makes the substitution of labor from one sector to another imperfect. As result, skilled or educated households mostly supply labor hours to the male

[5] We assume that households are ricardians households, so their discount factor β_H is expected to be highest.

entrepreneurs sector, by contrast, unskilled or uneducated households mostly supply their labor hours to the female entrepreneurs sector.

The representative household maximizes (1) subject to the intertemporal budget constraint:

$$c_t^H + D_t = w_t^F n_t^F + w_t^M n_t^M + R_{D,t-1} D_{t-1} + \Xi_t - T_t \quad , \quad (3)$$

The right hand side of (3) describes the household's resources and the left hand side represents the uses of these resources. The household financial resources come from real wages received from female entrepreneurs dominated production sector, $w_t^F n_t^F$, and male entrepreneurs dominated production sector, $w_t^M n_t^M$, interest on deposits at the bank, $R_{D,t-1} D_{t-1}$, and profit from bank shares' they owned, Ξ_t. The household financial resources are used for consumption, c_t^H, deposits at the commercial banks, D_t, and lump sum tax paid to government, T_t.

The Lagrangian for the household optimization problem is written as follows:

$$L = E_o\left[\sum_{t=0}^{\infty} (\beta_H)^t \, u(c_t^H, n_t) + \sum_{t=0}^{\infty} (\beta_H)^t \lambda_t \left(w_t^F n_t^F + w_t^M n_t^M + R_{D,t-1} D_{t-1} + \Xi_t - c_t^H - D_t - T_t\right)\right] , \quad (4)$$

Here λ_t is the Langrange multiplier on the representative household budget constraint (3) and optimization is subject to the definition of the composite labor effort, n_t, (2).

Households optimize over c_t^H, n_t^F, n_t^M, and D_t, taking prices and the initial values of the price level P_0 as well as the deposits D_0 as given. This yields first-order conditions

for consumption, labor supply and deposits.[6] From which we then we derive the following expressions:

$$\lambda_t = \frac{1}{c_t^H}\frac{1}{\varpi_t} \ ; \ (5)$$

$$\lambda_t w_t^F = \frac{\vartheta_t\left[(1-\theta_H)^{\frac{1}{\tau}}\left(n_t^F\right)^{\frac{\tau-1}{\tau}}+(\theta_H)^{\frac{1}{\tau}}\left(n_t^M\right)^{\frac{\tau-1}{\tau}}\right]^{\frac{\tau}{\tau-1}-1}(1-\theta_H)^{\frac{1}{\tau}}\left(n_t^F\right)^{\frac{\tau-1}{\tau}-1}}{(1-n)} \ ; \ (6)$$

$$\lambda_t w_t^M = \frac{\vartheta_t\left[(1-\theta_H)^{\frac{1}{\tau}}\left(n_t^F\right)^{\frac{\tau-1}{\tau}}+(\theta_H)^{\frac{1}{\tau}}\left(n_t^M\right)^{\frac{\tau-1}{\tau}}\right]^{\frac{\tau}{\tau-1}-1}(\theta_H)^{\frac{1}{\tau}}\left(n_t^M\right)^{\frac{\tau-1}{\tau}-1}}{(1-n)} \ ; \ (7)$$

$$\lambda_t = \varpi_t(\beta_H)^t E_t\left[\lambda_{t+1}R_{d,t}\right] \ . \ (8)$$

And in turn, these imply that in equilibrium, the marginal rate of substitution between consumption and labor is equal to the real wage.

3.2. Production Sectors of Intermediate Goods

There is a continuum of infinitely lived agents involved in the production process. Some are female entrepreneurs and some are male entrepreneurs. Both female and male entrepreneurs produce intermediate goods, consume final gods, accumulate physical capital and pay wages to their workers, which are the households, whose optimization problems have just been discussed. They are both financially constrained but evolve in two parallel production sectors that produce two imperfectly substitutable intermediate goods.

4.2.1. Production Sector Dominated by Female Entrepreneurs

Female entrepreneurs have bought capital, k_{t-1}^F, in the last period, using bank loans, and in period t will use that capital, alongside hired labor, to produce final goods; with the proceeds, she will pay labor, consume, pay back bank loans, and buy new capital for tomorrow subject to financing constraint. Since female entrepreneurs are

[6] The derivative with respect to λ_t is omitted since it is equal to the budget constraint. This conditions result from the more general Kuhn-Tucker conditions assuming that all variables and multipliers are strictly positive.

credit constrained, they discount the future more heavily than the households and the male entrepreneurs and this behavior guarantees into the model that the credit constraints will be bind in the neighborhood of the steady state. The representative female entrepreneur maximizes thus its expected utility, which is as follows:

$$U_o = E_0 \sum_{t=0}^{\infty} (\beta_F)^t \log c_t^F \ , \ (9)$$

Where, β_F, stands for the female entrepreneur's consumer intertemporal discount factor and c_t^F is her individual consumption.

This entrepreneur maximizes (9) subject to the budget constraint:

$$c_t^F + w_t^F n_t^F + R_{L,t-1}^F L_{t-1}^F + q_t^M k_t^F = p_t^F y_t^F + L_t^F + q_t^F (1-\delta) k_{t-1}^F . (10)$$

The right hand side of (10) describes the female entrepreneur's resources and the left hand side represents the uses of these resources. The female entrepreneur financial resources come from revenue of final goods produced, $p_t^F y_t^F$, bank loans, L_t^F, and yields of physical capital invested, $q_t^F (1-\delta) k_{t-1}^F$. The female entrepreneur financial resources are used to consume, c_t^F, to pay wage to workers, $w_t^F n_t^F$, pay bank loans, $R_{L,t-1}^F L_{t-1}^F$, and buy new capital for tomorrow, $q_t^M k_t^F$.

Here y_t^F stands for the intermediate goods supplied by the production sector dominated by female entrepreneurs, k_{t-1}^F represents units of physical capital that were purchased at the price q_{t-1}^F, L_t^F is loans granted by banks to the production sector dominated by female entrepreneurs on which the interest to pay is $R_{L,t}^F$, n_t^F denotes the amount of labor hired by the sector at the wage w_t^F.

The representative female entrepreneur has access to the following production function that takes labor and capital inputs and turns them into goods:

$$y_t^F = a_t^F (n_t^F)^{1-\alpha} (k_{t-1}^F)^{\alpha} \ , \quad (11)$$

Where α represents the labor share in the production sector and a_t^F measures the total productivity factor, (TPF).

The equation of motion for the stock of physical capital is given by:

$$k_t^F = (1-\delta) k_{t-1}^F + i_t^F \ , (12)$$

Where i_t^F represents investment in physical capital and $\delta \, is$ the depreciation rate of capital.

The financial frictions arise as follows. We assume that the amount of loans one entrepreneur can obtain is constrained by the value of the collateral it can pledge. In this model, collateral is materialized by, the physical capital holding. The process implies that how much physical capital an entrepreneur can accumulate depends on the minimum loan return required by banks, which in turn depends on three mains components: the LTV ratio, the expected future price of capital pledge as collateral and the real interest rate on loans. Consequently, the variations of quantity of collateral modify the transmission of shocks and can amplify their effects.

Written in equation term, this friction reads like:

$$R_{L,t}^F \, L_t^F \leq V_t^F \left((1-\delta) k_t^F \right) E_t [q_{t+1}^F] \ , (13)$$

Where V_t^F stands for the maximum loan to value (LTV) ratio available to the entrepreneur and determines the amount of loans that banks make available to female entrepreneurs for a given value of the capital pledge. The borrowing constraint (13) shows that, female entrepreneurs cannot borrow more than a fraction V_t^F of the expected value of their stock of capital.

The Lagrangian for the optimization problem is as follows:

$$L = E_o\left[\sum_{t=0}^{\infty}(\beta_F)^t\, u(c_t^F) + \sum_{t=0}^{\infty}(\beta_F)^t \lambda_t^F\left(\, p_t^F\; y_t^F + L_t^F \; + q_t(1-\delta)k_{t-1}^F \; - c_t^F - w_t^F n_t^F - R_{L,t-1}^F L_{t-1}^F - q_t k_t^F\right) + \sum_{t=0}^{\infty}(\beta_F)^t \lambda_{F,t}^V\left(V_t^F\left((1-\delta)k_t^F\right) E_t[q_{t+1}^F] - R_{L,t}^F\; L_t^F\right)\right] \quad , \text{(14)}$$

Where λ_t^F is the Lagrange multiplier on the budget constraint (10) and $\lambda_{F,t}^V$ is the Lagrange multiplier on the borrowing constraint (13).

The first-order conditions for consumption, labor, physical capital and loans demanded are expressed as:

$$\lambda_t^F = \frac{1}{c_t^F} \quad , \text{(15)}$$

$$w_t = \frac{(1-\alpha)Y_t^F}{n_t^F} \quad , \text{(16)}$$

$$\lambda_t^F q_t^F = E_t\left[\beta_F \lambda_{t+1}^F\left(\frac{\alpha\, p_{t+1}^F Y_{t+1}^F}{K_t^F} + (1-\delta)q_{t+1}^F\right) + \lambda_{F,t}^V V_t^F (1-\delta)\frac{q_{t+1}^F}{R_{L,t}^F}\right], \text{(17)}$$

$$\lambda_t^F - \lambda_{F,t}^V = \beta_F E_t[\lambda_{t+1}^F] R_{L,t}^F \quad , \text{(18)}$$

Equation (17) shows that the value of the physical capital in the sector dominated by female entrepreneurs closely depends notably on its future productive capacity but also on its value as collateral. Equation (18) demonstrates that the lending rate $R_{L,t}^F$ would determine the sign of the collateral constraint.

4.2.2. Production Sector dominated by Male Entrepreneurs

Before starting we shall mention that, the male entrepreneur's problem is very similar to that of the female one, so this sub-section will be written in a more concise manner. Within the production sector dominated by male entrepreneurs, the representative male entrepreneur maximizes its expected utility described as follows:

$$U_o = E_0 \sum_{t=0}^{\infty} (\beta_M)^t \log c_t^M \ , (19)$$

Where, β_M, stands for the male entrepreneur discount factor and c_t^M represents his consumption. Since male entrepreneurs are also credit constrained but less than female entrepreneurs, they discount the future less heavily than the male entrepreneurs.

The representative male entrepreneur solve (19) subject to an intertemporal budget constraint:

$$c_t^M + w_t^M n_t^M + R_{L,t-1}^M L_{t-1}^M + q_t^M k_t^M = p_t^M y_t^M + L_t^M + q_t^M (1-\delta) k_{t-1}^M \ , (20)$$

The representative male entrepreneur has access to the following production function that takes labor and capital inputs and turns them into goods:

$$y_t^M = a_t^M (n_t^M)^{1-\alpha} (k_{t-1}^M)^{\alpha} \ , (21)$$

The equation of motion for the stock of physical capital is given by:

$$k_t^M = (1-\delta) k_{t-1}^M + i_t^M \ , (22)$$

The equation of is friction reads like:

$$R_{L,t}^M \, L_t^M \leq V_t^M \left((1-\delta) k_t^M \right) E_t [q_{t+1}^M] \ , (23)$$

The Lagrangian for the optimization problem is as follows:

$$L = E_o\left[\sum_{t=0}^{\infty}(\beta_M)^t\, u(c_t^M) + \sum_{t=0}^{\infty}(\beta_M)^t \lambda_t^M \left(p_t^M\, y_t^M + L_t^M \; + q_t^M(1-\delta)k_{t-1}^M \; - \right.\right.$$
$$c_t^M - w_t^M n_t^M - R_{L,t-1}^M L_{t-1}^M - q_t k_t^M\Big) +$$
$$\left.\sum_{t=0}^{\infty}(\beta_M)^t \lambda_{M,t}^V \left(V_t^M\left((1-\delta)k_t^M\right) E_t[q_{t+1}^M] - R_{L,t}^F\, L_t^F\right)\right] \text{, (24)}$$

The first-order conditions for consumption, labor, physical capital and loans demanded are expressed as:

$$\lambda_t^M = \frac{1}{c_t^M} \quad \text{, (25)}$$

$$w_t^M = \frac{(1-\alpha)Y_t^M}{n_t^M} \quad \text{, (26)}$$

$$\lambda_t^M q_t^M = E_t\left[\beta_M \lambda_{t+1}^M \left(\frac{\alpha\, p_{t+1}^M Y_{t+1}^M}{K_t^M} + (1-\delta)q_{t+1}^M\right) + \lambda_{M,t}^V V_t^M (1-\delta)\frac{q_{t+1}^M}{R_{L,t}^M}\right], \text{(27)}$$

$$\lambda_t^M - \lambda_{M,t}^V = \beta_M E_t[\lambda_{t+1}^M] R_{L,t}^M \quad \text{, (28)}$$

Overall, the take away of this sub-section is that, the model has two key differences between female and male entrepreneur. First, the discount factor for female entrepreneur β_F is lower than male entrepreneur discount factor β_M. This feature implies that female entrepreneur' ability to save capital is reduced. Second, the female entrepreneur' maximal LTV ratio in their borrowing constraint V_t^F is lower than male entrepreneur one V_t^M. This second feature means that female entrepreneurs can't pledge their accumulated capital as efficiently as male entrepreneurs.

4. 3. Final Goods Production Sector

Firms producing the economy's final good y_t use the intermediate goods supplied by the sector dominated by female entrepreneurs y_t^F and those offered by the male-dominated sector y_t^M, using the following CES production function:

$$y = \left[(1-\theta_y)^{\frac{1}{\mu}} (y_t^F)^{\frac{(\mu-1)}{\mu}} + (\theta_y)^{\frac{1}{\mu}} (y_t^M)^{\frac{(\mu-1)}{\mu}}\right]^{\frac{\mu}{\mu-1}} \quad , (29)$$

The firm chooses y_t^F and y_t^M, to maximize its profits, given the production function and inputs price p_t^F and p_t^M:

$$\max_{y_t^F, y_t^M} [y_t - (p_t^F y_t^F + p_t^M y_t^M)] \ , (30)$$

S.t :

$$y = \left[(1-\theta_y)^{\frac{1}{\mu}} (y_t^F)^{\frac{(\mu-1)}{\mu}} + (\theta_y)^{\frac{1}{\mu}} (y_t^M)^{\frac{(\mu-1)}{\mu}}\right]^{\frac{\mu}{\mu-1}} , (31)$$

The first order conditions for this problem imply the following demand for the output of the sector dominated by female entrepreneurs:

$$y_t^F = (1-\theta_y)(p_t^F)^{-\mu} y_t \ , (32)$$

And its counterpart for the sector dominated by male entrepreneurs:

$$y_t^M = (\theta_y)(p_t^M)^{-\mu} y_t \ . (33)$$

Because final goods producing firms operate under perfect competition profits are zero. Further, inserting the demand function into the profit function and imposing the zero profit condition reveal that the only price P_t that is consistent with this requirement is given by:

$$P_t = 1 = \left[\left(1-\theta_y\right)\left(p_t^F\right)^{(1-\mu)} + \theta_y\left(p_t^M\right)^{(1-\mu)}\right] \text{ , (34)}$$

We shall recall that our model is based on RBC approach and one of its key assumptions is the flexibility of price. Hence, P_t the price of final goods serves to set inputs price p_t^F and p_t^M. Since final good is the economy's numeraire, its price P_t equals 1 in equilibrium.

4. 4. Capital Producing Sector

Capital producers purchase final goods as investment goods I_t and transform them into physical capital that it is sold then to both types of entrepreneurs. These producers choose the quantity of investment to maximize profits as follows:

$$\max E_t \; _{I_t}\left[q_t I_t - I_t - \frac{\Psi}{2}\left(\frac{I_t}{k_t} - \delta\right)^2 k_t\right] . \text{ (35)}$$

The first order condition (relative to investment I_t) is given by:

$$E_t\left[q_t - 1 - \Psi\left(\frac{I_t}{k_t} - \delta\right)\right] = 0 . \text{ (36)}$$

Since capital producers face an adjustment cost$\left(\frac{\Psi}{2}\left(\frac{I_t}{k_t} - \delta\right)^2 k_t\right)$ relation (36) highlights the relationship between the price of physical capital q_t and the marginal cost of adjustment. Note however that, at the stationary state, those adjustment costs are not active and the price of capital therefor equals one.

4.5.Banking sector

The representative bank intervenes in the model as loans supplier to both entrepreneurial sectors. It solves the following problem:

$$\text{Max } E_0 \sum_{t=0}^{\infty} \left(\frac{\lambda_t}{\lambda_{t-1}}\right) \beta_H^t DIV_t \quad , \quad (37)$$

Where DIV_t represents the dividends paid to households by the bank, the ultimate owners of bank shares. Note that as a result, in the banking sector optimization problem, the discount factor is the same as in the household program. As in equation (4), here, λ_t, represents the marginal utility of wealth.

Banks optimize subject to the flow of funds constraint

$$DIV_t + R_{D,t-1} D_{t-1} + L_t^F + L_t^M = D_t + R_{L,t-1}^F L_{t-1}^F + R_{L,t-1}^M L_{t-1}^M \quad , \quad (38)$$

and the balance sheet identity:[7]

$$D_t = L_t^F + L_t^M \quad . \quad (39)$$

Here D_t represents households' deposits collected by the banking sector, L_t are the total loans offered while L_t^F and L_t^M are loans to the sector dominated by female and male entrepreneurs respectively.

The Lagrangian associated with the banker's optimization problem is the following:

$$L = E_o \left[\sum_{t=0}^{\infty} \left(\frac{\lambda_t}{\lambda_{t-1}}\right) \beta_H^t DIV_t + \sum_{t=0}^{\infty} \left(\frac{\lambda_t}{\lambda_{t-1}}\right) \beta_H^t \left(D_t + R_{L,t-1}^F L_{t-1}^F + R_{L,t-1}^M L_{t-1}^M - R_{D,t-1} D_{t-1} - L_t^F - L_t^M\right)\right] , \quad (40)$$

[7] In fact, the flow of funds constraint of the banking sector implicitly states that deposits can be freely converted into loans.

With the associated first-order conditions for the choice of, D_t, L_t^F and L_t^M :

$$\frac{\partial L_B}{\partial D_t} = \left(\frac{\lambda_t}{\lambda_{t-1}}\right)\beta_H^t - E_t\left[\left(\frac{\lambda_{t+1}}{\lambda_t}\right)(\beta_H)^{t+1}\right]R_{D,t} = 0 \quad , (41)$$

$$\frac{\partial L_B}{\partial L_t^F} = E_t\left[\left(\frac{\lambda_{t+1}}{\lambda_t}\right)(\beta_H)^{t+1}\right]R_{L,t}^F - \left(\frac{\lambda_t}{\lambda_{t-1}}\right)\beta_H^t = 0 \quad , (42)$$

$$\frac{\partial L_B}{\partial L_t^M} = E_t\left[\left(\frac{\lambda_{t+1}}{\lambda_t}\right)(\beta_H)^{t+1}\right]R_{L,t}^M - \left(\frac{\lambda_t}{\lambda_{t-1}}\right)\beta_H^t = 0 \quad , (43)$$

With some simplifications, these three simplify to:

$$(\lambda_t) = (\beta_H)^t E_t[\lambda_{t+1}]R_{d,t} \quad , (44)$$

$$(\lambda_t) = (\beta_H)^t E_t[\lambda_{t+1}]R_{L,t}^F \quad , (45)$$

$$(\lambda_t) = (\beta_H)^t E_t[\lambda_{t+1}]R_{L,t}^M \quad , (46)$$

4.6. Government

Government intervenes in the economy, by following a policy of public spending represented by the process g_t. This spending is financed via lump sum taxes T_t and the government budget always binds, so that:

$$g_t = T_t \quad , (47)$$

Note that this implies government debt is absorb from the model but could be introduced later.

4.7. Exogenous Stochastic Variables

The seven exogenous stochastic variables include the preference shock affecting the marginal utility of household ϖ, the preference shock affecting the marginal utility of the labor supply ϑ, the productivity shock hitting the production sector dominated by female entrepreneurs a^F, the productivity shock hitting the production sector dominated by male entrepreneurs a^M, the loan-to-value ratio shock in the sector dominated by female entrepreneurs V^F , its counterpart in the sector dominated by

male entrepreneurs V^M and the fiscal policy shock g . We assume that the exogenous stochastic variables follow AR (1) processes with $\rho \in (0,1)$.

Specifically, we define:

- The shock affecting the marginal utility of household:

$$\varpi_t = \rho_{\varpi}\varpi_{t-1} + \eta_{\varpi} \ , \quad (48)$$

With ρ_{ϖ} the autoregressive coefficient and $\eta_{\varpi}$is the i.i.d. zero mean innovation, with standard deviation σ_{ϖ}.

- The shock affecting the marginal utility of the labor supply:

$$\vartheta_t = \rho_{\vartheta}\vartheta_{t-1} + \eta_{\vartheta} \ , \quad (49)$$

With ρ_{ϑ} the autoregressive coefficient and $\eta_{\vartheta}$is the i.i.d. zero mean innovation, with standard deviation σ_{ϑ}.

- The productivity shock in the sector dominated by female entrepreneurs:

$$a_t^F = \rho_{a^F} a_{t+1}^F + \eta_{a^F} \ , \quad (50)$$

With ρ_{a^F} the autoregressive coefficient and $\eta_{a^F}$is the i.i.d. zero mean innovation, with standard deviation σ_{a^F}.

- The productivity shock in the sector dominated by male entrepreneurs:

$$a_t^M = \rho_{a^M} a_{t+1}^M + \eta_{a^M} \ , \quad (51)$$

With ρ_{a^M} the autoregressive coefficient and $\eta_{a^M}$is the i.i.d. zero mean innovation, with standard deviation σ_{a^M}.

- The Loan-to-Value ratio in the sector dominated by female entrepreneurs:

$$V_t^F = \rho_{V^F} V_{t+1}^F + \eta_{V^F} \ , \quad (52)$$

With ρ_{V^F} the autoregressive coefficient and $\eta_{V^F}$is the i.i.d. zero mean innovation, with standard deviation σ_{V^F}.

- The Loan-to-Value ratio in the sector dominated by male entrepreneurs:

$$V_t^M = \rho_{V^M} V_{t+1}^M + \eta_{V^M} \ , \quad (53)$$

With ρ_{V^M} the autoregressive coefficient and $\eta_{V^M}$is the i.i.d. zero mean innovation, with standard deviation σ_{V^M}.

- The fiscal policy shock:

The public spending is driven by: $g_t = \rho_g \, g_{t-1} + \eta_g$, (54)

With ρ_g the autoregressive coefficient and $\eta_g$is the i.i.d. zero mean innovation, with standard deviation σ_g.

4.7. Market Clearing Conditions

The equilibrium of this model consists of sequences of allocations of quantities $\{Y_t, n_t, c_t^H, c_t^F, c_t^M, k_t^F, k_t^M\}_{t=0}^{\infty}$, of loans and deposits $\{L_t^F;\ L_t^M;\ D_t\}_{t=0}^{\infty}$, of prices $\left\{w_t^M; w_t^F; q_t^M; q_t^M; p_t^M; p_t^F\right\}_{t=0}^{\infty}$ of interest rates $\left\{R_{L,t}^F;\ R_{L,t}^M;\ R_{D,t}\right\}_{t=0}^{\infty}$, of multipliers $\left\{\lambda_t;\ \lambda_t^M;\ \lambda_t^F; \lambda_{M,t}^V; \lambda_{F,t}^V\right\}_{t=0}^{\infty}$and of processes $\left\{\varpi_t, \vartheta_t, a_t^F, a_t^M, V_t^F, V_t^M, g_t\right\}_{t=0}^{\infty}$, such as, on the one hand the allocations solve the household's, the producers, the entrepreneurs and the banking sector problems at the equilibrium prices, and on the other linking, different markets clear. These market-clearing conditions are as follows:

- In the **final goods market**:

$$y_t = c_t + i_t + g_t \quad , (55)$$

Where aggregate consumption c_t is given as:

$$c_t = c_t^H + c_t^F + c_t^M \quad , (56)$$

and the aggregate stock of capital k_t is:

$$k_t = k_t^F + k_t^M \quad , (57)$$

and where, finally, the equilibrium of the Government budget is:

$$g_t = T_t \quad , \quad (58)$$

- In the **labor market**, the market clearing condition is:

$$n_t = n_t^F + n_t^M \quad , (59)$$

- In the **credit market**, the market clearing condition is:

$$L_t^F + L_t^M = D_t \quad , (60)$$

5. Calibration Procedure of the Model

The calibration procedure assigns numerical values to the model's parameters using a mix of previous evidences, appeals to the literature, or by seeking some specific ratios in the data. These appeals are to past experience, the validity of economic theories, opinion of senior experts in the field, stylized facts about the economy and existing empirical literature. The core parameters of the model are calibrated regarding benchmark and different cases. Table 13 presents the results of the calibration of the model parameters in the benchmark.

Table 13: Value of the Calibrated Parameters in the Benchmark

Time Preferences		
$\boldsymbol{\beta_H}$	β_F	β_M
0.99	0.94	0.98

Loan-to-Value Ratios in the Female end Male Sectors	
$\boldsymbol{V^F}$	V^M
0.5	0.8

Production			
$\boldsymbol{\theta_y}$	δ	α	μ
0.5	0.04	0.3	2

Labor Market	
$\boldsymbol{\theta_H}$	τ
0.5	2

We calibrate the discount factors according to the degree of patience or not of economic agent. Because households are patients, their discount factor β_H is set to 0.99, a value generally admitted in the literature. Female entrepreneurs are impatient and their discount factor β_F is calibrated to 0.97 in the range suggested by Iacoviello (2005) and Iacoviello and Neri (2008) for impatient agents. However male entrepreneur are more patient than female entrepreneurs and less patient than household, hence, we calibrate their discount factor β_M to 0.98. The lower value of

discount factor for female entrepreneurs reflects Cameroonian economy features where by contrast to their male counterparts, female entrepreneurs have difficulty projecting themselves in the future and as a result save less and thus accumulate less pledgeable collateral.

The calibration of the Loan to Value ratio (LTV) of female entrepreneurs deserves some attention. Christensen et al. (2007), estimate a lower value of the LTV (0.32), in a model for Canada where firms can borrow against business capital. Iacoviello (2005) estimates a value of 0.89, but, in his model, only commercial real estate can be collateralized. Contrast to those previous study, in our economy entrepreneurs borrow against physical capital. In addition in our model feature heterogeneity among entrepreneurs and female entrepreneurs sector are more constrained than male entrepreneurs sector because they can't pledge their accumulated capital as efficiently as male entrepreneurs. As result, we calibrate a lower value of the LTV for female entrepreneur V^F at 0.5 and a higher value of LTV of male entrepreneurs V^M at 0.8.

The share of employment in the production sector dominated by male entrepreneurs θ_H is set to 0.5 as well as the share of intermediate goods produced in the production sector dominated by female entrepreneurs θ_y. The elasticity of substitution between the both sectors of production for labor supply τ is calibrated at 2 as well as the elasticity of substitution between the two productions sectors for intermediates goods demand μ. The depreciation rate of physical capital δ is set to 0.04 and the share of capital in the production process α is set to (0.3).

6. The Steady-State of the model

Tables 10-12 present the steady state of the model for four versions of the economy. The benchmark case represents the economy's steady state when female entrepreneurs are more financially constrained than male entrepreneurs because of their lower LTV ratio and lower discount factor.

Case 1 illustrates the economy's steady state when the female entrepreneurs sector is less financially constrained. To obtain case 1 result, sector F discount factor β_F changes from a value of 0.94 in the benchmark case to 0.97, to allow female entrepreneurs to become less impatient and increase their savings. In addition, sector F LTV ratio V^F changes from a value of 0.5 in the benchmark case to 0.7, to ease female entrepreneurs financial constraint.

Case 2 determines the economy's steady state when male entrepreneurs sector is more constrained than female entrepreneurs sector. To obtain case 2 result, sector F discount factor β_F changes from a value of 0.97 in case 1 to 0.99 to allow female entrepreneurs to become more patient than male entrepreneurs. In addition, sector F LTV ratio V^F changes from a value of 0.7 in case 1 to 0.9, to allow male entrepreneurs to be more financial constraint than female entrepreneurs.

Case 3 shows the economy's steady state when no sectors are financially constrained. Case 3 result is obtained by setting, in both sectors, the same value for discount factor ($\beta_F = \beta_M = 0.98$) and the same value for LTV ratio ($V^F = V^M = 0.8$).

All the equation of the steady state are available in the Appendix (8.5).

The table 1 shows that in the benchmark economy, the M sector is capital intensive, with a capital-labor ratio equal to 13.03 rather than 6.31 in sector F. as a counterpart,

the table shows that the sector F is labor intensive: the labor input in that sector is 60% of total hours against 40% for the M sector.

Table 1: Features of the Economy's Steady State

Variables	Benchmark
Capital-Labor ratio in sector F ($\boldsymbol{k^F/n^F}$)	6.31
Capital-Labor ratio in sector M ($\boldsymbol{k^M/n^M}$)	13.03
Proportion of value added from sector F ($\boldsymbol{p^F y^F/y}$)	0.52
Proportion of value added from sector M ($\boldsymbol{p^M y^M/y}$)	0.47
Household consumption to GDP $\left(\boldsymbol{C^H/y}\right)$	0.73
Sector F consumption over GDP $\left(\boldsymbol{C^F/y}\right)$	0.047
Sector M consumption over GDP $\left(\boldsymbol{C^M/y}\right)$	0.031
Total consumption over GDP $\left(\boldsymbol{C/y}\right)$	0.81
Sector F investment to GDP $\left(\boldsymbol{I^F/y}\right)$	0.080
Sector M investment to GDP $\left(\boldsymbol{I^M/y}\right)$	0.10
Sector F hours over total hours ($\boldsymbol{n^F/n^F+n^M}$)	0.60
Sector M hours over total hours ($\boldsymbol{n^M/n^F+n^M}$)	0.39

*Sector M is Male Entrepreneurs Sector and Sector F is Female Entrepreneurs Sector.

The table goes on to show that female entrepreneurs consume more (because they care less about the future) and as result, they save less. Male entrepreneurs by contrast, consume less and save more. Hence, the proportion of female entrepreneurs consumption over aggregate GDP is 0.47 against 0.31 for the male entrepreneurs. Due to the previous results, male entrepreneurs accumulate more pledgeable collateral, and realized more investment projects than female entrepreneurs. The proportion of aggregate investment generated by male entrepreneurs over aggregate GDP is 0.10 contrast to 0.08 for the female entrepreneurs production sector.

Furthermore, because the F sector is the most financially constrained, it is relatively expansive to produce in this sector and goods in this sector thus become scarce. As the demand of those goods remains unchanged, their supply collapses and their

prices rise, leading to an increase in the valued added. For the M sector by contrast, it is easier to produce, because of the lower financially constraints, goods from this sector thus become abundant. This increase of M sector supply leads to the decrease of their price, and the value added of the sector therefor decline. Hence, the proportion of value added for F sector (0.52) is greater than the proportion for M sector (0.47).

Table 2: Features of the Economy's Steady State when the Female Entrepreneurs Sector is Less Financially constrained

Variables	Benchmark	Less Financial Constraint	No Financial Constraint
Capital-Labor ratio in sector F ($\boldsymbol{k^F/n^F}$)	6.31	10.53	12.03
Capital-Labor ratio in sector M ($\boldsymbol{k^M/n^M}$)	13.03	12.23	12.03
Proportion of value added from sector F ($\boldsymbol{p^F y^F/y}$)	0.52	0.50	0.5
Proportion of value added from sector M ($\boldsymbol{p^M y^M/y}$)	0.47	0.49	0.5
Household consumption-output ratio $\left(\boldsymbol{C^H/y}\right)$	0.73	0.739	0.74
Sector F consumption-output ratio $\left(\boldsymbol{C^F/y}\right)$	0.047	0.023	0.014
Sector M consumption-output ratio $\left(\boldsymbol{C^M/y}\right)$	0.031	0.017	0.014
Total consumption-output ratio $\left(\boldsymbol{C/y}\right)$	0.81	0.78	0.77
Sector F investment-output ratio $\left(\boldsymbol{I^F/y}\right)$	0.080	0.10	0.11
Sector M investment-output ratio $\left(\boldsymbol{I^M/y}\right)$	0.10	0.11	0.11
Sector F hours over total hours ($\boldsymbol{n^F/n^F+n^M}$)	0.60	0.52	0.5
Sector M hours over total hours ($\boldsymbol{n^M/n^F+n^M}$)	0.39	0.47	0.5

*Sector M is Male Entrepreneurs Sector and Sector F is Female Entrepreneurs Sector.

The results of Table 2 indicate that when the financial constraint is loose, the production sector dominated by female entrepreneurs is becoming capital intensive and performs better than the benchmark case, but less than the case with no financial constraint in both sectors. Thus, as more as female entrepreneurs are less constrained as more as they become capital intensive as male entrepreneurs. The capital-labor ratio of female sector is 40% greater in this second case than under the benchmark, an increase that reaches 47% in the absence of financial constraints in

both sectors. The production sector dominated by male entrepreneurs is becoming labor intensive, and perform better than the benchmark, but less than the no constraint case. The labor hours of male entrepreneurs sector over total labor hours is 17% greater than under the benchmark, an increase that reaches 22% under the case with no constraint.

Moreover, results show that female entrepreneurs are saving more in the current period than in the benchmark case. Male entrepreneurs also save more than in the benchmark case and the case of no constraints. Thus, the female entrepreneurs sector consumption-output ratio is 104% lower than in the benchmark, the decreases that attains 121% under the case with no constraints in both sectors. The increase of female entrepreneurs savings increase the aggregate saving which become more than in the benchmark case but less than in the case with no constraint.

The loosening of female entrepreneurs production sector constraint increases the investment demand of the sector. Results demonstrate that, the proportion of investment of female entrepreneurs sector is 20% greater that under the benchmark, a proportion close to the no constraints case proportion. Hence, as more as female entrepreneurs are less constrained, their investment level increases closer to the male entrepreneurs level.

The ongoing disposal of resources' eases the production of intermediates goods in the female entrepreneurs sector. Their intermediate goods are becoming thus abundant. As the demand of those goods remains unchanged, their supply is increasing and their prices is declining, with a gradual decreasing of their valued added. Whereas, for the male entrepreneurs, they are becoming to lost market share and the supply of their goods decrease is decreasing. As result, their prices is increasing and inducing an increase of the sector value added. The proportion of value added of female entrepreneurs sector is 4% lower than under the benchmark, a proportion equivalent to the case with no constraint in both sectors. In contrast, concerning the male entrepreneurs sector, the proportion of value added is 4% greater than in the benchmark, an increase that reaches 6% under the last case.

Table 3: Features of the Economy's Steady State when the Male Entrepreneurs Sector is More Financially constrained than Female Entrepreneurs Sector

Variables	Benchmark	Sector M More Financial Constraint	No Financial Constraint
Capital-Labor ratio in sector F ($\boldsymbol{k^F/n^F}$)	6.31	13.01	12.03
Capital-Labor ratio in sector M ($\boldsymbol{k^M/n^M}$)	13.03	11.92	12.03
Proportion of value added from sector F ($\boldsymbol{p^F y^F/y}$)	0.52	0.49	0.5
Proportion of value added from sector M ($\boldsymbol{p^M y^M/y}$)	0.47	0.50	0.5
Household consumption-output ratio $\left(\boldsymbol{C^H/y}\right)$	0.73	0.74	0.74
Sector F consumption-output ratio $\left(\boldsymbol{C^F/y}\right)$	0.047	0.0066	0.014
Sector M consumption-output ratio $\left(\boldsymbol{C^M/y}\right)$	0.031	0.0117	0.014
Total consumption-output ratio $\left(\boldsymbol{C/y}\right)$	0.81	0.76	0.77
Sector F investment-output ratio $\left(\boldsymbol{I^F/y}\right)$	0.080	0.119	0.11
Sector M investment-output ratio $\left(\boldsymbol{I^M/y}\right)$	0.10	0.114	0.11
Sector F hours over total hours ($\boldsymbol{n^F/n^F+n^M}$)	0.60	0.48	0.5
Sector M hours over total hours ($\boldsymbol{n^M/n^F+n^M}$)	0.39	0.51	0.5

*Sector M is Male Entrepreneurs Sector and Sector F is Female Entrepreneurs Sector.

The results of Table 3 suggest that when female entrepreneurs are given more credit than male entrepreneurs, the production sector dominated by female entrepreneurs becomes capital intensive and performs better than the case with no financial constraint in both sectors. The capital-labor ratio is 51% greater under this case than in the benchmark case, even greater than the 47% in the no constraint case. Whereas the production sector dominated by male entrepreneurs becomes labor intensive. The labor hours of male entrepreneurs sector over total labor hours is 23% greater than under the benchmark, a rate close to the case without constraint.

The expansion of credit access to female entrepreneurs relative to male entrepreneurs and the increase of their saving provide the sector stance to realize more investment project and enlarge their market share, as much as male

entrepreneurs did. Results demonstrate that, in this case the proportion of investment of female entrepreneurs sector is 15% greater than the benchmark, and even greater than the case with no constraint in both sectors.

Due the fact that the female entrepreneurs production sector has more resources' than male sector, it becomes easier to produce intermediates goods in this sector. The intermediate goods of female sector become thus abundant. As the demand of those goods remains unchanged, their supply increases and their prices decline, leading to a decrease of the valued added. Whereas, for the male entrepreneurs production sector it remains quite difficult to produce intermediates goods because of lack of financing. The intermediate goods of male sector become thus scarce. The decrease of supply of the goods produced by the male entrepreneurs sector leads to the increase of their price, as the demand of those gods remains unchanged. The value added of the sector increase in consequence relative to female sector. The proportion of value added of female entrepreneurs sector is thus 6% lower than the benchmark. In contrast, concerning the male entrepreneurs sector, the proportion of value added is 6% greater that under the benchmark, a rate equivalent to the case where both sectors are non-financially constrained.

7. Simulations Results

This section provides an overview of the benchmark analysis against which counterfactual scenarios can be compared. DSGE models offer the possibility of conducting different alternatives scenarios able to assess the effects of different events or policies on macroeconomics variables. Therefore, in what follows, the analysis of the benchmark and a discussion of three counterfactual scenarios, will be presented.

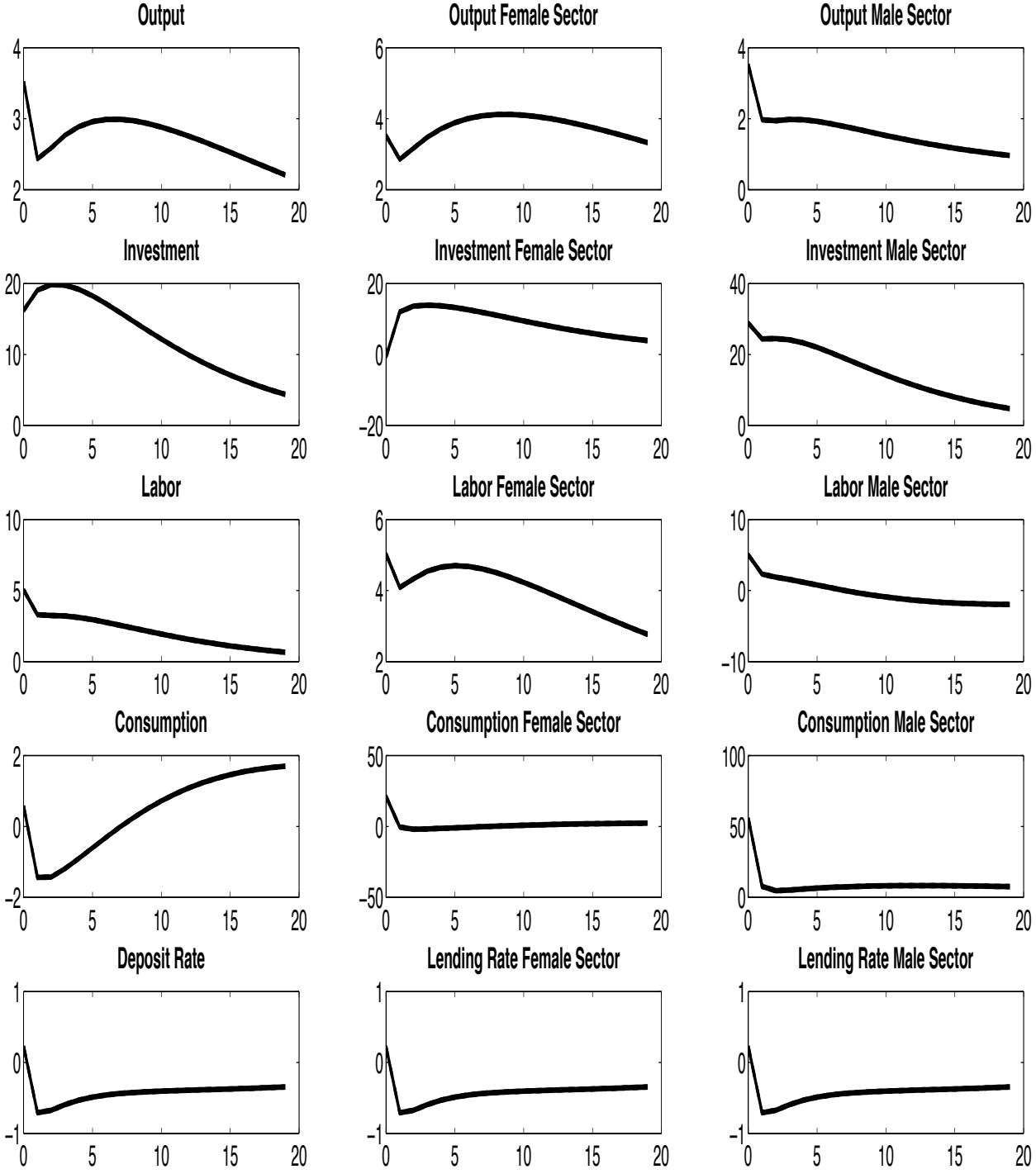
6.1. Benchmark analysis

The benchmark represents the core idea of the research stating that entrepreneurs face collateral constraints when assessing to credit, namely female entrepreneurs. Four mains shocks are involved in the analysis of the benchmark, such as, productivity shock in in each sector, financial shock and fiscal policy shock.

6.1.1. Benchmark analysis when productivity shock hits the female sector

Figure 1 depicts the response of the economy following a one standard deviation positive productivity shock in the female entrepreneurial sector. At first view, the figure shows that the increase in productivity leads to an expansion of the economy. This positive effect promising effect is boosted by the presence of the banking sector in the model and two channels are involved in the propagation of this mechanism: the collateral constraint channel, whereby an innovation changes the shadow value of loans and therefore consumption rises, and the assets-price effect, whereby changes in the level of physical capital alter the value of collateral that entrepreneurs can guarantee. Hence, the accumulation of physical capital pushes the price of physical capital price up, so that entrepreneurs also benefit from the wider access to credit that higher collateral value affords. As result, Investment is enhanced both by the technological improvement and by eased access to credit, so that aggregate saving and output feature a common increase.

Figure 1: A productivity shock in the female' entrepreneur sector

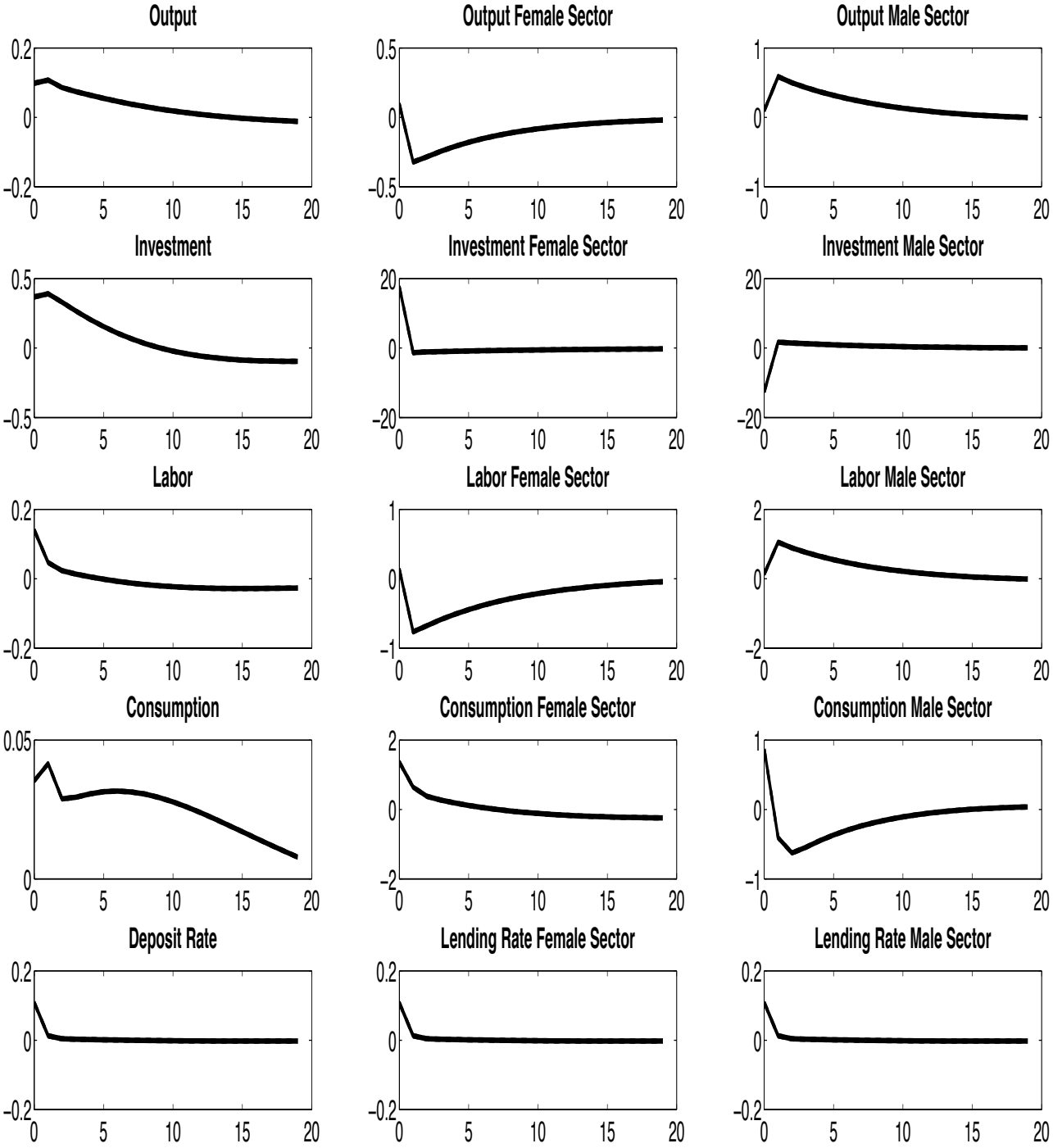


The effect of the shock is positive but less persistent in the production sector dominated by male entrepreneurs. The favorable effect lasts only for one period. In contrast, the productivity shock in the female sector leads to a persistent effect. While the positive effect of the shock is weak at the first period, from the second period, there is a sharp increase of the response, which last for 10 periods. The initially stronger increase of demand induces an even stronger supply of loans due to asset-price effect. This improvement in credit conditions boots real activity and allows both entrepreneurs to expand investment further, which in turn induces a higher price of capital and hence higher collateral valuations, reinforcing the initial effect. The positive effect on the male sector immediately collapse after the first period and give place to a rebound increase of positive effect in female sector with a rise of investment of 10%. The first period is thus the period during which the female sector adjust itself from the positive effect of the productivity shock and take advantage from the male sector.

6.1.2. Benchmark analysis when financial shock hit the male entrepreneurs sector

Figure 2 depicts the economy's reaction following a one standard deviation positive LTV ratio shock in the male sector. An increase of a Loan to Value ratio looses the financial constraint and allows the increase of loans demand. The resulting rise in investment induces an increase in labor hiring and capital demand. Higher demand for capital sharply increases its value, relaxing the collateral constraint further. There is a short-lived increase in the deposit, which decreases sharply afterward and induces the increase of consumption. But this positive effect last only at the first period and the economy starts to sluggish afterward.

Figure 2: a Loan To Value ratio shock in the male' sector in Benchmark

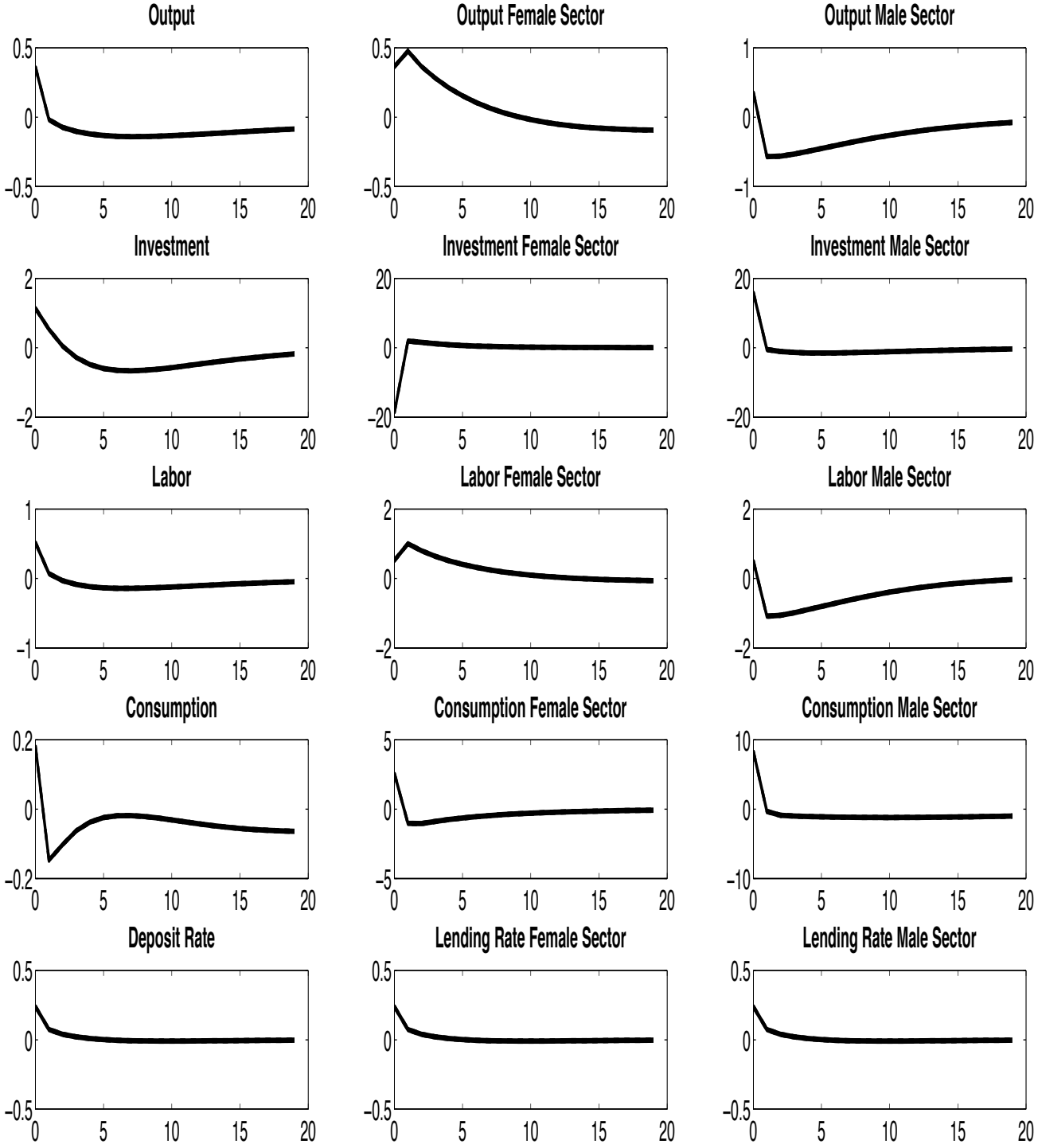


This positive LTV ratio shock to the male sector exerts a contractionary effect at the first period in the male sector, before turning to expansionary effect in the following periods. In contrast, in the female sector, the shock has an expansionary effect in the first period before turning to contractionary effect in the subsequent periods. The main contributor of the economy wealth in this case appears to be the production sector dominated by female entrepreneurs, namely in the first period. Since the female entrepreneurs know that the shock is temporary and that they would not be able to sustain higher investment in the long run, they initially mostly increase investment and only slightly consumption. Subsequently, rising investment and consumption lead to higher output in the female sector. For the male sector in contrast, the shock seems to exert a negative effect, in the first period. The increase in consumption is not enough to offset the low level of investment, as result, the sector produces nothing as output.

6.1.3. Benchmark analysis in presence of a fiscal policy shock

Figure 3 depicts the effect of one standard deviation positive fiscal policy shock in economy. An increase of public expenses essentially financed by taxes paid by household, increase the transfer from household to the government. The increase of taxes payment leads to the decrease of the disposal revenue of household. As result, the demand for deposits in the banking sector will be negatively affected. The fall of deposits induces the decline of banking sector assets. To re-balance its balance sheet, the banking sector will seek to reduce loans and increase deposits. Subsequently, the deposit rate as well as the lending rates will rise. Loans volumes decline for both entrepreneurs, and thus lead to the reduction of funds available for them.

Figure 3: a Fiscal Policy Shock in the Benchmark



This process is intensifying by the collateral constraint channel, as the banking sector could increase the requirements for banks loans supply, including collaterals. Since the production sector dominated by female entrepreneurs are more constrained, this will further accentuate their shortage in the credit market. Female entrepreneurs will cut their investment substantially and their demand for capital. At the same time they will increase labor demand and consumption due to the positive effect of the policy. The increase of consumption will offset the decline of investment and leads to a short increase of output.

In contrast, the male sector is less constrained and will easily overcome the adverse effect of the policy via the collateral channel. The level of loans granted to the sector will be at least identical to level before the policy. The male entrepreneurs' sector will thus increase their investment that counterweighs the fall in investment of the female entrepreneurs sector. Also, to compensate the high cost of capital, the male entrepreneurs sector will increase the demand for labor. The rise on investment and consumption leads to an increase of the output of the sector.

Overall, labor become more productive and the initial increase in labor income sustains consumption of household, and adding by the increase in both sectors' consumption, the aggregate consumption rises. The increase of investment in the male sector sustains the aggregate investment. The increase of aggregate investment and consumption limit the effect of the collateral channel in the female entrepreneurs' sector and lead to an increase of aggregate output.

6.2. Scenarios' analysis

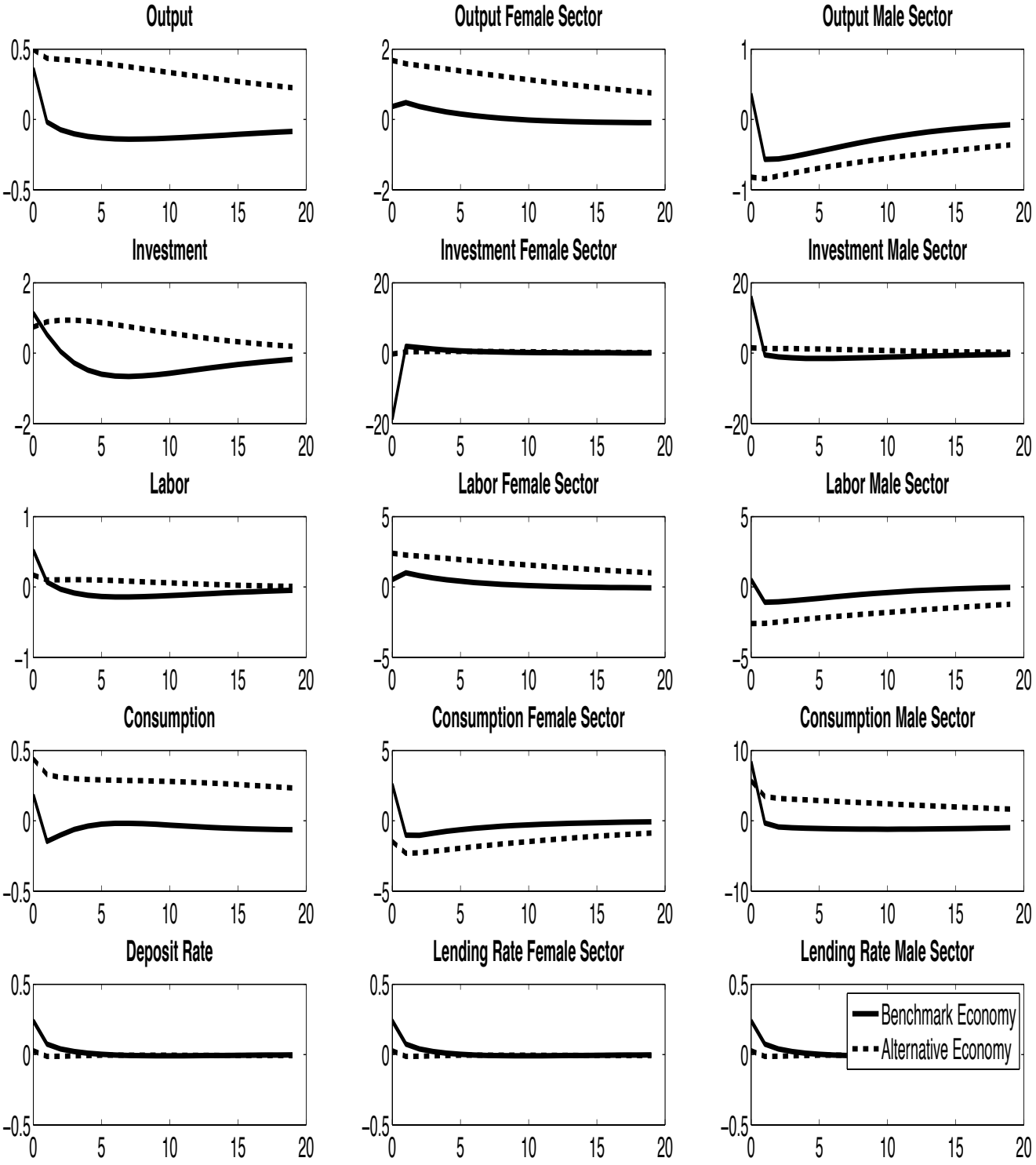
Three mains scenarios are involved in this analysis. At first we simulate an economy where the financial constraint is loose in the female entrepreneurs sector. Secondly, we simulate an economy where the male entrepreneurs sector is more constrained than the female entrepreneurs sector. Finally, we design a scenario where female entrepreneurs sector and male entrepreneurs sector, are given the same amount of financing. Given the type of scenarios, productivity shocks, financial shocks and fiscal policy shock guide us to assess of the economy behavior in each case.

6.2.1. Loosening Financial Constraint in the female entrepreneurs sector

6.2.1.a. The fist scenario in presence of productivity shock in the male sector

Figure 4 denotes a one standard deviation positive productivity shock to the male sector when the financial constraint is releasing in the male sector. Results reveal that, when financial constraint is loosening in the female sector, the expansionary effect of the positive productivity shock that hit the male sector is sustained by the female sector. Basically, the female sector that is now less constrained, reacts to the productivity shock in the male sector by increasing its labor demand and reducing its consumption. The labor demand of the female sector rises above the financial constraint case while the consumption demand decreases below the benchmark. Due to additional funding, the female sector succeeds to bring its negative investment of the benchmark to a steady state level. As the labor factor becomes more productive than the capital factor, the increase of labor demand and saving leads to an increase of the output of the sector above the reference case.

Figure 4: Productivity shock to male Sector in the fist Scenario



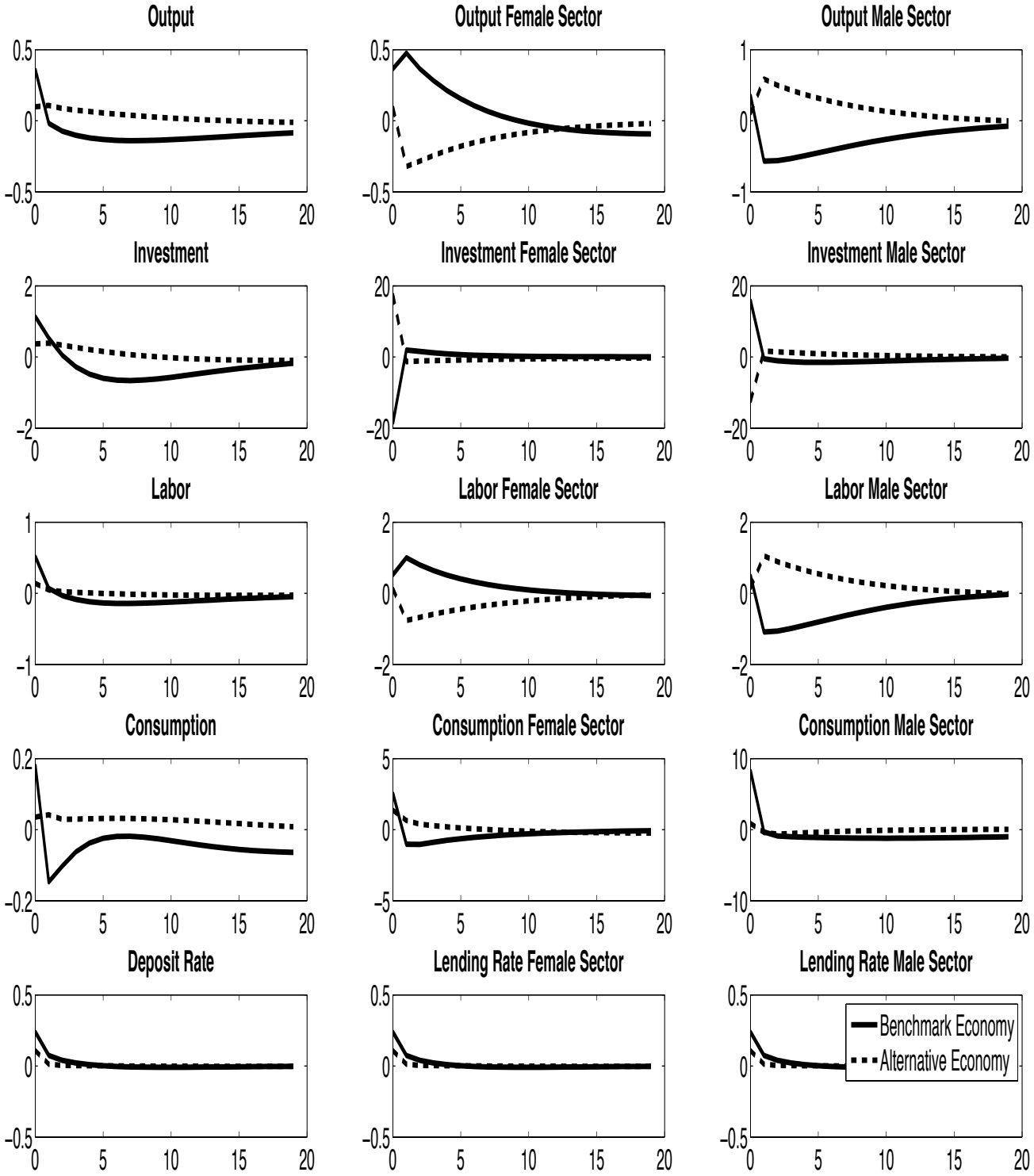
In contrast, the male sector responds to the productivity shock in its sector by cutting down that its labor demands as well as consumption. Due to the fact that female sector can now afford more capital since it becomes less constrained, the price of capital rises and pushes the male sector to reduce its demand for physical capital. The decrease of capital and labor factor reduces the production capacity of the sector and then leads the male sector to invest nothing for a long period. The combination of low quantity of production factors and no new investment induce a persistently decreases of the male sector output below the benchmark.

6.2.1.b. Analysis of the fist scenario in presence of LTV ratio shock in the male sector

Figure 15 depicts the reaction of the economy following a one standard deviation positive Loan To Value ratio shock in the male. An increase of a Loan to Value ratio in the male sector, when the female sector is less constrained, leads to a very weak increase in macroeconomic outcomes. The two channels of transmission of the shock become ineffective in this case and the aggregate output largely remains below the benchmark.

In fact, following a positive financial shock, the male entrepreneurs realizes that the positive effect of the shock is not permanent and also the female entrepreneurs' would try to acquire more market share in the future because of their favorable financial condition. Male entrepreneurs will thus try to keep everything unchanged, by increasing their current savings above the benchmark level for future investment and maintaining the same level of labor demand as in the benchmark. As result, the investment of the sector sharply decreases bellow the benchmark.

Figure 15: LTV ratio shock to Male Sector in the fist Scenario

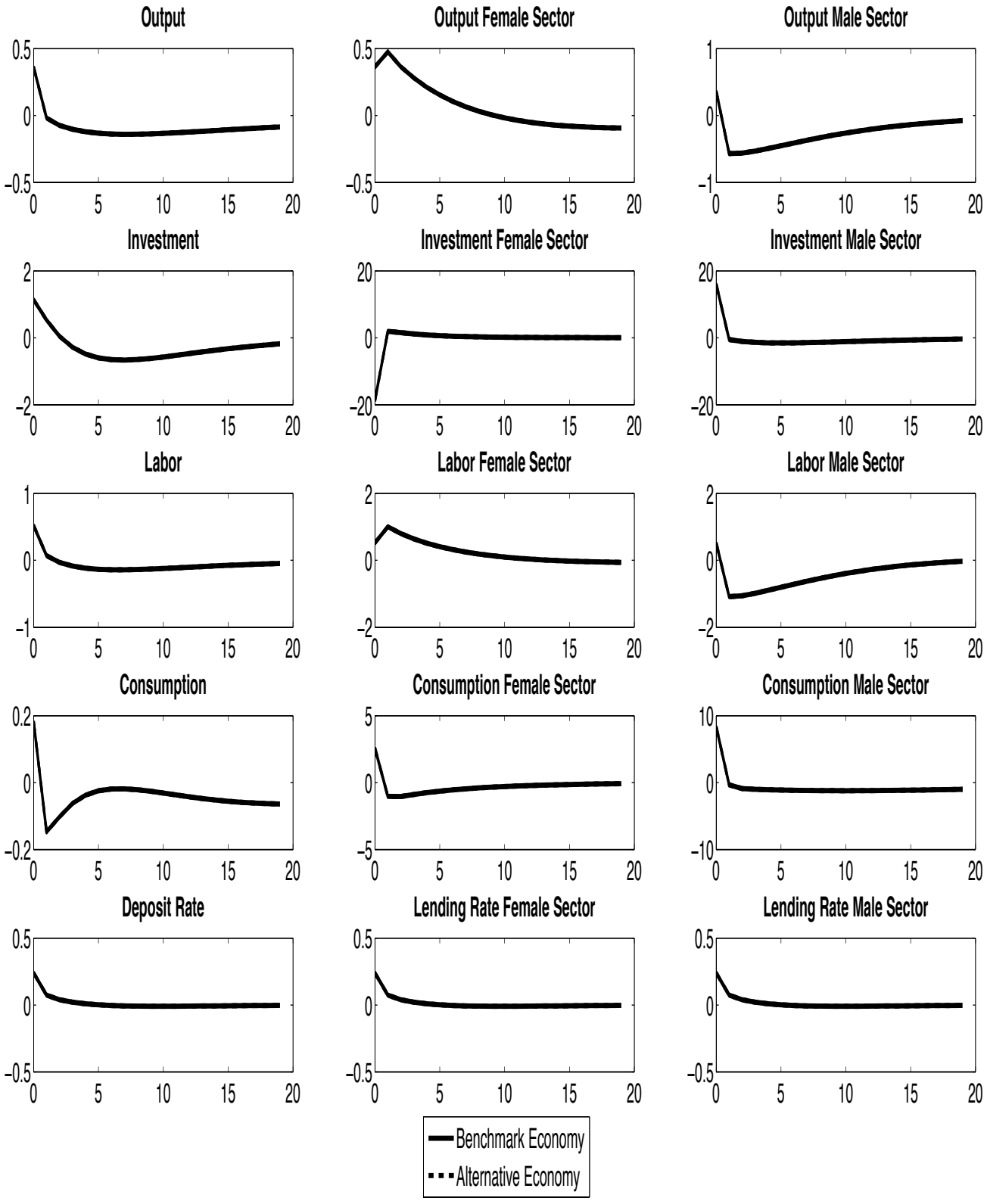


However, the main contributor of the economy wealth in this case appears to be the production sector dominated by female entrepreneurs. The loosening of financing constraint, naturally result in an increase in loans to the production sector dominated by female entrepreneurs. Since the female entrepreneurs know that the shock is temporary and they would not be able to sustain higher investment in the long run, they initially increase investment far above the benchmark level, and slightly consumption. Subsequently, rising consumption and investment lead to an increase of the output of the sector, even its level remains below the benchmark level. The weak level of output can also been justify by the fact that female sector stop demanding for labor, leading the level of labor demand far below the level of the benchmark.

6.2.1.c. Analysis of the fist scenario in presence of fiscal policy shock

Figure 16 illustrates the response of the economy following a one standard deviation positive fiscal policy shock. The results reveal that the ease of female sector financial constraint does not change the response of the economy following the fiscal shock. The scenario results remain identical to benchmark results. An increase of public expenses essentially financed by taxes paid by household, increase the transfer from household to the government. The increase of taxes payment leads to the decrease of the disposal revenue of household. As result, the demand for deposits in the banking sector will be negatively affected and in turn loans supply to entrepreneurs.
This process is intensifying by the collateral constraint channel, as the banking sector could increase the requirements for banks loans supply, including collaterals. Since the production sector dominated by female entrepreneurs are more constrained, this will further accentuate their shortage in the credit market. Female entrepreneurs will cut their investment substantially and their demand for capital. At the same time they will increase labor demand and consumption due to the positive effect of the policy. The increase of consumption will offset the decline of investment and leads to a short increase of output.

Figure 16: Fiscal Policy shock in the fist Scenario



In contrast, the production sector dominated by male entrepreneurs is less constrained and will easily overcome the adverse effect of the policy via the collateral channel. The level of loans granted to the sector will be at least identical to level before the policy. The male entrepreneurs' sector will thus increase their investment that counterweighs the fall in investment of the female entrepreneurs sector. Also, to compensate the high cost of capital, the male entrepreneurs sector will increase the demand for labor. The rise on investment and consumption leads to an increase of the output of the sector.

Overall, labor become more productive and the initial increase in labor income sustains consumption of household, and adding by the increase in both sectors' consumption, the aggregate consumption rises. The increase of investment in the male sector sustains the aggregate investment. The increase of aggregate investment and consumption limit the effect of the collateral channel in the female entrepreneurs' sector and lead to an increase of aggregate output.

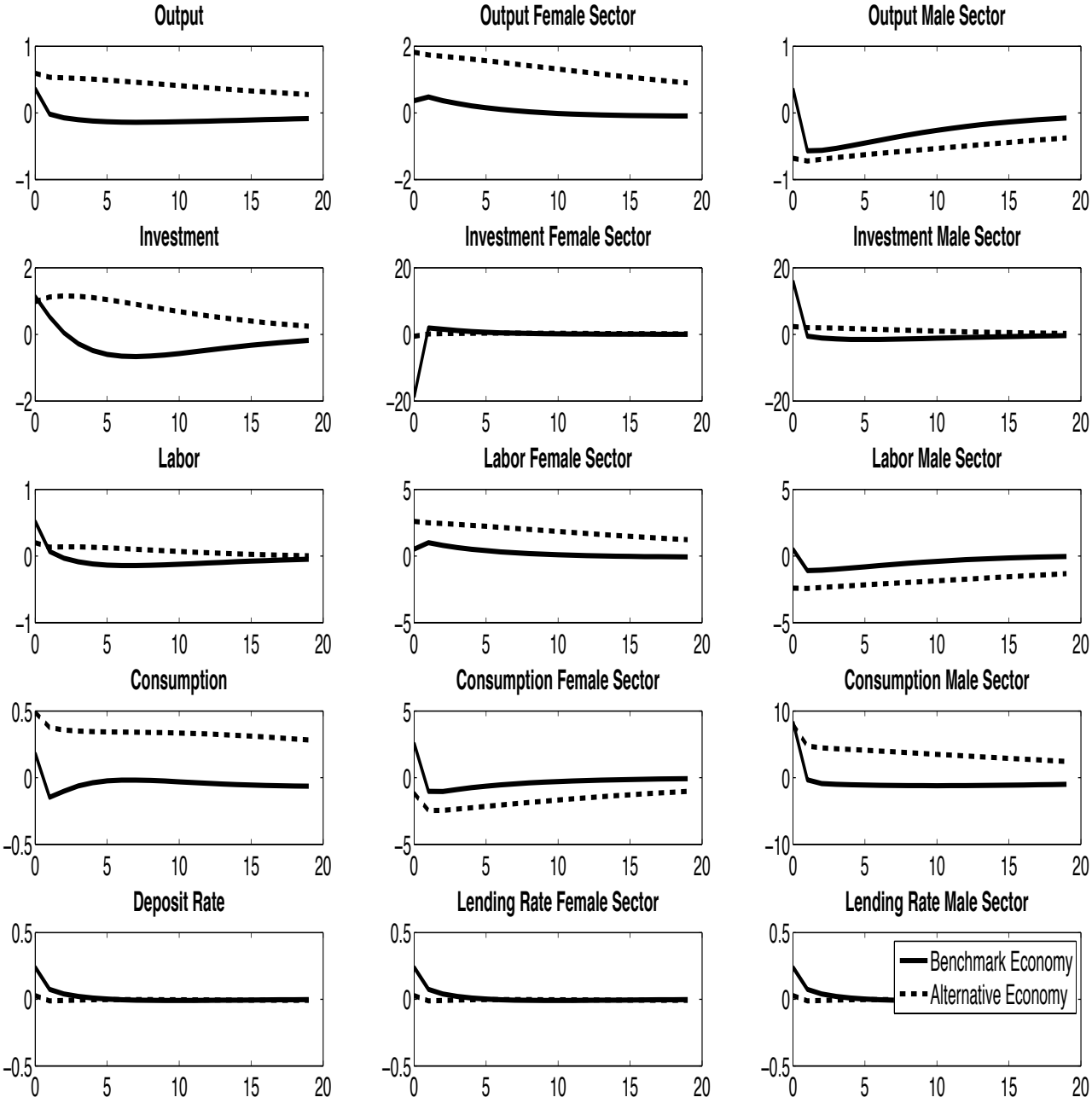
6.2.2. Tightening Financial Constraint in the male sector

6.2.2.a. Tightening Financial Constraint and productivity shock in the male sector

Figure 17 plots the effect on the economy of a tightening borrowing constraint in the male sector when this sector faces a one standard deviation positive productivity shock. The tightening financial constraint in the male sector exerts a crowding-out effect in the credit market by inducing the reduction of the quantity of loans available for the male sector in favor of the female sector. This reduction of financing obliges the male sector to cut its investments. However the decrease of investment above the benchmark is compensate by the positive effect of the productivity shock in the sector, leading the level of investment around the steady state. Because the male sector stop investing due to borrowing constraint, the quantity of jobs hiring and the savings also decrease. Since physical capital is used as collateral to obtain loans, the reduction of capital demand due to no investment further constraint the male sector. Hence, they becomes unable to borrow, they would be forced to cut back their investment expenditures once more and thus their demand for capital. This situation would have huge repercussion in their activities and leads to a fall in output,

which will be persistent throughout the period. Hence, the collateral constraints effect accentuates the negative impact of the tightening financing constraint and exposed the male sector to risk of default and credit cut.

Figure 17: Productivity shock to male sector in the second Scenario



In contrast, the female sector benefits from the two events in the male sector, namely the tightening financing constraint and the positive productivity shock. The favorable financing condition naturally results in an increase in loans to the female sector, which induces increases of the investment from negative level at the benchmark to the steady state level and an increase of savings. As the female entrepreneurs realizes that male entrepreneurs face credit cut and can not fully capture the feature of the shock, they would try to take advantage of this situation by increasing the demand of labor, as well as capital. Subsequently, factors or production demand and savings lead to higher output in the sector above the benchmark.

Overall, the favorable financing conditions in the female sector helps to amplify the positive effect of the productivity shock in the economy, even if the shock appears in the male sector, leading to an increase of macroeconomic outputs.

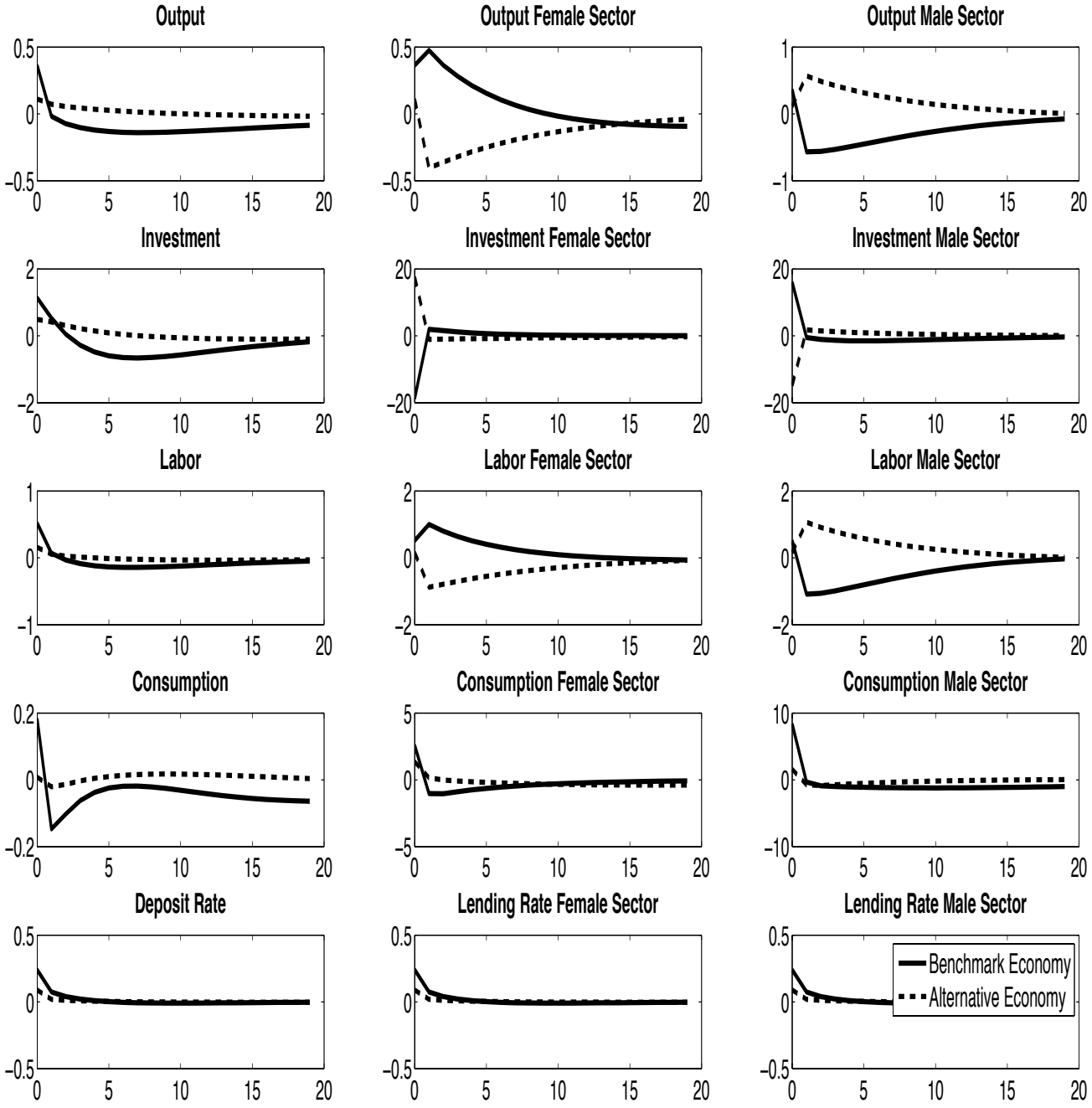
6.2.2.b. Tightening Financial Constraint in the male sector in presence of LTV shock

Figure 18 depicts a one standard deviation positive LTV ratio shock in the male sector when the same sector faces a tightening financial constraint. An increase of a Loan to Value ratio allows entrepreneurs to demand more loans and use the proceeds to invest more. The rise in aggregate investment induces an increase in aggregate labor and capital demand. Higher demand for capital sharply increases its value, relaxing the collateral constraint further. There is a short-lived increase in the deposit, which decreases sharply afterward and induces the increase of aggregate consumption. However the positive effect of the shock in the economy activity is too weak leading all the macroeconomic variables below the benchmark, namely the aggregate output. This can been mainly explained by the fact that the positive effect of LVT ratio shock in the male sector which is insufficient to upset the tightening borrowing constraint of the sector.

The male sector reacts to the ease of its financial constraints by increasing labor demand and savings. As male entrepreneurs understand that the shock is temporary and they would be unable to sustain higher investment in the long run, they initially mostly decrease investment below the benchmark. Subsequently, rising savings and

labor demand offset the decline of investment and leads to a weak increase of output on the sector above the benchmark.

Figure 18: LTV ratio shock to male sector in the second Scenario



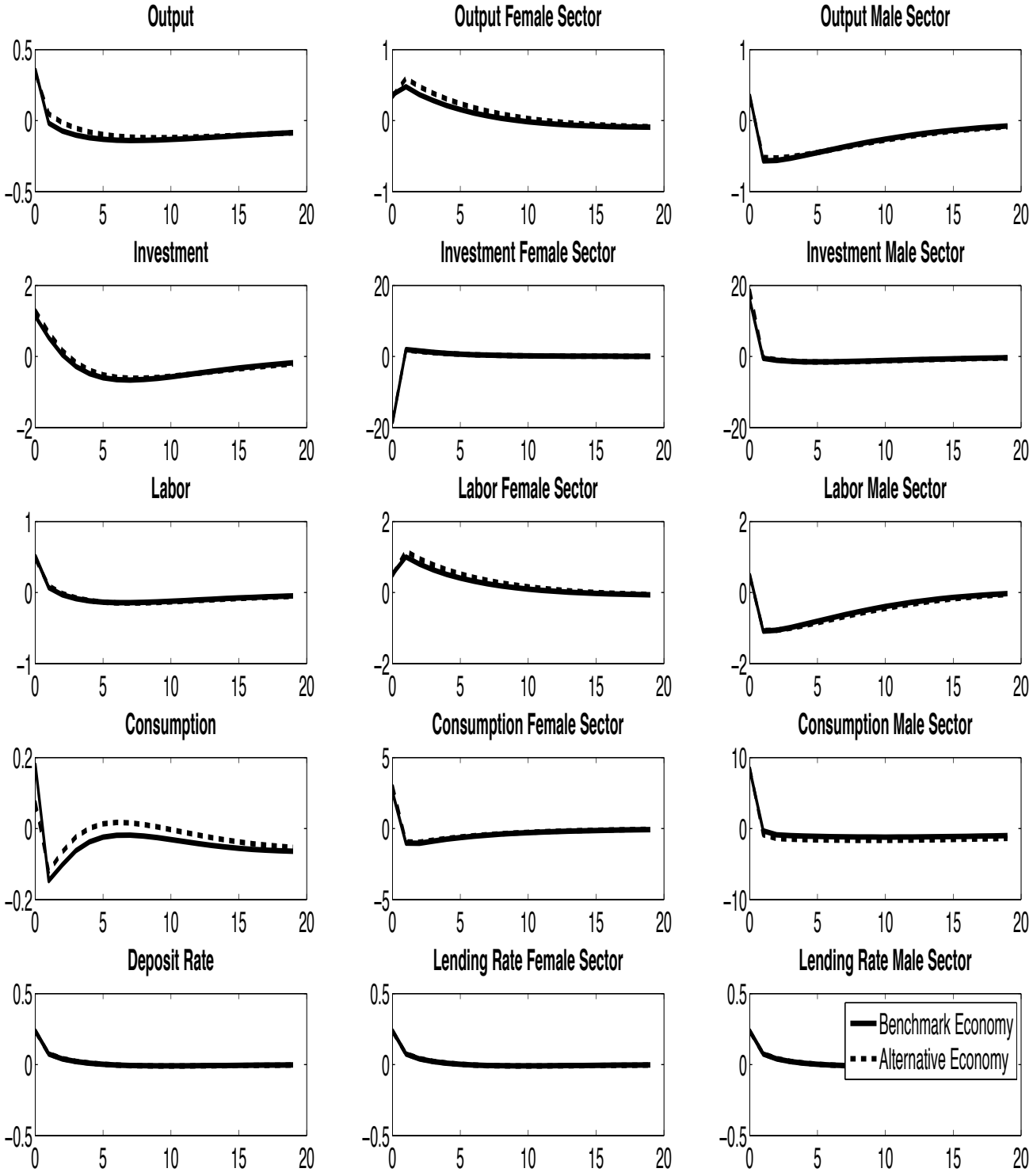
The favorable financial conditions allow the female sector to sharply increase its investment level above the benchmark at around 20%, which represents the rate of investment decreasing in the male sector. This result means that the tightening financing condition in the male sector is compensated only by the loosening financial constraints in the female sector and not by the positive LTV ratio shock in the male sector. In fact, the female sector reacts to the positive LTV ratio shock in the opposite sector by highly increasing its demand of physical capital and slightly the labor demand, knowing that the male sector can't sustain its desired capital demand. The increase of capital demand increases its valuation and more increases the collateral constraint channel with an increase of consumption. The high increase of investment and consumption induces an increase of output of the sector, even if its level is weak and below the benchmark level.

6.2.2.c. Tightening Financial Constraint in the male sector in presence of fiscal policy shock

Figure 19 illustrates the response of the economy following a one standard deviation positive fiscal policy shock in the case of tightening constraint of male sector. The results reveal that the tightening financial constraint of male sector does not change the response of the economy following the fiscal shock. The scenario results remain identical to benchmark results. An increase of public expenses essentially financed by taxes paid by household, increase the transfer from household to the government and decreases the disposal revenue of household. As result, the demand for deposits in the banking sector will be negatively affected and in turn loans supply.

This process is intensifying by the collateral constraint channel. As the production sector dominated by male entrepreneurs are more constrained, this will further accentuate their shortage in the credit market. However male entrepreneurs will expect a deterioration of financial condition of the female sector following the shock and then increase investment in the first period. At the same time they will drastically reduces savings demand. The increase of investment will offset the decline of savings and leads to a short increase of output.

Figure 19: Fiscal Policy shock in the second Scenario



In contrast, the production sector dominated by female entrepreneurs is less constrained and will easily overcome the adverse effect of the policy via the collateral channel. The level of loans granted to the sector will be at least identical to level before the policy. The female' sector will at first reduces their investment in the first period which counterweighs the increase in investment of the male sector. Also, to compensate the high cost of capital, the female entrepreneurs sector will increase the demand for labor and consumption. The rise on investment and consumption overcome the decrease of investment and leads to an increase of the output of the sector.

Overall, the increase of investment in the male sector sustains the aggregate investment. The increase of labor demand and consumption in both sectors sustain aggregate consumption and labor. The increase of aggregate investment and consumption limit the effect of the collateral channel in the male sector and lead to an increase of aggregate output.

6.2.3. Female sector and Male sector are given same amount of financing

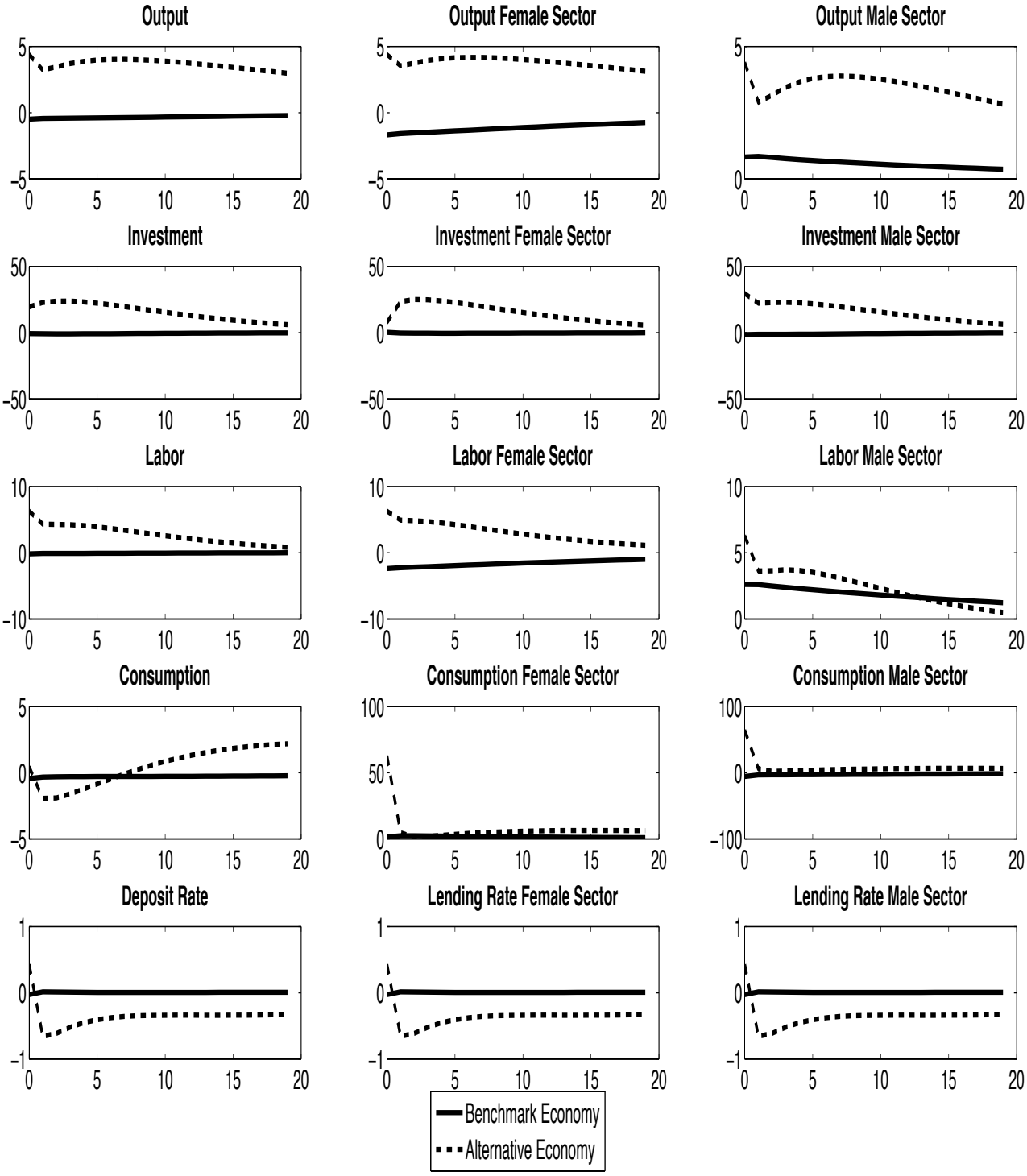
6.2.3.a. Both Sectors with same amount of financing in presence of household preference shock

Figure 20 depicts the reaction of the economy following an increase in the household preference when both sectors are given same amount of financing. The demand for deposits in the banking sector will be positively affected. The rise of deposits induces the increase of banking sector assets. The banking sector increases the quantity of loans supplied to both production sectors leading to short increases of lending rates and the deposit rate.

As the female sector is not constrained, the additional funding due to the positive effect of the shock, offers them the opportunity to increase their investment above the benchmark at around 20%. The sector will thus increase labor demand and the demand for physical capital above the benchmark. Savings due to the positive effect of the policy will also expand more than the male sector. The increase of

savings demand and investment lead to a huge and persistent increase of output above the benchmark at around 5%.

Figure 20: Household Preference shock in the last Scenario



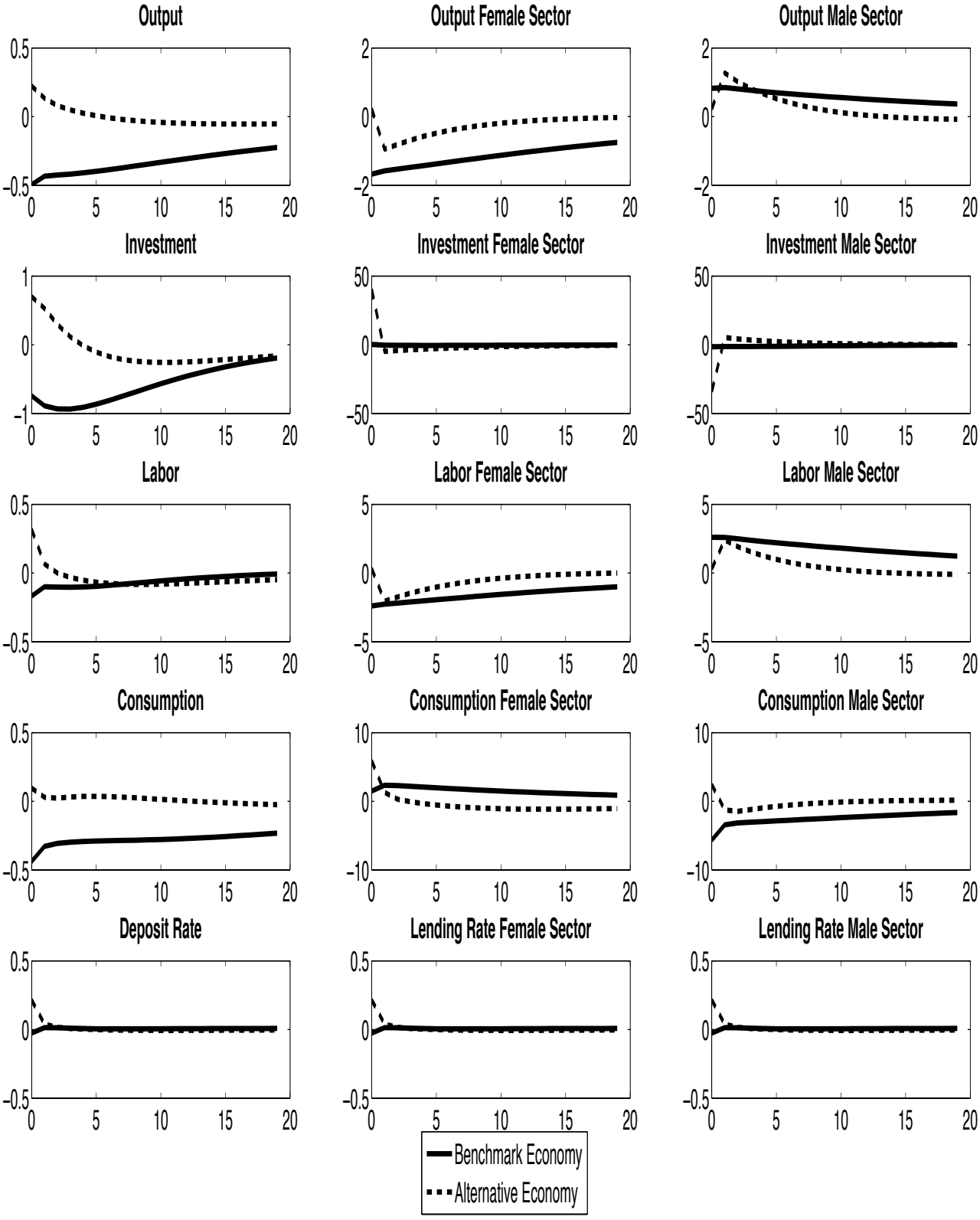
Likewise, the production sector dominated by male entrepreneurs which is also no constrained, also gains more for the positive effect of the shock. The increase of the level of loans granted to the sector would ease the increase of their investment level above the benchmark at around 30% with an effect that lasts only for one period. This rise of investment induces the short upswing of labor demand of 2% and a huge increase of consumption demand above the benchmark of 50%. The rise on investment and consumption leads to an increase of the output of the sector above the benchmark at around 4%. However the increase of output is less persistent than in the female sector and collapse to the benchmark level (1%) after the first period.

Overall, the increase of household preference exerts an expansionary and persistent effect in the economy activity. There is more job creation and the national savings increases largely. The increase of factor of production demand leads to an increase of aggregate investment above the benchmark of around 20%. As result, the aggregate output rises persistently above the benchmark. The positive effect of the shock is more persistent in the female sector than in the male sector. Female entrepreneurs appears thus as the main driver of economy activity when both sector are given same amount of financing.

6.2.3.b. Both Sectors with same amount of financing in presence of LTV shock in male sector

Figure 21 illustrates the reaction of the economy following the one standard deviation positive LTV ratio shock in the male sector when both sectors are given same amount of financing. A sudden increase of the LTV ratio induces an increase of the deposit rate at 0.1% slightly above the benchmark. The increase of deposit rate leads to a huge increase of the aggregate savings above the benchmark. The aggregate labor demand also rises and induces an increase of aggregate investment far above the benchmark. The increase of investment and consumption leads to a persistent increase of output above the benchmark level.

Figure 21: LTV Ratio Shock Sector in the last Scenario



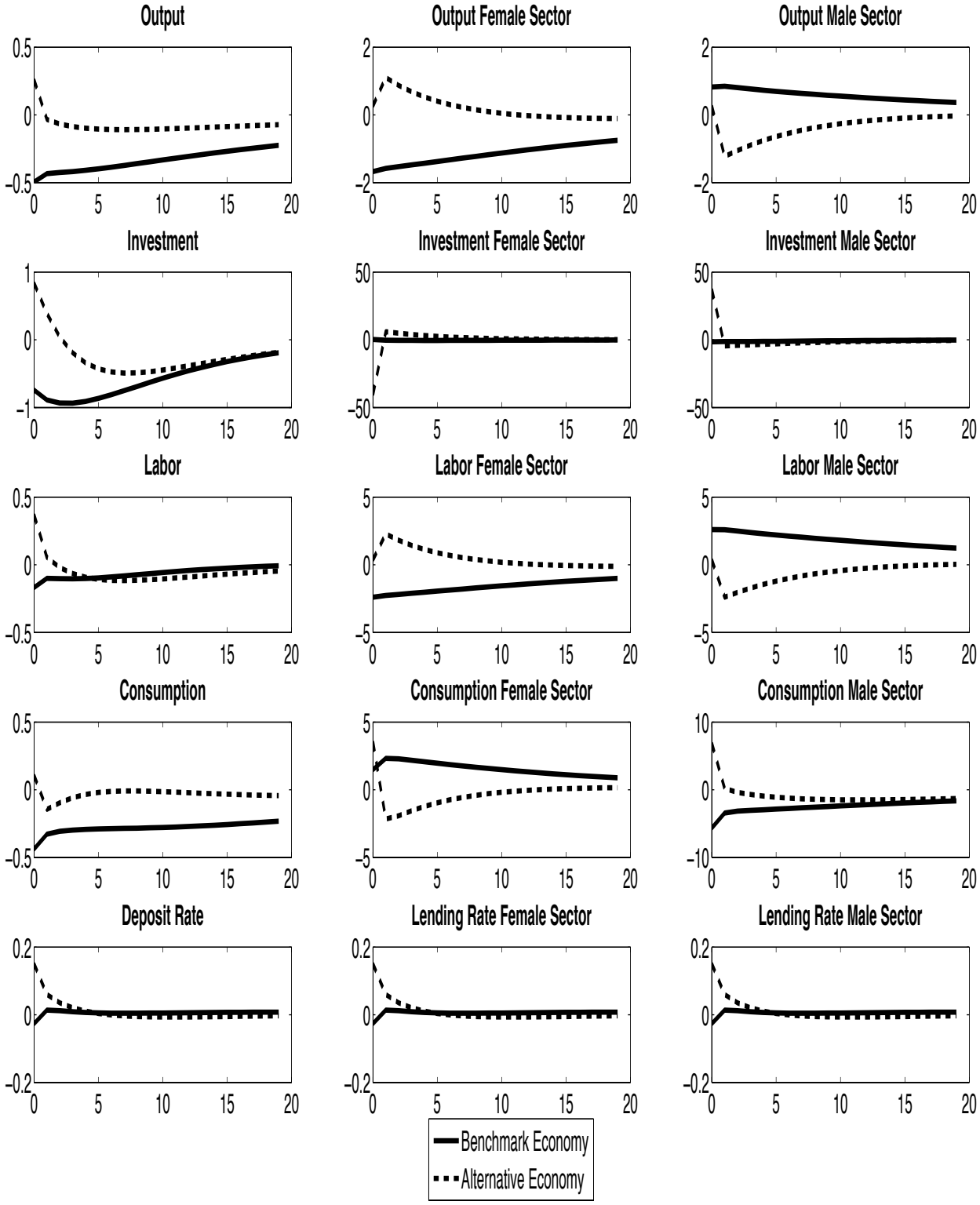
This is result can be explained by the performance in each sectors following the shock. Basically, the positive LTV ratio increases the financial resource of male sector. The sector responds to the shock by relocating the extra funding to savings, which highly increase above the benchmark level. However, the male sector drastically cut down their investment and the investment level sharply decreases at 48% below the benchmark level. In addition, male sector also stop demanding labor and maintains its level below the benchmark level. The decrease of investment and factor of production demand contravenes the positive effect of the shock. As result, the shock has no effect of the male sector output, which is persistently maintained below the benchmark level.

In contrast, the female sector positively responds to the LTV shock in the male sector by increasing its investment level at 49% above the benchmark level. In fact, female entrepreneurs discounts the decreases of male sector investments and attempt to capture their market share by increasing their investment which will lead to a net increase of aggregate investment. In the same vein, female sector continues to hire more jobs and increases its savings for upcoming investment. The increase of labor demand and investment induce an increase of output of the sector above the benchmark level. This increase in the female sustains the increase of the aggregate output. Theses results confirm that, when both sector are given same amount of financing, in presence of LTV shock in male sector, the female sector appears as the sole sector that sustain economic activity.

6.2.3.c. Both Sectors with same amount of financing in presence of Fiscal Policy shock

Figure 22 denotes the reaction of the economy following the one standard deviation positive fiscal policy when both sectors are given same amount of financing. A sudden increase of public expenses induces increases of the deposit rate, which leads to the rise of the aggregate saving. The shock also leads to an increase of job creation at 0.5% above the benchmark level. In presence of sufficient factors of production, the aggregate investment rises up above the benchmark and induces an increase of the aggregate output above the benchmark.

Figure 22: Fiscal Policy Shock in the last Scenario



Once more this general results are justify by the weakness of the male sector. The sector responds to the positive fiscal shock by expanding their investment at 49% above the benchmark, as well as its consumption demand at 10% above the benchmark level. However, the male sector stop hiring jobs by maintaining the level far below the benchmark level. This decision will have deep repercussion in the sector outcomes and will weaken the initial increase of investment. As result, the shock exerts no effect of the male sector output, which is persistently maintained below the benchmark level.

Inversely, the female sector responds to the positive fiscal shock by cutting down its investment level at 48% below the benchmark level. In fact, female entrepreneurs discount the upcoming increases of male sector investment and try to preserve their market share by decreasing their investment. To offset the fall off investment, the female sector continues to hire more jobs and increases its savings for upcoming investment. The sufficient factors of production induce an increase of output of the sector above the benchmark level. This increase in the female sector output, sustains the increase of the aggregate output. Theses results confirm that, when both sector are given same amount of financing, in presence of fiscal policy shock, the female sector contribute more than the male sector in the increase of the macroeconomic outcomes.

4. Conclusions and policy implications

Economist recognized that financial sector imperfections are relevant not only to explain economic development and the impact of financial frictions on real economy, but also to design appropriate stabilization policy. It this research we took a closer look at exactly what financial frictions impact female entrepreneurship in their borrowing operation and what policies are more effective to overcome it for a sustainable macroeconomic outcomes.

Two broad body of theoretical literature can justify the link between female entrepreneurship and macroeconomics gains, namely, the Keynesian and Kaleckian approach in the one hand, the neo-classical and structuralist approach in the other hand. Empirical literature on its part emphasizes that the study of macroeconomics implications of financial frictions is exclusively based on DSGE models. The framework can be RBC approach or New-Keynesian approach. The type of financial frictions can be External Finance Premium version or Collaterals Constraints version.

This research uses a DSGE model with financial micro-foundation to assess the problem of female entrepreneurs facing financial frictions and its macroeconomics implications. The model features two sectors, such as, a production sector dominated by female entrepreneurs and a production sector dominated by male entrepreneurs. Financial frictions appear because entrepreneurs face collateral constraint when borrowing from the banking sector. The steady state and calibration analysis demonstrates that collateral constraints appear as the key financial frictions faced by female entrepreneurs in the credit market in Cameroon. The less financial constrained sector is capital intensive and the most financial constrained sector is labor intensive. When female sector are granted credit as much as the male sector, it performs better in term of value-added in GDP.

The benchmark analysis reveals financial frictions in the credit market matters in the sluggishness of macroeconomics outcomes. Moreover, female sector contributes to shrinking aggregate labor demand, investment, consumption and output due to financial constraint. The counterfactual scenarios analyses shows that the banking sector plays a key role in amplifying the magnitude by which macroeconomics

indicators respond to shocks through the collateral constraints channel and the asset-price channel. The loosening financial constraint improves female entrepreneurs productivity and job creation with expansionary implications in the macroeconomic outcomes. In case of tightening financial constraint, male sector and female sector are complementary in sustaining economy activity when the conjuncture slumps. Furthermore, female entrepreneurs are the main driver of economy activity when both sector are given same amount of financing. The policy implications which comes out from the results of the research are:

- *Cameroonian authority should play a key role in furthering female entrepreneurs access in financial services, namely, inclusion in the Douala Stock Exchange Market as well as the Central Africa Exchange Market.*
- *A National Agency which plays a role of collateral and guarantees female entrepreneurs debt contract besides the banking sector, can help to alleviate frictions in the credit market in Cameroon and enhance female entrepreneurship.*
- *Law enforceability is needed to guarantee equal right between men and female regarding family properties, such as, land, real estate or shares, in other to allow female entrepreneurs which owned them to directly use them as collaterals without the permission of family elders, husband or properties administrator.*
- *The Central Africa Banking Commission (COBAC), as the regulator of the banking sector, should enforces its law regarding the lending rates and adopt new strategy that relax collateral constraints, with special attention to female entrepreneur, in other to avoid the banking sector implicitly discriminating between both type of entrepreneurs.*
- *Cameroonian authority can adopt a National Policy of Financing Female Entrepreneurship, by issuing public bonds or securities with end of collecting financings from citizens and directly finance female entrepreneurs projects. This policy will allow national authority to better regulate the sector and enhance fiscal revenue, play the role of collateral between the lenders (citizens) and borrowers (female entrepreneurs), and fostering female entrepreneurship for job creation and inclusive economic growth.*

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Annex

A 1. The Steady-State of the model

All the algebra development for the analytical determination of the steady-state of the model are available in the Technical Appendix upon request.

- **Interest rates**

$$R_D = \frac{1}{\beta_H} \tag{1}$$

$$R_L^F = R_d \tag{2}$$

$$R_L^F = R_d \tag{3}$$

$$q = 1 \tag{4}$$

- **Capital/output ratios**

$$k^F/y^F = \frac{\alpha p^F}{\frac{1}{\beta_F} - (1-\delta) - \frac{\left(1-\beta_F R_L^F\right)V^F(1-\delta)}{\beta_F R^F}} \tag{5}$$

$$\left(\frac{k^F}{n^F}\right) = \left(\frac{k^F}{y^F}\right)^{\frac{1}{1-\alpha}} \tag{6}$$

$$w^F = (1-\alpha)\left(\frac{k^F}{n^F}\right)^{\alpha} \tag{7}$$

$$k^M/y^M = \frac{\alpha p^M}{\frac{1}{\beta_M} - (1-\delta) - \frac{\left(1-\beta_M R_L^M\right)V^M(1-\delta)}{\beta_M R^M}} \tag{8}$$

$$\left(\frac{k^M}{n^M}\right) = \left(\frac{k^M}{y^M}\right)^{\frac{1}{1-\alpha}} \tag{9}$$

$$w^M = (1-\alpha)\left(\frac{k^M}{n^M}\right)^{\alpha} \tag{10}$$

$$\left(\frac{n^F}{n^M}\right) = \left(\frac{w^F}{w^M}\right)^{-\tau}\left(\frac{1-\theta_H}{\theta_H}\right) \tag{11}$$

- **Relative price**

$$\frac{p^F}{p^M} = \left[\frac{\left(\frac{k^F}{n^F}\right)^{\alpha}}{\left(\frac{k^M}{n^M}\right)^{\alpha}}\left(\frac{n^F}{n^M}\right)\left(\frac{\theta_y}{1-\theta_y}\right)\right]^{-\frac{1}{\mu}} \tag{12}$$

$$p^M = \left[\left(1-\theta_y\right)\left(\frac{p^F}{p^M}\right)^{(1-\mu)} + \theta_y\right]^{\frac{1}{(\mu-1)}} \quad (13)$$

$$p^F = \left(\frac{p^F}{p^M}\right)p^M \quad (14)$$

- **All others variables**

$$\frac{y}{n^F} = \frac{\left(\frac{k^F}{n^F}\right)^{\alpha}(p^F)^{\mu}}{(1-\theta_y)} \quad (15)$$

$$\frac{c}{n^F} = \frac{y}{n^F} - \frac{\delta k^F}{n^F} - \frac{\delta k^M}{n^M}\frac{1}{n^F/n^M} \quad (16)$$

$$\frac{c^F}{n^F} = p^F\left(\frac{k^F}{n^F}\right)^{\alpha} + (1-R_L^F)\frac{V^F(1-\delta)}{R_L^F}\frac{k^F}{n^F} - \delta\frac{k^F}{n^F} - w^F \quad (17)$$

$$\frac{c^M}{n^M} = p^M\left(\frac{k^M}{n^M}\right)^{\alpha} + (1-R_L^M)\frac{V^M(1-\delta)}{R_L^M}\frac{k^M}{n^M} - \delta\frac{k^M}{n^M} - w^M \quad (18)$$

$$\frac{c^H}{n^F} = \frac{c}{n^F} - \frac{c^F}{n^F} - \frac{c^M}{n^M}\frac{1}{n^F/n^M} \quad (19)$$

$$\frac{1}{n^F} = \frac{n}{n^F} + \frac{\frac{c^H}{n^F}\vartheta(1-\theta_H)^{\frac{1}{\tau}}\left(\frac{n}{n^F}\right)^{\frac{1}{\tau}}}{w^F} \quad (20)$$

$$L^M = \frac{V^M(1-\delta)k^M}{R_L^M} \quad (21)$$

$$L^F = \frac{V^F(1-\delta)k^F}{R_L^F} \quad (22)$$

$$\lambda = \frac{1}{c^H} \quad (23)$$

$$\lambda^F = \frac{1}{c^F} \quad (24)$$

$$\lambda^M = \frac{1}{c^M} \quad (25)$$

$$\lambda_M^V = \beta_M\lambda^F R_L^F + \lambda^F \quad (26)$$

$$\lambda_M^V = \beta_M\lambda^M R_L^M + \lambda^M \quad (27)$$

A 2. The variables of the model

The variables of the model that have been used for empirical analysis are:

c_t : Consumption

c_t^H : The representative household consumption

c_t^F: The consumption of the production sector dominated by female entrepreneurs

c_t^M: The consumption of the production sector dominated by male entrepreneurs

y_t: The composite index of final good

y_t^F: The production of intermediaries goods by the production sector dominated by female entrepreneurs

y_t^M: The production of intermediaries goods by the production sector dominated by male entrepreneurs

n_t : The composite index of labor supply by households

n_t^F : Labor supply by households to the production sector dominated by female entrepreneurs

n_t^M: Labor supply by households to the production sector dominated by male entrepreneurs

w_t^F : Wage given to households by the production sector dominated by female entrepreneurs

w_t^M: Wage given to households by the production sector dominated by male entrepreneurs

λ_t: The marginal utility of Households consumption

λ_t^F: The marginal utility of the consumption made by the production sector dominated by female entrepreneurs

λ_t^M: The marginal utility of the consumption made by the production sector dominated by male entrepreneurs

$\lambda_{F,t}^V$: The marginal utility of the borrowing constraints of the production sector dominated by female entrepreneurs

$\lambda_{M,t}^V$: The marginal utility of the borrowing constraints of the production sector dominated by male entrepreneurs

$R_{D,t}$: The deposit rate

$R_{L,t}^F$: The lending rate on loan granted to the production sector dominated by female entrepreneurs

$R_{L,t}^M$: The lending rate on loan granted to the production sector dominated by male entrepreneurs

q_t: The physical capital price

k_t: The physical capital

k_t^F: The physical capital used by the production sector dominated by female entrepreneurs

k_t^M: The physical capital used by the production sector dominated by male entrepreneurs

i_t^F: The investment of the production sector dominated by female entrepreneurs

i_t^M: The investment of the production sector dominated by male entrepreneurs

i_t: The aggregate investment

L_t^F: Loans granted to the production sector dominated by female entrepreneurs

L_t^M: Loans granted to the production sector dominated by male entrepreneurs

P_t^F: Relative price of intermediate goods supplied by the production sector dominated by female entrepreneurs

P_t^M: Relative price of intermediate goods supplied of the production sector dominated by male entrepreneurs

ϖ: The preference shock affecting the marginal utility of household

ϑ: The shock affecting the marginal utility of the labor supply

a^F: The shock of the production sector dominated by female entrepreneurs

a^M: The shock of the production sector dominated by male entrepreneurs

V^F: The loan's to value ratio shock of the production sector dominated by female entrepreneurs

V^M: The loan's to value ratio shock of the production sector dominated by male entrepreneurs

g : The public spending shock

A 3. The parameters of the model

The denomination of the parameters of the model is given as follow:

β_H : The Households discount factor

β_F: The discount factor of the production sector dominated by female entrepreneurs

β_M: The discount factor of the production sector dominated by male entrepreneurs

θ_H: The share of employment in the production sector dominated by male entrepreneurs

θ_y: The share of intermediate goods produced in the production sector dominated by female entrepreneurs

μ: The constant elasticity price of demand of intermediates goods of each sector

τ : The elasticity of substitution between the two productions sectors

δ : The depreciation rate of capital

α : The labor share in the production sector

V^M : The loan's to value (LTV) ratio of the production sector dominated by female entrepreneurs

V^F : The loan's to value (LTV) ratio of the production sector dominated by male entrepreneurs

ρ_{ϖ}: The persistence of the preference shock affecting the marginal utility of household

ρ_{ϑ}: The persistence of the preference shock affecting the marginal utility of the labor supply

ρ_{a^F}: The persistence of the productivity shock of the production sector dominated by female entrepreneurs

ρ_{a^M}: The persistence of the productivity shock of the production sector dominated by male entrepreneurs

ρ_{V^F}: The persistence of the loan's to value ratio shock of the production sector dominated by female entrepreneurs

ρ_{V^M}: The persistence of the loan's to value ratio shock of the production sector dominated by male entrepreneurs

ρ_g : The persistence of the public spending shock

$\hat{\varepsilon}_{\varpi}$: The standard deviation shock of the preference shock affecting the marginal utility of household

$\hat{\varepsilon}_{\vartheta}$: The standard deviation shock of the preference shock affecting the marginal utility of the labor supply

$\hat{\varepsilon}_{\hat{a}^F}$: The standard deviation shock of the productivity shock of the production sector dominated by female entrepreneurs

$\hat{\varepsilon}_{\hat{a}^M}$: The standard deviation shock of the productivity shock of the production sector dominated by male entrepreneurs

$\hat{\varepsilon}_{\eta^{VF}}$: The standard deviation shock of the loan's to value ratio shock of the production sector dominated by female entrepreneurs

$\hat{\varepsilon}_{\eta^{VM}}$: The standard deviation shock of the loan's to value ratio shock of the production sector dominated by male entrepreneurs

$\hat{\varepsilon}_{\eta^g}$: The standard deviation shock of the public spending shock