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

Thierry Kame Babilla
Sandra Kendo
Martin Jaures Ndzana Eloundou
Adele Ngo Bilong

June 2015
Macroeconomics implications of female entrepreneurs facing financial frictions to access to credit: a DSGE Model approach in Cameroon

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

Authors

Thierry KAME BABILLA
Lead Researcher
CEREG_University of Yaoundé II
Yaoundé, Cameroun
thierrykamebilla@yahoo.fr

Sandra Kendo
Member
CEREG_University of Yaoundé II
Yaoundé, Cameroun
sandra2172003@yahoo.fr

Martin Jaures Ndzana Eloundou
Member
CEREG_University of Yaoundé II
Yaoundé, Cameroun
nadzaeloundou_2009@yahoo.fr

Adele Ngo Bilong
Member
CEREG_University of Yaoundé II
Yaoundé, Cameroun
adelebilong1@yahoo.fr

Acknowledgements

This research is carried out with financial and scientific support from the Partnership for Economic Policy (PEP) (www.pep-net.org) with funding from the Department of International Development (DFID) of the United Kingdom (or UK Aid), the government of Canada through the International Development Research Center (IDRC). Authors gratefully acknowledge Kevin Moran for its technical support and guidance, as well as, Martin Cicowiez, Erwin Corong, Helene Maisonnave and Bernard Decaluwe for valuables comments, inputs and suggestions.
**Table of content**

I. Introduction p.3

II. Literature review p.5  
   2.1. Theoretical literature review  
   2.2. Empirical literature review

III. Some stylized facts p.6  
   3.1. Gender analysis in Cameroon  
   3.2. Entrepreneurship and gender issue in Cameroon

IV. Methodology: a DSGE Model with Gendered Financial Frictions p.7  
   4.1. Households  
   4.2. Production Sector of Intermediate Goods  
   4.3. Final Goods Production Sector  
   4.4. Banking Sector  
   4.5. Government  
   4.6. Exogenous Stochastic Variables  
   4.7. Market Clearing Conditions  
   4.8. The steady-State of the model

V. Calibration Procedure of the Model p.

VI. Simulations Results  
   6.1. Benchmark analysis  
   6.2. Scenario’a analysis

VII. Conclusion and policy implications p.26

Appendix

References p.27
List of tables

Table 1: Net rate of school attendance in Secondary Cycle
Table 2: Repartition of active male and female according to institutional sectors
Table 3: Proportion of female involved in political positions
Table 4: Repartition of positions within the Municipality Committee
Table 5: Proportion of female in the Governance Agency
Table 6: The Cameroon’s Gender Gap Index
Table 7: Constraints factors for female entrepreneurship in Cameroon
Table 8: Banking rate in Cameroon
Table 9: Distribution of credit by nature and duration
Table 10: Features of the Economy’s Steady State
Table 11: Features of the Economy’s Steady State when the Female Entrepreneurs Sector is Less Financially constrained
Table 12: Features of the Economy’s Steady State when the Male Entrepreneurs Sector is More Financially constrained than Female Entrepreneurs Sector
Table 13: Value of the Calibrated Parameters in the Benchmark

List of figures

Figure 1: Completion Rate of Basic Education Level
Figure 2: Enrollment rate in Higher Education level
Figure 3: Labor Force Participation rates
Figure 4: Owners according to the type of enterprise
Figure 5: Constraints to entrepreneurship in Cameroon
Figure 6: Access to production credit per entrepreneurs (%)
Figure 7: Distribution of credit by duration and type of bank’s customer
Figure 8: Cameroon Doing Business Indicators (2013-2014)
Figure 9: Evolution of Interest Rates in Cameroon (%)
Figure 10: Pictogram of the theoretical DSGE model
Figure 11: A productivity shock in the female’ sector in Benchmark
Figure 12: a Loan To Value ratio shock in the male’ sector in Benchmark
Figure 13: a Fiscal Policy Shock in the Benchmark
Figure 14: Productivity shock to male Sector in the fist Scenario
Figure 15: LTV ratio shock to Male Sector in the fist Scenario
Figure 16: Fiscal Policy shock in the fist Scenario
Figure 17: Productivity shock to female sector in the second Scenario
Figure 18: LTV ratio shock to male sector in the second Scenario
Figure 19: Fiscal Policy shock in the second Scenario
Figure 20: Household Preference shock in the last Scenario
Figure 21: LTV Ratio Shock in the male Sector in the last Scenario
Figure 22: Fiscal Policy Shock in the last Scenario
Executive Summary

Financial inclusion in developing economies remains a main concern nowadays for national policymakers as well as international stakeholders. In Cameroon, which is aspiring to an emergence in 2035, the key challenge is to identify and overcome obstacles in financial access for vulnerable sectors, such as female entrepreneurs sector.

Basically, Cameroon authorities have done enough this last decades to achieve gender equality and have succeeded in the area of education, health, employment and political participation. However, despite Government efforts to promote female entrepreneurship, the ability of female to become entrepreneurs is at 5%, the rate of firms with female top managers is at 10% and the rate of firms with female participation ownership is 16%. This sluggish ratio of female entrepreneurs can been explained by 14 constraints of entrepreneurship in Cameroon. Among those 14 constraints, it appears that financial constraint contravenes the most the development of female entrepreneurship in Cameroon. Importantly, the presence of financial frictions in the credit market represents one of the fundamental factors explaining the low access to financing by female entrepreneurs.

Theoretical literature justifies the relationship between female entrepreneurship and macroeconomics variables, by, the Keynesian and Kaleckian approach in the one hand, the neo-classical and structuralist approach in the other hand. The mainstream message is that female entrepreneurship enhances economic efficiency and improves macroeconomics outcomes. Empirical literature on its part emphasizes that the study of macroeconomics implications of financial frictions is exclusively based on DSGE models, which can be RBC approach or New Keynesian approach.

This research aims thus to assess the effects of financial frictions faced by female entrepreneurs on macroeconomics performances in Cameroon, and to examine policies likely to waive those frictions. We capture this key issue by means of a DGSE model with financial micro-foundation, which grounds its analytical framework on Real Business Cycle approach. The model features two sectors, namely, 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 analyses demonstrate that:

- Collateral Constraints appears as the key financial frictions faced by female entrepreneurs in the credit market in Cameroon.
- The less financial constrained sector is capital intensive in the production process.
The most financial constrained sector is labor intensive in the production process.
Female entrepreneurs are labor intensive whereas male entrepreneurs are capital intensive.
When female sector are granted credit as much as the male sector, it performs better in term of value-added in GDP than male sector.

The benchmark analysis reveals:

- Financial frictions in the credit market matters in the sluggishness of macroeconomics outcomes.
- Female sector contributes to shrinking aggregate labor demand, investment, consumption and output due to financial constraint.

The counterfactual scenarios analyses provide the following findings:

- 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 tends to improve 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. The female sector offsets the sluggishness of the male sector and totally transmits the positive effect of the shock at the whole economy.
- Investments in both sectors change in diametrically opposed directions with the female sector investment offsetting male sector investment, depending on the scope of financial constraint.
- 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:

- **Financial incentives are critical for female entrepreneurship to adopt the productivity and income enhancing technologies and practices that drive investment development and broader economic growth.**
- **Cameroonian authority should play a key role in furthering female entrepreneurs access in financial services, namely, inclusion in the Douala Stock Exchange Market (DSX) as well as the Central Africa Exchange Market (BVMAC).**
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 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 order 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), should enforces its law regarding the lending rates and adopt new strategy that relax collateral constraints, in order 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, 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.

National authority should promote financial inclusion by reducing the cost of banking intermediation via the introduction of credit reporting system, granting exemptions for enormous requirements during the financial contract, and establishing more transparency and credit-information sharing.

1. Introduction

Female entrepreneurs still faced financial frictions in accessing to credit in Cameroon, despite progress made towards achieving gender equality\(^1\) (Fondo and Mbaye 2010; Oluwu 2012; Esta 2013). The constraints of gender credit access refer to the socio-cultural context, which highlights social norms, social values and social practices (Ifelunini and Wosowei 2013). Both endogenous factors and exogenous factors can explain why female entrepreneurs faced financial frictions in the credit market (Essel 1996).

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

---

\(^1\) 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.
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 (Asiedu and al. 2012; Ifelunini and Wosowei 2013). Another endogenous factor that explains the credit constraint for female is linked to their family. 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 (Damiano and Mwakubu 2014; Wekwete 2014).

Exogenous constraints are directly related to the operation of the banking sector. Indeed, banks are rigid in the process of granting credit. This rigidity is explained by the conditions imposed by banks and the time of acquisition of the credit that evaluates as the time between the demand for credit and obtaining effective of this credit (Asiedu and al. 2012; Ifelunini and Wosowei 2013; Seguino and Were 2014).

Identification of exogenous factors can also be related to the type and the size of female entrepreneurs activities. Female entrepreneurs are easily engaged in agricultural and commercial sectors. Despite the fact that their activity is small in term of capital assets, their activity remains in a start-up development process. In that process, there is a minimum capital required. But their equity is insufficient and they usually take credit to finance their activity. Those credit required are given by the banks with a high interest rate. Because, as the study of Stiglitz and Weiss (1981) related to credit rationing, those types of projects have high-risk default, and the banks to manage those risky projects fixed a high interest rate (Bird and Sapp 2004; Asiedu and al. 2012; Angelucci and others 2013; Ifelunini and Wosowei 2013).

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. 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 land. 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

---

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.
husband’s consent (Fonjong 2001; Evou et al. 2006; Kuepie et al. 2013). 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 their wives’ commercial activity by simply notifying the clerk of the commerce tribunal of their opposition based upon the family’s interest. 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. Literature review

2.1. Theoretical literature review

Originally, the related literature defines entrepreneurship as the business creation or the innovation process. Schumpeter (1950, 1961) was the first to lay stone to this literature by defining entrepreneurship as the creative destructive process where the entrepreneur coordinates production and agent change. This seminal definition has been expanded and entrepreneurship is currently defines as a catalyst of structural transformation and institutional evolution, which is concerned not only with the business success, but also with subjective factors and non-economic welfare (Acs and Naude 2012; Naude 2014). Entrepreneurship is thus beneficial for productivity, employment and economic growth. As result, given the key role of women in development process, female entrepreneurship in developing countries has recently been a surge of interest (Berik and al 2008; Loko and Diouf 2009; Minniti an Naude 2010; Boungou Bazika 2012; Brunnermeier and others 2012).

In fact, two broad body of 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. Keynesian and Kaleckian macroeconomics emphasizes the demand side effects of intergroup inequality on growth and development (Keynes 1936; Kalecki 1954; Dutt 2010; Damiano and Mwakubo 2014; Seguino and Were 2014). However, Kaleckian and Keynesian research does not explore the role of gender credit inequality, nor focus on the supply side effects of inequality. Seguino and Were (2014) look at both demand and supply side effects of gender inequality when
considering the relationship between gender and macroeconomics in Sub-Saharan Africa. The authors also look at the transmission mechanism on the macro-economy both in the short and the long run, to understand the extent to which macro policies are socially sustainable. Stotsky (2006) examines the implications of gender differences in economic behavior for macroeconomic policy, finding that reducing gender inequality and improving the status of female may contribute to higher rates of economic growth and greater macroeconomic stability. Nevertheless, these researches do not take in account the limited access of credit faced by female entrepreneurs in Africa.

The effect of absolute and relative gender inequality on macroeconomics is also based on the neo-classical and structuralist approaches. The mainstream neo-classical approaches explore the long run effects of inequality on economy growth and largely focus on the impact of capabilities inequality. In contrast, structuralist macroeconomist and feminist economists emphasize the short run effects as well as long run effects, and the role of inequality in livelihoods (Were and Kiringai 2003; Doss, 2006; Berik et al. 2009; Damiano and Mwakubo 2014; Seguino and Were 2014).

However, lack of financing access and higher start-up costs is a significant constraint hindering female’s entrepreneurial entry in developing countries (Langowitz and Minniti 2007; Yueh 2009). Physical accumulation process could be hindering. Since, investments in capital are determinants of economic growth and development. Thus by constraining the accumulation of these assets, gender can hamper growth and development (Abena Oduro 2012). Gender inequality in access to credit, may also slow down the adoption of new technologies and the pace of growth. Thus structural transformation can be undermined by gender-biased access to necessary inputs or credit. In turn, economic development would be inhibited because, development requires a structural transformation from low value-added, low productivity, and rural based activities to higher value-added, more productivities activities in services and manufacturing located in cities (Abena Oduro 2012; Naude 2014).

Female entrepreneurs access to credit matters thus as an instrument for development as it enhances economic efficiency and improves macroeconomics outcomes in several ways (Berik and al 2008; Damiano and Mwakubo 2014). Productivity differentials among companies owned by men and by women have been found to be mainly the result of differences in access to productive inputs, such as credit. A reduction of this productivity gap through equal access to productive resources yields considerable output gains (Muravyev and others 2009; Revenga and Shetty 2012). Also, better opportunities for female to earn and

---

3 Capabilities refers to the requisite functioning’s necessary to enter into productive work, be it paid or unpaid, and includes such measures as educational attainment and health.
control income contribute to broader economic development in developing economies. In particular, higher female credit access can boost growth by mitigating the impact of a shrinking wealth creation (Baliamoune-Lutz and McGillivray 2007; Miller 2008; Hansen and Rand 2012; Henrik and Rand 2012; Bandiera and Natraj 2013).

2.2. Empirical 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. 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

---

4 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.
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 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 does 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. Some stylized facts

This section provides an overview of thinking on the connection between gender and entrepreneurship in Cameroon. It posits a descriptive and statically analysis of gender in Cameroon in the one hand, and in the other linking it addresses the link between gender and entrepreneur by emphasizing on the constraints to female entrepreneurs, namely, access to credit.

3.1. Gender analysis in Cameroon

Cameroon authorities have done enough this last decades to achieve gender equality. One of the noticeable achievements is the launched in 1997 of the Ministry in charge of female promotion. The aims of gender policy in Cameroon is thus based on four mains pillars, namely, ease female access to productive resources and ensure control, enhance and encourage female labor productivity and in turn their revenues, increase basic infrastructures quality, and promote female fundamental rights. This section will assess the evolution of these objectives in term of education, employment and politics participation.

- Education
  Efforts to reduce the education gap between male and female are increasing the level of female enrolment and their school performances in Cameroon. These results are partly motivated by the fact that education is a priority area of policy focus in Cameroon.
The national educational system is based on four core stages, the Nursery School level, the Primary or Basic Education level, the Secondary Cycle and the Higher Education level. In the Basic Education level, Figure 1 reveals that, in average, the completion rate of girls increases by 19.6% from 2003 to 2012, more than boys completion rate, which increases only by 9% in the same period.

Similar observations are obtained when turning to Secondary Cycle. Referring to Table 1 (in appendix), female pupils perform better than male pupils in the Secondary cycle. The net rate of school attendance in Secondary Cycle for female pupils increases from 35.7% in 2001 to 51.5% in 2010, relative to male school attendance rate, which increases from 33.9% to 47.8%. This growing rate of female school attendance in Secondary Cycle can been explained by the policy of “Education for all” engaged by the authority and the expansion of Public Secondary School in local communities.
Likewise, in the higher Education level, figure 2 reveals that the rate of enrolment in Higher education is increasing in Cameroon, for men as well as for female. Importantly, the disparity between male and female deceases as the overall rate of enrolment increases. In average, the rate of enrolment of female is quite close of the male rate of enrolment during last decade. Female rate of enrolment in higher education rose from 4% in 2002 to 10% in 2011, while male rate of enrolment rose from 7% to 14% in the same period.

Considering some education expenditure as the household survey of 2001 and 2007 had mentioned, there is an average increase associated with a reduction of the value of its variation coefficient. The education expenditure rose on average from 37447.71 CFA in 2001 to 40517.59 CFA in 2007. For the non-poor households, the average education expenditure fell within the period. A within-gender analysis of the education expenditure of poor males is relatively stable on the period, with a reduction expenditure gap between poor males and non-poor males. For female, there is an increase of the average education expenditure for both the poor and the non-poor, with a prevailing decrease gap between the two groups.

A better education level can help female to better integrate the labor market and to beneficiate to better paid according to the employment type in the formal sector.

- **Employment**

**Figure 3: Labor Force Participation rates**

Concerning employment, considerable efforts have been made to enhance the female participation in the labor market in Cameroon. Even if male labor force participation is still quite greater than female labor force participation, female has entered the labor market in massive numbers during this past decades. Figure 3 reveals that male labor force participation represents in average 76% during 1990 to 2012, against 62% for female.
However, for female who are under-represented in paid-employment, particularly outside the public sector, informal self-employment provides a critical source of revenue. Thus, active female (93.8%) are over represented in the informal sector than active male (6.2%). (ILO 2010). Within the informal sector, female are over represented in the non-agricultural sector while male are over represented in the agricultural sector. Table 2 (in appendix) reveals that, self-employment in informal enterprises accounted for 24.3% of female’s non-agricultural employment in 2001 against 38.9% in 2010. While, self-employment in informal enterprises accounted for 23.6% of male’s non-agricultural employment against 35.9% in the same period. In contrast, self-employment in informal enterprises accounted for 52.4% of female’s agricultural employment in 2001 against 48.5% in 2010. While, self-employment in informal enterprises accounted for 68.5% of male’s agricultural employment in 2001 against 57.9% in 2010. Hence, better access to high-paid Job as the one the men have may help female to better act as politician and enhance their participation in the different level of government actions.

- Political participation

Female participation in political life in Cameroon is increasing years by years. Overall, the proportion of female involved in political positions increases from 6.7% in 2001 to 11.7% in 2011. Specifically, the ratio of female Minister increases from 9.1% in 2001 to 16.1% in 2011. The ratio of female Secretary of State rose from 8.3% in 2001 to 20% in 2011. However, until now in Cameroon, no female had occupied the positions of Prime minister, Vice-prime minister and Minister of State.

Table 3: Proportion of female involved in political positions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T F %F</td>
<td>T F %F</td>
<td>T F %F</td>
<td>T F %F</td>
<td>T F %F</td>
</tr>
<tr>
<td>Prime Minister</td>
<td>1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vice-Prime Minister</td>
<td>- - - - - - - - - - - - - - - - 2 0 0 1 0 0 1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minister of State</td>
<td>7 0 0 5 0 0 3 0 0 3 0 0 2 0 0 2 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minister</td>
<td>22 2 9.1 32 4 12.5 31 5 16.1 31 5 16.1 31 5 16.1 31 5 16.1 31 5 16.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minister* delegate</td>
<td>3 0 0 10 0 0 8 0 0 9 1 11.1 15 0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secretary of State</td>
<td>12 1 8.3 10 2 20 6 1 16.6 6 1 16.6 10 2 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>45 3 6.7 58 6 10.3 51 6 11.8 52 7 13.5 60 7 11.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


*Minister in charge of Assignment are assimilated to Minister delegate
“F” refers to female. “%F” refers to in percentage to female. “T” refers to total.

At the local community level (Table 4 in appendix), the number of positions occupied by female within the municipality committee is also increasing. During the period 2002 to 2007, the ratio of female Mayor in Cameroon was only 2.9%. This proportion has been improved
and represents in average 6.7% during 2007 to 2012. Moreover, female represent in average 15.5% of municipal advisers since the period 2007-2012. In contrast, the proportion of female first and second Deputy-Mayor decreases during the period.

The four mains governance agencies in Cameroon, such as, the National Anti-Corruption Commission (CONAC), the Elections Cameroon (ELECAM), the National Agency of Financial Investigation (ANIF) and the Cameroon Supreme Court, reveal that females are increasingly present for policy advice and political decisions. Since 2007, 25% of ELECAM members, 9.8% of Supreme Court judges and 32% of ANIF members are female. The ELECAM goes forward by increasing this ratio to 27.8% in 2011, contrast to the ANIF and the Supreme Court where the ratio of female members and judges remains constant from 2007 to 2011 (Table 5 in appendix).

Furthermore, the 2013 Global Gender Gap data reveals that even if there is an improvement in female political empowerment, the percentage of female in parliament and Ministerial Positions remain low with a rate of 14% against 86% for men.

Table 6: The Cameroon’s Gender Gap Index

<table>
<thead>
<tr>
<th></th>
<th>Rank (out of 136 countries)</th>
<th>Score (0.00 = inequality 1.00 = equality)</th>
<th>Sample average</th>
<th>Female</th>
<th>Male</th>
<th>Female to male ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political empowerment</td>
<td>99</td>
<td>0.090</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women in Parliament</td>
<td>93</td>
<td>0.16</td>
<td>0.24</td>
<td>14</td>
<td>86</td>
<td>0.16</td>
</tr>
<tr>
<td>Women in Ministerial in Positions</td>
<td>73</td>
<td>0.16</td>
<td>0.19</td>
<td>14</td>
<td>86</td>
<td>0.16</td>
</tr>
</tbody>
</table>


Notwithstanding the increasing gender equality in education, health, employment and political participation, gender issue matters when looking to the involvement of entrepreneurs in the credit market.

3.2. Entrepreneurship and gender issue in Cameroon

Despite Government efforts to promote female entrepreneurship, the latest Cameroon General Survey of Enterprises (RGE 2009) reveals that only 38% of head of enterprises are female. Among those 38% of enterprises owned by female entrepreneurs, the vast majority is small-scale enterprises (TPE)⁵.

⁵ Four types of enterprises have been identified in this survey: bigger enterprises (GE), medium enterprises (ME), small enterprises (PE) and small-scale enterprises (TPE).
In 2013, the Global Gender Gap report emphasizes that in Cameroon, the ability of female to become entrepreneurs is at 5%, the rate of firms with female top managers is at 10% and the rate of firms with female participation ownership is 16%, while these rates are respectively, 95%, 90% and 84% for male entrepreneurs. This sluggish ratio of female entrepreneurs’ in Cameroon can been explained by several aspects.

Basically, the substantial constraints in entrepreneurship as shown in figure 5 (in appendix), are, taxation, corruption, credit access, administrative procedures, unfair competition, infrastructures, financial costs, lack of dialogue between private sectors and Government, energy supply, transport and justice. Among those 14 constraints, 58.7% of surveyed enterprises believe that taxation remain the primary obstacle in entrepreneurship, 50.6% of surveyed enterprises consider corruption as the second constraint, and 37.8% of surveyed enterprises believe that access to credit is the third constraint of entrepreneurship in Cameroon.

- **Financing access as one of the keys constraints of female entrepreneurship**

Regarding female entrepreneurship, it appears that among the three keys constraint of entrepreneurship in Cameroon, access to credit inhibits the most the development of female entrepreneurship. Table 7 reveals that access to financing and corruption are ranked as the two major constraints of female entrepreneurship in Cameroon. Notably, despite the authorities efforts, 23% of survey responses identify that in Cameroon female entrepreneurship continues to register poor access to financing.
Table 7: Constraints factors for female entrepreneurship in Cameroon (2013-2014)

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Rank of constraints</th>
<th>Percent of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corruption</td>
<td>1st</td>
<td>24</td>
</tr>
<tr>
<td>Access to financing</td>
<td>2nd</td>
<td>23</td>
</tr>
<tr>
<td>Inadequate supply of infrastructure</td>
<td>3rd</td>
<td>14</td>
</tr>
<tr>
<td>Tax regulations</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Inefficient government bureaucracy</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Tax rates</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Poor work ethic in national labor force</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Insufficient capacity to innovate</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Crime and theft</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Restrictive labor regulations</td>
<td>10</td>
<td>2.5</td>
</tr>
<tr>
<td>Foreign currency regulations</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Inflation</td>
<td>12</td>
<td>1.5</td>
</tr>
<tr>
<td>Inadequacy educated workforce o.6</td>
<td>13</td>
<td>0.5</td>
</tr>
<tr>
<td>Poor public health</td>
<td>14</td>
<td>0.4</td>
</tr>
<tr>
<td>Policy instability</td>
<td>15</td>
<td>0.3</td>
</tr>
<tr>
<td>Government instability or coups</td>
<td>16th</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Source: Authors from World Economic Forum data (2014)

More precisely, the Cameroon Households survey demonstrated that, female entrepreneurs in Cameroon are mostly affected by the lack of production credit. According to figure 6, the weak production financing access of female entrepreneurs in Cameroon decreases from 4% in 2001 to 3.4% in 2011. In contrast, male entrepreneurs access to production financing increases from 12% in 2001 to 14% in 2011.

This financial constraint encountered by female entrepreneurs in Cameroun can be motivated by four majors factors, namely, the shallowness of financial system, the business environment, the vulnerability of female entrepreneurs and the financial frictions in the credit markets.

Figure 6: Access to production credit per entrepreneurs (%)
The financial sector is dominated by a less competitive banking sector, which is composed of 13 banks subdivided in three subgroups, such as, foreign banks, domestic private banks, and state-owned banks. Cameroon, as a member state of CEMAC, faces the existence of two competing financial markets, which do not represent significant alternatives to bank lending, since there are shallow and fragmented. Securities Exchange of Central Africa launched in 2003 in Libreville-Gabon, and the Douala Stock Exchange inaugurated in 2003 in Douala-Cameroon.

Considering the banking sector, access to financial services remains feeble. The bank density and the banking rate can explain the shallowness of banking sector. The share of the adult population with a formal bank account sluggishly increases from 20.41% in 2012 to 20.68% in 2013. However, this banking rate is lag behind the average of LICs (24%), even if it is above the average of the CEMAC region (18.51%). Importantly, the female banking rate was around 11% in 2013 while male banking rate was 19%.

<table>
<thead>
<tr>
<th>Table 8: Banking rate in Cameroon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Banking Rate of active population</strong></td>
</tr>
<tr>
<td>Years</td>
</tr>
<tr>
<td>Cameroon</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>CEMAC</td>
</tr>
</tbody>
</table>

Source: Authors using BEAC data (2014) and the Global Gender Gap data (2013)

The low level of banking rate is also related to the weak bank density in Cameroon. In average, around 49 096 people shares one bank desk, leading the level of Cameroonian bank density behind the CEMAC level, with 23 203 people sharing one bank desks in average in CEMAC. Hence, given this low level of bank density, it becomes difficult to target entrepreneurs around the country for potential credit bargaining, both in rural and urban area. Consequently, the role of banks in saving mobilization is limited and bank lending remains a marginal source of funding, with long-term lending constituting less than 1.5% of total loans (Table 9).

---

6 The 13 banks represented in Cameroon are Afriland First Bank, Cameroon International Bank of Saving and Credit, Citibank Cameroon, Commercial Bank of Cameroon, Cameroon, Commercial Society of Bank, Ecobank Cameroon, National Financial Credit Bank, General Society of Banks in Cameroon, Union Bank of Cameroon, United Bank for Africa Cameroon, Atlantic Bank Cameroon, BGFIBank Cameroon.
Table 9: Distribution of credit by nature and duration

<table>
<thead>
<tr>
<th>Credit Nature</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long-term credit</strong></td>
<td></td>
</tr>
<tr>
<td>Long-term credit to investment</td>
<td>0.48%</td>
</tr>
<tr>
<td>Long-term credit to real estate</td>
<td>0.12%</td>
</tr>
<tr>
<td>Long-term credit to equipment</td>
<td>0.06%</td>
</tr>
<tr>
<td>Long-term consolidated credit</td>
<td>0.00%</td>
</tr>
<tr>
<td>Long-term consolidated campaign credit</td>
<td>0.31%</td>
</tr>
<tr>
<td>Long-term credit to consumption</td>
<td>0.03%</td>
</tr>
<tr>
<td><strong>Medium-term credit</strong></td>
<td>34.77%</td>
</tr>
<tr>
<td>Medium-term credit to investment</td>
<td>10.86%</td>
</tr>
<tr>
<td>Medium-term credit to real estate</td>
<td>0.33%</td>
</tr>
<tr>
<td>Medium-term credit to equipment</td>
<td>12.37%</td>
</tr>
<tr>
<td>Medium-term consolidated credit</td>
<td>0.00%</td>
</tr>
<tr>
<td>Medium-term consolidated campaign credit</td>
<td>0.10%</td>
</tr>
<tr>
<td>Medium-term credit to consumption</td>
<td>9.22%</td>
</tr>
<tr>
<td><strong>Short-term credit</strong></td>
<td>35.26%</td>
</tr>
<tr>
<td>Discount cheque or immediate credit</td>
<td>0.26%</td>
</tr>
<tr>
<td>Negotiable certificate</td>
<td>2.79%</td>
</tr>
<tr>
<td>Cash credit</td>
<td>26.63%</td>
</tr>
<tr>
<td>Short-term credit to equipment</td>
<td>0.48%</td>
</tr>
<tr>
<td>Support credit</td>
<td>1.75%</td>
</tr>
<tr>
<td>Short-term campaign credit</td>
<td>1.64%</td>
</tr>
<tr>
<td>Short-term credit to consumption</td>
<td>1.53%</td>
</tr>
<tr>
<td>Short-term consolidated credit</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Source: Authors using data from National Council of Credit (2014).

In fact, private enterprises represent the first customer of banks in Cameroon with a ratio of credit granted of more than 60%, following by individual (14.12%) and individuals enterprises (7.61%). However, individuals are granted most medium-term credit than private enterprises, with a ratio of 63.85% relatively to 31.51%, respectively. Surprisingly, short-term credits are the most granted credit to private enterprises (38.07%) rather than long-term credit (1.7%). Even for individuals’ enterprises, short-term credits are the first type of credit granted (18.36%) rather than long-term credit (0.44%). The distribution of credit by bank’s customer partly justifies the difficulties encountered by female entrepreneurs, both self-employed and those running Small or Medium Scale enterprises to access to long-term financing.

Figure 7: Distribution of credit by duration and type of bank’s customer

Source: Authors using data from National Council of Credit (2014)
The vulnerability of female entrepreneurship is one of the main reasons why female entrepreneurs are most exposed to financial frictions according to banks. Self-employment, small-scale enterprises, farms and informal business dominate the features of female entrepreneurship in Cameroon. As a result, their productivity activities are governed to a limited extent by formal laws, regulations, and social protections. Due to high risk surrounding informal activity, female business tends to be less profitable and generate lower sales turnover than those owned by men. The predominance of small-scale business among their activities is seen as a symptom of wide uncertainty, which negatively affects the probability of success. Moreover, to provide for their families, most of the time, female work in farms or run small-scale trades. Another factor which limits the productivity of female entrepreneurs, since those activities are day-to-day businesses to smooth consumption over time.

Figure 8: Cameroon Doing Business Indicators (2013-2014)

The business environment is another key factor explaining the insufficient credit access. Despite some marginal reforms, the business climate in Cameroon continues to evolve under its potential. Overall, unless getting electricity, all the Cameroon's doing business indicators are ranks behind the average of SSA in 2014. The country's rating has deteriorated significantly regarding access to credit (109th in 2014 rather than 105th in 2013), starting business (132th rather than 125th in 2013) and construction permits (127th rather than 95th). The 800 days needed in Cameroon to resolve a legal dispute versus 652 days in average SSA explained the country's 175th ranking with respect to enforcing contract. However, marginal improvement has been made concerning the process of registering property, with a rank of 159th out of 189 in 2014 rather than 160th out of 189 in 2013.
The shallowness of financial sector, the vulnerability of females entrepreneurs and the poor business environment highlight the presence of financial frictions in the credit market as one of the fundamental factors explaining the low access to financing by female entrepreneurs. The existing frictions can be found through collaterals, interest rates, bank’s commission and fees. The general idea of less creditworthy of female entrepreneurs is fully justify when looking for collateral. The lack of female owned properties, such as land, real estate, paid-employment or wages (which are assets generally used as collateral by the banking sector in Cameroon), inhibits their ability to offers collaterals and obtained credit for the banking sector. Sometimes, female entrepreneur need the approbation of head of the family or of their husband on their owned assets while using them as collateral. Hence female entrepreneurs’ are less likely to have required collaterals’ and become less creditworthy than male entrepreneurs for credit demand.

Figure 9: Evolution of Interest Rates in Cameroon (%)

Source: Authors using World Bank Financial data (2014)

Financing constraints sometimes also comes from high interest rate. In fact, to preserve themselves from risk and uncertainty of less creditworthiness customers, banking sector tends to increase the commissions and fees of banks operations’, which account for about 40% of the income of banking sector in Cameroon. Given this high level of commissions and fees, female entrepreneurs are less likely to have banks accounts, overdraft protection and loans. As figure 9 demonstrates, there has been a huge gap between the deposit rate and the lending in Cameroon during the last three decades. As result, financial intermediation
involves high costs that create disincentives for female entrepreneurs who might wish to establish a business, invest in it or increase their productivity.

4. **Methodology: a DSGE Model with Gendered Financial Frictions**

This research uses a Dynamic Stochastic General Equilibrium (DSGE) model with financial micro-foundations to address the problem of gendered financial frictions in the credit market and its macroeconomics implications in Cameroon. The model grounds its analytic framework from the Real Business Cycle (RBC) approach (King et al. 1988; Cooley and Hansen 1989; Stadler 1994; Carlstrom and Fuerst 1997; Kiyotaki and Moore 1997; Gertler and Kiyotaki 2010; Gilchrist and Zakrajcev 2011).

Given the salient features of Cameroonian economy, the theoretical model departs from the standard RBC framework in several aspects. Firstly, gender issue is introduced in the model via heterogeneity on the production sectors. We feature two types of sectors, such as, production sector dominated by female entrepreneurs and production sector dominated by male entrepreneurs. Secondly, both sectors are financially constrained, however male entrepreneurs production sector is less constrained than female entrepreneurs production sector. Thirdly, we feature the financial sector characteristic of African economies, which is mainly represented by the banking sector. Fourthly, to finance their operation of producing intermediates goods, each sector borrow funds from the banking sector. Fifthly, the financial source of banking sector is the deposit of households and the households own the shares of the banking sector. Sixthly, the financial intermediation between banks and entrepreneurs is subject to frictions. Seventhly, the types of financial frictions that affect the economy are the quantities constraints. Eighthly, households supply differentiated labor and in return earn wages from both sectors, and profit from bank, used to consume, save and pay lump sum taxes to government. Ninethly, Government uses taxes to finance exogenously the public expenditure.

In fact, financial friction appears because both entrepreneurs face a collateral constraint when borrowing from the bank⁷. It posits the existence of credit imperfections problem between banking sector and entrepreneurs. Credit limits can be affected by the quantity of collateral for loans. And the same time, the collaterals can be affected by the size of the credit limits. The dynamic interaction between credit limits and collateral could be a powerful transmission mechanism by which the effects of stocks spillover to real sector. Specifically, since physical capital is used as collateral to obtain loans and produce intermediate goods,

---

⁷ The collateral constraints model improve in many areas the business cycle properties than the external finance premium (Kiyotaki and Moore 1997).
in presence of a temporary shock at the current period that reduces entrepreneurs production, they becomes unable to borrow, they would be forced to cut back their investment expenditures and thus 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. Overall, we would consider an economy populated by households, female entrepreneurs dominated production sector, male entrepreneurs dominated production sector, final goods sector, banking sector and government (Figure 10 in Appendix).

4.1. Households

A continuum of infinitely lived households gains their utility from consumption $c^H_t$, and labor supply $n_t$. The intertemporal optimization problem of the representative household is to maximize lifetime utility function:

$$U_0 = E_0 \sum_{t=0}^{\infty} \sigma_t \beta^H_t \left( \log c^H_t + \vartheta_t \log (1 - n_t) \right)$$

(1)

Here $\sigma_t$ stands for the preference shock affecting the marginal utility of household, $\beta^H_t$ denotes the household subjective intertemporal discount factor and $\vartheta_t$ represents the preference shock affecting the marginal utility of the labor supply. Households have the possibility to choose in which of the two production sectors of the economy to offer their labor hours. The labor index $n_t$ consists of hours worked in the production sector dominated by female entrepreneurs $n^F_t$ and production sector dominated by male entrepreneurs $n^M_t$, and is given by the CES aggregator as follow:

$$n_t = \left[ (1 - \theta_u) \frac{1}{\tau} (n^F_t)^{\frac{\tau - 1}{\tau}} + \theta_u \frac{1}{\tau} (n^M_t)^{\frac{\tau - 1}{\tau}} \right]^{\frac{\tau}{\tau - 1}}$$

(2)

Here $\theta_u$ stands for the share of employment in the production sector dominated by male entrepreneurs. $\tau$ denotes the elasticity of substitution between the two productions sectors for labor supply. Since wages are flexible, they are set to equal the marginal rate of substitution between consumption and labor in each production sector.

The representative household is subject to an intertemporal budget constraint:

$$c^H_t + D_t = w_t^F n^F_t + w_t^M n^M_t + R_{D,t-1} D_{t-1} + \Xi_t - T_t$$

(3)

\[\text{We assume that households are ricardians households, so their discount factor } \beta^H_t \text{is expected to be highest.}\]
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 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, intermediate goods producers $w_t^M n_t^M$, interest on deposits $R_{D,t-1}D_{t-1}$ at the bank, and profit from bank shares they owned $\Xi_t$.

The Lagrangian for the household optimization problem can been written as follow:

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

(4)

Here $\lambda_t$ is the Langrange multiplier on the representative household budget constraint.

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.

The optimal conditions yield first order conditions for consumption, labor supply and deposits:

$$\frac{\partial L_{H1}}{\partial c_t^H} = \omega_t(\beta^H_t)^t \frac{\partial u(c_t^H, n_t^F)}{\partial c_t^H} - \omega_t(\beta^H_t)^t \lambda_t = 0$$

(5)

$$\frac{\partial L_{H1}}{\partial n_t^F} = \omega_t(\beta^H_t)^t \frac{\partial u(c_t^H, n_t^F)}{\partial n_t^F} + \omega_t(\beta^H_t)^t \lambda_t w_t^F = 0$$

(6)

$$\frac{\partial L_{H1}}{\partial n_t^M} = \omega_t(\beta^H_t)^t \frac{\partial u(c_t^H, n_t^F)}{\partial n_t^M} + \omega_t(\beta^H_t)^t \lambda_t w_t^M = 0$$

(7)

$$\frac{\partial L_{H1}}{\partial D_t} = -\omega_t(\beta^H_t)^t \lambda_t + E_t[\omega_{t+1}(\beta^H_t)^{t+1} \lambda_{t+1}]R_{D,t} = 0$$

(8)

Then we derive the following expression:

$$\lambda_t = \frac{1}{c_t^H}$$

(9)

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

(10)

---

The derivative with respect to $\lambda_t$ 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. This implies especially that the nominal interest rate $R_t$ is positive.
\[ \lambda_t w_t^M = \frac{\theta_t \left[ (1-\theta_H) \frac{1}{\tau(n_F^M)^{\frac{r-1}{r}} + (\theta_H) \frac{1}{\tau(n_M^M)^{\frac{r-1}{r}}} \right]^\frac{r}{r-1} \left( \theta_H \tau(n_F^M)^{\frac{1}{r}} \right)^{\frac{r-1}{r}}}{(1-n)} \]  

(11)

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

(12)

The first three efficiency conditions, relations (9), (10) and (11), imply that the equality of the marginal rate of substitution between consumption and labor is equal to the real wage, as given:

\[ \frac{w_t^F}{c_t^F} = \frac{\theta_t \left[ (1-\theta_H) \frac{1}{\tau(n_F^M)^{\frac{r-1}{r}} + (\theta_H) \frac{1}{\tau(n_M^M)^{\frac{r-1}{r}}} \right]^\frac{r}{r-1} \left( \theta_H \tau(n_F^M)^{\frac{1}{r}} \right)^{\frac{r-1}{r}}}{(1-n)} \]  

(13)

\[ \frac{w_t^M}{c_t^F} = \frac{\theta_t \left[ (1-\theta_H) \frac{1}{\tau(n_F^M)^{\frac{r-1}{r}} + (\theta_H) \frac{1}{\tau(n_M^M)^{\frac{r-1}{r}}} \right]^\frac{r}{r-1} \left( \theta_H \tau(n_F^M)^{\frac{1}{r}} \right)^{\frac{r-1}{r}}}{(1-n)} \]  

(14)

4.2. 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 goods, accumulate physical capital and pay wages to household. They are both financial constraint but evolve in two parallel production sectors and produce two non-substitutable intermediates goods.

4.2.1. Production Sector Dominated by Female Entrepreneurs

Within the production sector dominated by female entrepreneurs, the representative female entrepreneur maximizes its expected utility described as follow:

\[ U_o = E_0 \sum_{t=0}^{\infty} (\beta_F)^t \log c_t^F \]  

(15)

Here, \( \beta_F \) stands for the female entrepreneur consumer subjective intertemporal discount factor, \( c_t^F \) represents the female entrepreneur current individual consumption.

The representative female entrepreneur solve the above problem subject to an intertemporal budget constraint:

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

(16)

Here \( y_t^F \) stands for the intermediate goods supplied by the production sector dominated by female entrepreneurs, \( k_{t-1}^F \) represents the units of physical capital bought at the price \( q_t^F \), \( L_t^F \) is
loans granted by banks to the production sector dominated by female entrepreneurs on which the interest to pay is $R^P_t \cdot n^F_t$ denotes the amount of labor hired by the sector at the wage $w^F_t$.

The representative female entrepreneur production function of intermediates goods is thus expressed as follow:

$$y^F_t = a^F_t (n^F_t)^{1-\alpha}(k^F_t)^{\alpha}$$  \hspace{1cm} (17)

Here $\alpha$ represents the labor share in the production sector and $a^F_t$ measures the total productivity factor, (TPF).

And the equation of motion for the stock of capital stock is given by:

$$k^F_t = (1 - \delta)k^F_{t-1} + i^F_t$$  \hspace{1cm} (18)

Where $i^F_t$ represents the investment of the production sector dominated by female entrepreneurs and $\delta$ is the depreciation rate of capital.

To feature the financial frictions, we assume that the amount of loans required by both entrepreneurs to the banking sector is constrained by the value of their collaterals. In this model, collateral is materialized by the holdings of physical capital. The process implies that the amount of physical capital that entrepreneurs will be able to accumulate each period is inversely proportionate to the minimum return required by banks in order to supply one unit of loans, which in turn depends on three mains components such as, the LTV ratio, the expected future price of capital and the real interest rate on loans. Consequently, the variations of quantity of collateral modify the transmission of shocks and even amplifying some type of shocks.

The production sector dominated by female entrepreneurs will also face the following intertemporal borrowing constraint:

$$R^P_t L^P_t \leq V^F_t \left( (1 - \delta)k^F_t \right) E_t[q^P_{t+1}]$$  \hspace{1cm} (19)

Here $V^F_t$ stand for the stochastic female entrepreneur’s loan to value (LTV) ratio and determines the amount of loans that banks make available to female entrepreneurs for a given discounted value of their capital stock. The borrowing constraints demonstrate that, female entrepreneurs cannot borrow more than a fraction $V^F_t$ of the expected value of their physical capital stock. Since female entrepreneurs are 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 Lagrangian for the optimization problem of the production sector dominated by female entrepreneurs can be written as follow:

\[ L = E_0 \left[ \sum_{t=0}^{\infty} (\beta_F)^t u(c_t^F) + \sum_{t=0}^{\infty} (\beta_F)^t \lambda_t^F \left( p_t^F \gamma_t^F + L_t^F + q_t(1-\delta)k_{t-1}^F - c_t^F - w_t^F n_t^F - R_{L,t-1}^F L_{t-1}^F - q_t k_{t-1}^F \right) + \sum_{t=0}^{\infty} (\beta_F)^t \lambda_{F,t}^V V_t^F \left( (1-\delta)k_{t-1}^F \right) E_t[q_{t+1}^F - R_{L,t}^F L_t^F] \right] \]  

(20)

Here, \( \lambda_t \) is the Lagrange multiplier on the representative household budget constraint. Here \( \lambda_t^F \) represents the Lagrange multiplier on the budget constraint and \( \lambda_{F,t}^V \) stands for the Lagrange multiplier on the borrowing constraint within the production sector dominated by female entrepreneurs optimization problem.

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

\[ \lambda_t^F = \frac{1}{c_t^F} \]  

(21)

\[ w_t = \frac{(1-\alpha)Y_t^F}{n_t^F} \]  

(22)

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

(23)

\[ \lambda_t^F - \lambda_{F,t}^V = \beta_F E_t[\lambda_{t+1}^F] R_{L,t}^F \]  

(24)

Hence, the above equations show that the value of the physical capital in the sector dominated by female entrepreneurs closely depends on the upcoming marginal productivity along with the ability to possess the required collateral for loans. Equation (24) 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

Within the production sector dominated by male entrepreneurs, the representative male entrepreneur maximizes its expected utility described as follow:

\[ U_o = E_0 \sum_{t=0}^{\infty} (\beta_M)^t \log c_t^M \]  

(26)

Here, \( \beta_M \) stands for the male entrepreneur consumer subjective intertemporal discount factor, \( c_t^M \) represents the male entrepreneur current individual consumption.
The representative male entrepreneur solve the above problem subject to an intertemporal budget constraint:

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

(27)

Here \( y_t^M \) stands for the intermediate goods supplied by the production sector dominated by male entrepreneurs, \( k_{t-1}^M \) represents the units of physical capital bought at the price \( q_t^M \), \( L_t^M \) is loans granted by banks to the production sector dominated by male entrepreneurs on which the interest to pay is \( R_{L,t}^M \), \( n_t^M \) denotes the amount of labor hired by the sector at the wage \( w_t^M \).

The representative male entrepreneur production function of intermediates goods is thus expressed as follow:

\[ y_t^M = a_t^M (n_t^M)^{1-\alpha} (k_{t-1}^M)^\alpha \]  

(28)

Here \( \alpha \) represents the labor share in the production sector and \( a_t^M \) measures the total productivity factor, (TPF).

And the equation of motion for the stock of capital stock is given by:

\[ k_t^M = (1 - \delta) k_{t-1}^M + i_t^M \]  

(29)

Where \( i_t^M \) represents the investment of the production sector dominated by male entrepreneurs and \( \delta \) is the depreciation rate of capital.

The production sector dominated by male entrepreneurs will also face the following intertemporal borrowing constraint:

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

(30)

Here \( V_t^M \) stand for the stochastic male entrepreneur’s loan to value (LTV) ratio and determines the amount of loans that banks make available to male entrepreneurs for a given discounted value of their capital stock. The borrowing constraints demonstrate that, male entrepreneurs cannot borrow more than a fraction \( V_t^M \) of the expected value of their physical capital stock. Since male entrepreneurs are also credit constrained but less than female entrepreneurs, they discount the future less heavily than the male entrepreneurs.

The Lagrangian for the optimization problem of the production sector dominated by male entrepreneurs can been written as follow:
\[ L = E_o \left[ \sum_{t=0}^{\infty} (\beta_M)^t u(c_t^M) + \sum_{t=0}^{\infty} (\beta_M)^t \lambda_t^M \left( p_t^M y_t^M + L_t^M + q_t^M (1 - \delta) k_{t-1}^M - c_t^M - w_t^M n_t^M - R_{L,t-1}^M L_{t-1}^M - q_t^M k_t^M \right) + \sum_{t=0}^{\infty} (\beta_M)^t \lambda_t^V \left( V_t^M \left( (1 - \delta) k_t^M \right) E_t[q_{t+1}^M - R_{L,t}^F L_t^F] \right) \right] \] 

(31)

Here \( \lambda_t^M \) represents the Lagrange multiplier on the budget constraint and \( \lambda_{M,t}^V \) stands for the Lagrange multiplier on the borrowing constraint within the production sector dominated by male entrepreneurs optimization problem.

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

\[ \lambda_t^M = \frac{1}{c_t^M} \] 

(32)

\[ w_t^M = \frac{(1-\alpha)Y_t^M}{n_t^M} \] 

(33)

\[ \lambda_t^M q_t^M = E_t \left[ \beta_M \lambda_{t+1}^M \left( \frac{\alpha_{F,t+1}^M y_{t+1}^F}{k_t^M} \right) + (1 - \delta) q_{t+1}^M \right] + \lambda_t^V V_t^M \left( (1 - \delta) \frac{q_{t+1}^M}{R_{L,t}^F} \right) \] 

(34)

\[ \lambda_t^M - \lambda_{M,t}^V = \beta_M E_t[\lambda_{M,t+1}^M] R_{L,t}^M \] 

(35)

4.3. Final Goods Production Sector

The firm producing the final good \( y_t \) in the economy uses intermediates goods supplied by the sector dominated by female entrepreneurs \( y_t^F \) and intermediates goods offered by the sector dominated by male entrepreneurs \( y_t^M \). The final goods production function is assumed to be a CES function type, as given:

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

(36)

The firm maximizes its profits over \( y_t^F \) and \( y_t^M \), given the production function and given the price \( P_t \). So the problem can be written as:

\[ \text{max}_{y_t^F, y_t^M} [y_t - (p_t^F y_t^F + p_t^M y_t^M)] \] 

(37)

Subject to the production

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

(38)
The first order condition for each intermediates goods produced in the sector dominated by female entrepreneurs is:

\[ y_t^F = (1 - \theta_y)(p_t^F)^{-\mu}y_t \]  \(39\)

And the first order condition for each intermediates goods produced in the sector dominated by male entrepreneurs is:

\[ y_t^M = (\theta_y)(p_t^M)^{-\mu}y_t \]  \(40\)

Here \( \theta_y \) represents the share of intermediate goods produced in the production sector dominated by female entrepreneurs and \( \mu \) measures the elasticity of substitution between the both sectors of production. Because the firm operates under perfect competition profits are zero. Inserting the demand function into the profit function and imposing the zero profit condition reveals that the only price \( P_t \) that is consistent with this requirement is given by:

\[ 1 = [(1 - \theta_y)(p_t^F)^{(1-\mu)} + \theta_y(p_t^M)^{(1-\mu)}] \]  \(41\)

We internalize the presence of capital producers in the model, who purchase final goods as investment goods \( I_t \) and transform them into physical capital sold to female entrepreneurs dominated sector and male entrepreneurs dominated sector. The capital producers choose thus the quantity of investment to maximize its profits as follow:

\[ \max E_t \left[ q_t I_t - I_t - \frac{\Psi}{2} \left( \frac{I_t}{k_t} - \delta \right)^2 k_t \right] \]  \(42\)

The first order condition (relative to the Investment) for the optimization problem is given by:

\[ E_t \left[ q_t - 1 - \Psi \left( \frac{I_t}{k_t} - \delta \right) \right] = 0 \]  \(43\)

Since the capital producers face an adjustment cost \( \left( \frac{\Psi}{2} \left( \frac{I_t}{k_t} - \delta \right)^2 k_t \right) \), this relation highlight the relationship between the physical capital price and the marginal cost of adjustment. However, at the stationary state, we assume that there is not adjustment cost in the market of capital and the price of capital equals to one.

4.3. Banking sector

The representative bank intervenes in the model as loans supplier to the sector denominated by female entrepreneurs and to the sector denominated to male entrepreneurs. The representative bank solve the following problem:

\[ \max E_0 \sum_{t=0}^{\infty} \left( \frac{\alpha_t}{\alpha_{t-1}} \right) \beta_t^H DIV_t \]  \(44\)
Here $DIV_t$ represents the dividends paid to households by the bank, since the latter owned the banks’ shares. In the banking sector optimization problem, the discount factor is the same as in the household program because the household owned the banks.

Subject to the flow of funds constraint

$$DIV_t + R_{D,t-1}D_{t-1} + L_{t,F} + L_{t,M} = D_t + R_{F,t-1}L_{t-1,F} + R_{M,t-1}L_{t-1,M}$$

and the balance sheet identity\(^{10}\)

$$D_t = L_{t,F} + L_{t,M}$$

Here $D_t$ represents households deposits collected by the banking sector, $L_t$ are loans offered by the banking sector to the sector dominated by female entrepreneurs $L_{t,F}$ and $L_{t,M}$ are loans to the sector dominated by male entrepreneurs, $c_t^B$ is the banking sector residual revenue after the household’s deposits have been repaid and the loan have been granted to both entrepreneurial sectors.

The first order conditions to the banker’s problem relative to the deposits $D_t$, the loans to female entrepreneurs dominated sector $L_{t,F}$ and the loans to male entrepreneur dominated sector $L_{t,M}$, are expressed as follow:

The Lagrangian associated with the optimization problem is defined as:

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

(47)

The first order conditions are expressed as follow:

$$\frac{\partial L}{\partial D_t} = \left( \frac{\Omega_{t+1}}{\Omega_t} \right) \beta_H^t - E_t \left( \frac{\Omega_{t+1}}{\Omega_t} \right) (\beta_H)^{t+1} R_{D,t} = 0$$

(48)

$$\frac{\partial L}{\partial L_{t,F}} = E_t \left( \frac{\Omega_{t+1}}{\Omega_t} \right) (\beta_H)^{t+1} R_{L,F,t} - \left( \frac{\Omega_t}{\Omega_{t-1}} \right) \beta_H^t = 0$$

(49)

$$\frac{\partial L}{\partial L_{t,M}} = E_t \left( \frac{\Omega_{t+1}}{\Omega_t} \right) (\beta_H)^{t+1} R_{L,M,t} - \left( \frac{\Omega_t}{\Omega_{t-1}} \right) \beta_H^t = 0$$

(50)

With some simplifications, we have:

$$\Omega_{t} = (\beta_H)^t E_t [\Omega_{t+1}] R_{D,t}$$

(51)

$$\Omega_{t} = (\beta_H)^t E_t [\Omega_{t+1}] R_{L,F,t}$$

(52)

$$\Omega_{t} = (\beta_H)^t E_t [\Omega_{t+1}] R_{L,M,t}$$

(53)

\(^{10}\) In fact, the flow of funds constraint of the banking sector implicitly states that deposits can be freely converted into loans.
4.4. Government

Government intervenes in the economy, by an active policy of public spending \( g_t \), funded by lump sum taxes \( T_t \) as follow:\(^{11}\):

\[
g_t = T_t
\]

(54)

4.6. Exogenous Stochastic Variables

The seven exogenous stochastic variables include, the preference shock affecting the marginal utility of household \( \hat{\eta}_m \), the preference shock affecting the marginal utility of the labor supply \( \hat{\eta}_\theta \), the productivity shock hitting the production sector dominated by female entrepreneurs \( \hat{\eta}_{aF} \) the productivity shock hitting the production sector dominated by male entrepreneurs \( \hat{\eta}_{aM} \), the loan-to-value ratio shock of the production sector dominated by female entrepreneurs \( \hat{\eta}_{vF} \), the loan-to-value ratio shock of production sector dominated by male entrepreneurs \( \hat{\eta}_{vM} \) and the fiscal policy shock \( \hat{\eta}_g \). We assume that the exogenous stochastic variables follow AR (1) processes with \( \rho \in (0,1) \).

Specifically, we defines:

- **The preference shock affecting the marginal utility of household:**

\[
\hat{\omega}_t = \rho_{\omega} \hat{\omega}_{t-1} + \hat{\eta}_{\omega}
\]

(55)

Here \( \rho_{\omega} \) represents the autoregressive coefficient and \( \hat{\eta}_{\omega} \) stands for the i.i.d. Zero mean normal random variable with standard deviation equals to \( \sigma_{\omega} \).

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

\[
\hat{\vartheta}_t = \rho_{\theta} \hat{\vartheta}_{t-1} + \hat{\eta}_{\theta}
\]

(56)

Here \( \rho_{\theta} \) represents the autoregressive coefficient and \( \hat{\eta}_{\theta} \) stands for the i.i.d. Zero mean normal random variable with standard deviation equals to \( \sigma_{\theta} \).

- **The productivity shock hitting the production sector dominated by female entrepreneurs:**

The total productivity factor \( (a_t^F) \) is defined as:

\[
\hat{a}_t^F = \rho_{aF} \hat{a}_{t+1}^F + \hat{\eta}_{aF}
\]

(57)

Here \( \rho_{aF} \) represents the autoregressive coefficient and \( \hat{\eta}_{aF} \) stands for the i.i.d. Zero mean normal random variable with standard deviation equals to \( \sigma_{aF} \).

---

\(^{11}\) This expression is motivated by the assumption that government budget is balanced at each period.
• The productivity shock hitting the production sector dominated by male entrepreneurs:

The total productivity factor \( a_t^M \) is defined as:

\[
\hat{a}_t^M = \rho_{aM} \hat{a}_{t-1}^M + \hat{\eta}_{aM} \tag{58}
\]

Here \( \rho_{aM} \) represents the autoregressive coefficient and \( \hat{\eta}_{aM} \) stands for the i.i.d. zero mean normal random variable with standard deviation equals to \( \sigma_{aM} \).

• The Loan-to-Value ratio shock of the production sector dominated by female entrepreneurs

The LTV ratio is modeled as an exogenous variable as follow:

\[
\hat{v}_t^F = \rho_{vF} \hat{v}_{t+1}^F + \hat{\eta}_{vF} \tag{59}
\]

Here \( \rho_{vF} \) represents the autoregressive coefficient and \( \hat{\eta}_{vF} \) stands for the i.i.d. zero mean normal random variable with standard deviation equals to \( \sigma_{vF} \).

• The Loan-to-Value ratio shock of the production sector dominated by male entrepreneurs

The LTV ratio is modeled as an exogenous variable as follow:

\[
\hat{v}_t^M = \rho_{vM} \hat{v}_{t+1}^M + \hat{\eta}_{vM} \tag{60}
\]

Here \( \rho_{vM} \) represents the autoregressive coefficient and \( \hat{\eta}_{vM} \) stands for the i.i.d. zero mean normal random variable with standard deviation equals to \( \sigma_{vM} \).

• The fiscal policy shock:

The public spending is driven by:

\[
\hat{g}_t = \rho_g \hat{g}_{t-1} + \hat{\eta}_g \tag{61}
\]

Here \( \rho_g \) represents the autoregressive coefficient and \( \hat{\eta}_g \) stands for the i.i.d. zero mean normal random variable with standard deviation equals to \( \sigma_g \).

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 \( \{w_t^H, w_t^F, q_t^M, p_t^F, p_t^M\}_{t=0}^\infty \) of interest rates \( \{R_{Lt}^F, R_{Lt}^M, R_{Dt}\}_{t=0}^\infty \) of multipliers.
\( \{\lambda_t; \lambda^M_t; \lambda^F_t; \lambda^V_t\}_{t=0}^{\infty} \) and of exogenous processes \( \{\hat{\omega_t}, \hat{b_t}, \hat{a^F_t}, \hat{a^M_t}, \hat{v^F_t}, \hat{v^M_t}, \hat{g_t}\}_{t=0}^{\infty} \), such as, in the one hand the allocations solve the household’s, the producers, the entrepreneurs and the banking sector problems at the equilibrium prices, and in he other linking, different markets clear. Since the first point has been fulfilled in the theoretical model developed above, in this sub-section, we will focus to the second point. Henceforth, the market clearing conditions is achieved through equilibrium in different markets.

- In the **final goods market**, the equilibrium condition is given by the following aggregate resource constraint:
  \[ y_t = c_t + i_t + g_t \] (62)

- Where the aggregate consumption is given as:
  \[ c_t = c^H_t + c^F_t + c^M_t \] (63)

- Where the aggregate stock of capital is defined as:
  \[ k_t = k^F_t + k^M_t \] (64)

- Where the equilibrium of the Government budget is expressed as:
  \[ g_t = T_t \] (65)

- In the **labor market**, the market clearing condition is:
  \[ n_t = n^F_t + n^M_t \] (66)

- In the **credit market**, the market clearing condition is:
  \[ L^F_t + L^M_t = D_t \] (67)

### 4.8. The Steady-State of the model

All the equation of the steady state are available in the Appendix (8.5). Table 10 presents the results of the steady state of the model. The benchmark represents the economy’s steady state when female entrepreneurs are more financially constrained than male entrepreneurs. The case 1 relates to the economy’s steady state when female entrepreneurs are less impatient as male entrepreneurs. The case 2 illustrates to the economy’s steady state when the female entrepreneurs sector is less financially constrained. The case 3 determines the economy’s steady state when male entrepreneurs sector is more constrained than female entrepreneurs sector. The case 4 is the economy’s steady state when elasticity of substitution...
between two sectors in both goods and labor markets is lower than those of the benchmark. The case 5 shows the economy’s steady state when no sectors are financially constrained.

Table 10: Features of the Economy’s Steady State

<table>
<thead>
<tr>
<th>Variables</th>
<th>Benchmark</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
<th>Case 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital-Labor ratio in sector F (k_F/n_F)</td>
<td>6.31</td>
<td>11.02</td>
<td>10.53</td>
<td>13.01</td>
<td>6.5</td>
<td>12.03</td>
</tr>
<tr>
<td>Capital-Labor ratio in sector M (K_M/n_M)</td>
<td>13.03</td>
<td>12.16</td>
<td>12.23</td>
<td>11.92</td>
<td>12.62</td>
<td>12.03</td>
</tr>
<tr>
<td>Proportion of value added from sector F (p_F y_F/y)</td>
<td>0.52</td>
<td>0.50</td>
<td>0.50</td>
<td>0.49</td>
<td>0.50</td>
<td>0.5</td>
</tr>
<tr>
<td>Proportion of value added from sector M (p_M y_M/y)</td>
<td>0.47</td>
<td>0.49</td>
<td>0.49</td>
<td>0.50</td>
<td>0.49</td>
<td>0.5</td>
</tr>
<tr>
<td>Household consumption to GDP (C_H/y)</td>
<td>0.73</td>
<td>0.73</td>
<td>0.739</td>
<td>0.74</td>
<td>0.73</td>
<td>0.74</td>
</tr>
<tr>
<td>Sector F consumption over GDP (C_F/y)</td>
<td>0.047</td>
<td>0.026</td>
<td>0.023</td>
<td>0.006</td>
<td>0.053</td>
<td>0.014</td>
</tr>
<tr>
<td>Sector M consumption over GDP (C_M/y)</td>
<td>0.031</td>
<td>0.016</td>
<td>0.017</td>
<td>0.011</td>
<td>0.025</td>
<td>0.014</td>
</tr>
<tr>
<td>Total consumption over GDP (C/y)</td>
<td>0.81</td>
<td>0.77</td>
<td>0.78</td>
<td>0.76</td>
<td>0.809</td>
<td>0.77</td>
</tr>
<tr>
<td>Sector F investment to GDP (I_F/y)</td>
<td>0.080</td>
<td>0.10</td>
<td>0.10</td>
<td>0.119</td>
<td>0.077</td>
<td>0.11</td>
</tr>
<tr>
<td>Sector M investment to GDP (I_M/y)</td>
<td>0.10</td>
<td>0.11</td>
<td>0.11</td>
<td>0.114</td>
<td>0.11</td>
<td>0.11</td>
</tr>
<tr>
<td>Sector F hours over total hours (n_F/n_F + n_M)</td>
<td>0.60</td>
<td>0.51</td>
<td>0.52</td>
<td>0.48</td>
<td>0.57</td>
<td>0.5</td>
</tr>
<tr>
<td>Sector M hours over total hours (n_M/n_F + n_M)</td>
<td>0.39</td>
<td>0.48</td>
<td>0.47</td>
<td>0.51</td>
<td>0.42</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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

The results of the benchmark indicate that, the production sector dominated by male entrepreneurs is capital intensive. The capital-labor ratio is 13.03 in male entrepreneurs sector rather than 6.31 in female entrepreneurs sector. Whereas the production sector dominated by female entrepreneurs is labor intensive. The labor hours of female entrepreneurs sector over total labor hours is 0.60 against 0.39 for the male entrepreneurs sector. Moreover, results show that female entrepreneurs consume more in the current period because they care less about the future. As result, female entrepreneurs save less. This result confirms the assumption made that female entrepreneurs are impatient. Male entrepreneurs in contrasts, consumes less in the current period than male entrepreneurs, as they care more about the future. Male entrepreneurs save more than female entrepreneurs. This results also confirms the assumption made that male entrepreneurs are more patient than female entrepreneurs. 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, we also found that male entrepreneurs realized more investment projects than female entrepreneurs. The proportion of investment of male entrepreneurs production sector over aggregate GDP is 0.10 contrast to 0.08 for the female entrepreneurs production sector.

Furthermore, as the female entrepreneurs production sector is the most financially constrained, it becomes difficult to produce intermediates goods in this sector. The intermediate goods of female sector become thus scarce. As the demand of those goods remains unchanged, their supply collapses and their prices rise, leading to an increase of the valued added. Whereas for the female entrepreneurs production sector, it is easier to produce intermediates goods in this sector, since it is less financially constrained than female entrepreneurs sector. The intermediate goods of male sector become thus abundant. The increase of supply of the goods produced by the male entrepreneurs sector leads to the decrease of their price, as the demand of those goods remains unchanged. The value added of the sector decline. Hence, the proportion of value added of female entrepreneurs sector (0.52) is greater than the proportion of the male entrepreneurs sector (0.47).

Table 11: Features of the Economy’s Steady State when the Female Entrepreneurs Sector is Less Financially constrained

<table>
<thead>
<tr>
<th>Variables</th>
<th>Benchmark</th>
<th>Less Financial Constraint</th>
<th>No Financial Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital-Labor ratio in sector F ($k^n_F/n^n_F$)</td>
<td>6.31</td>
<td>10.53</td>
<td>12.03</td>
</tr>
<tr>
<td>Capital-Labor ratio in sector M ($k^n_M/n^n_M$)</td>
<td>13.03</td>
<td>12.23</td>
<td>12.03</td>
</tr>
<tr>
<td>Proportion of value added from sector F ($p^n_Fy^n_F/y$)</td>
<td>0.52</td>
<td>0.50</td>
<td>0.5</td>
</tr>
<tr>
<td>Proportion of value added from sector M ($p^n_My^n_M/y$)</td>
<td>0.47</td>
<td>0.49</td>
<td>0.5</td>
</tr>
<tr>
<td>Household consumption-output ratio ($C^n_H/y$)</td>
<td>0.73</td>
<td>0.739</td>
<td>0.74</td>
</tr>
<tr>
<td>Sector F consumption-output ratio ($C^n_F/y$)</td>
<td>0.047</td>
<td>0.023</td>
<td>0.014</td>
</tr>
<tr>
<td>Sector M consumption-output ratio ($C^n_M/y$)</td>
<td>0.031</td>
<td>0.017</td>
<td>0.014</td>
</tr>
<tr>
<td>Total consumption-output ratio ($C^n/y$)</td>
<td>0.81</td>
<td>0.78</td>
<td>0.77</td>
</tr>
<tr>
<td>Sector F investment-output ratio ($I^n_F/y$)</td>
<td>0.080</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>Sector M investment-output ratio ($I^n_M/y$)</td>
<td>0.10</td>
<td>0.11</td>
<td>0.11</td>
</tr>
<tr>
<td>Sector F hours over total hours ($n^n_F/n^n_M+n^n_M$)</td>
<td>0.60</td>
<td>0.52</td>
<td>0.5</td>
</tr>
<tr>
<td>Sector M hours over total hours ($n^n_M/n^n_M+n^n_M$)</td>
<td>0.39</td>
<td>0.47</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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

The results of table 11 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.
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.

The results of table 12 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.

Table 12: Features of the Economy’s Steady State when the Male Entrepreneurs Sector is More Financially constrained than Female Entrepreneurs Sector

<table>
<thead>
<tr>
<th>Variables</th>
<th>Benchmark</th>
<th>Sector M More Financial Constraint</th>
<th>No Financial Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital-Labor ratio in sector F (k^f/n^f)</td>
<td>6.31</td>
<td>13.01</td>
<td>12.03</td>
</tr>
<tr>
<td>Capital-Labor ratio in sector M (k^m/n^m)</td>
<td>13.03</td>
<td>11.92</td>
<td>12.03</td>
</tr>
<tr>
<td>Proportion of value added from sector F (p^f y_f/y)</td>
<td>0.52</td>
<td>0.49</td>
<td>0.5</td>
</tr>
<tr>
<td>Proportion of value added from sector M (p^m y_m/y)</td>
<td>0.47</td>
<td>0.50</td>
<td>0.5</td>
</tr>
<tr>
<td>Household consumption-output ratio (C^H/y)</td>
<td>0.73</td>
<td>0.74</td>
<td>0.74</td>
</tr>
<tr>
<td>Sector F consumption-output ratio (C^f/y)</td>
<td>0.047</td>
<td>0.0066</td>
<td>0.014</td>
</tr>
<tr>
<td>Sector M consumption-output ratio (C^m/y)</td>
<td>0.031</td>
<td>0.0117</td>
<td>0.014</td>
</tr>
<tr>
<td>Total consumption-output ratio (C/y)</td>
<td>0.81</td>
<td>0.76</td>
<td>0.77</td>
</tr>
<tr>
<td>Sector F investment-output ratio (I^f/y)</td>
<td>0.080</td>
<td>0.119</td>
<td>0.11</td>
</tr>
<tr>
<td>Sector M investment-output ratio (I^m/y)</td>
<td>0.10</td>
<td>0.114</td>
<td>0.11</td>
</tr>
<tr>
<td>Sector F hours over total hours (n_f/n_M+n^M)</td>
<td>0.60</td>
<td>0.48</td>
<td>0.5</td>
</tr>
<tr>
<td>Sector M hours over total hours (n_M/n_M+n^M)</td>
<td>0.39</td>
<td>0.51</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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

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 to 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.

5. Calibration Procedure of the Model

The calibration procedure within the DSGE empirical literature is the specification of priors’ beliefs. Priors are values assigned to theoretical DSGE model parameters, steady state values and exogenous variables. These priors beliefs are formed through past experience, the validity of economic theories, opinion of senior experts in the institution in question, value judgment, stylized facts about the economy in question and existing empirical literature (An & Schorfheide 2007; Adebayo and Mordi 2010; Fernandez- Villaverde 2010). The calibrated parameters of the model are mainly steady state ratios that have been analytically found and deeply analyzed in the previous section. 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>
<thead>
<tr>
<th>Table 13: Value of the Calibrated Parameters in the Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time Preferences</strong></td>
</tr>
<tr>
<td>( \beta_H ) \quad ( \beta_F ) \quad ( \beta_M )</td>
</tr>
<tr>
<td>0.99 \quad 0.94 \quad 0.98</td>
</tr>
<tr>
<td><strong>Loan-to-Value Ratios in the Female and Male Sectors</strong></td>
</tr>
<tr>
<td>( \nu_F ) \quad ( \nu_M )</td>
</tr>
<tr>
<td>0.5 \quad 0.8</td>
</tr>
<tr>
<td><strong>Production</strong></td>
</tr>
<tr>
<td>( \theta_y ) \quad ( \delta ) \quad ( \alpha ) \quad ( \mu )</td>
</tr>
<tr>
<td>0.5 \quad 0.04 \quad 0.3 \quad 2</td>
</tr>
<tr>
<td><strong>Labor Market</strong></td>
</tr>
<tr>
<td>( \theta_H ) \quad ( \tau )</td>
</tr>
<tr>
<td>0.5 \quad 2</td>
</tr>
</tbody>
</table>

We calibrate the discount factors according to the degree of patience or not of economic agent. Because households are patients, their discount factor \( \beta_H \) is set to 0.99, a value generally admitted in the literature. Female entrepreneurs are impatient and their discount factor \( \beta_F \) 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 \( \beta_M \) to 0.98.
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. 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 $\theta_H$ is set to 0.5 as well as the share of intermediate goods produced in the production sector dominated by female entrepreneurs $\theta_Y$. The elasticity of substitution between the both sectors of production for labor supply $\tau$ is calibrated at 2 as well as the elasticity of substitution between the two productions sectors for intermediates goods demand $\mu$. The depreciation rate of physical capital $\delta$ is set to 0.04 and the share of capital in the production process $\alpha$ is set to (0.3).

6. Simulations Results

This section provides an overview of the benchmark analysis from which counterfactual scenarios would be drawn and analyzed. In fact, DSGE models offer the possibility of conducting different scenarios with end to assess the effects of events in macroeconomics variables. Therefore, in what follow, the analysis of the benchmark and the discussion of the three counterfactual scenarios, will be made in the framework of some exogenous shocks used in the theoretical DSGE model.

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 11 depicts the response of the economy following a one standard deviation positive productivity shock in the female entrepreneurs sector. At the first view, the increase in productivity leads to an expansion of the economy. The promising effect of the increase in
productivity is boosted by the presence of the banking sector in the model. Two channels are involved in the propagation of this mechanism. The collateral constraints channel, whereby an innovation changes the shadow value of loans and therefore consumption rises. The assets-price effect, whereby induces changed in physical capital alter the value of collateral that entrepreneurs can guarantee. Hence, the accumulation of physical capital pushes 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 particularly eased access to credit, so that aggregate saving and output feature a common increase.

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 boosts 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.

Figure 11: A productivity shock in the female’ sector in Benchmark
As labor-intensive sector becomes more productive, female entrepreneurs also increases labor demand more and more, while male entrepreneurs sector demand for labor deceases gradually. In addition, the female sector demand for savings increase more than the male sector. The female sector consumption rises only at 25% against 59% for the male sector. Overall, the dynamic of saving and investment are prompted with respect to the financial frictions set up, and this translates into a higher persistence in output in female sector than in the male sector.

However, the total effect on economy activity is less persistent and last only for one period as in the male sector, except for the aggregate investment and aggregate savings. This results implies that male entrepreneurs sector, as the less financial constraint sector, is the main driver of economy of activity, even in presence of positive productivity shock in the female sector. This is simply because, the positive effect of the shock is not persistent enough in the female entrepreneurs sector, to lead the expansion effect of the whole economy.

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

Figure 12 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.

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 13 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.

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.
Figure 13: a Fiscal Policy Shock in the Benchmark
6.2. Scenarios' analysis

Three main 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 first scenario in presence of productivity shock in the male sector

Figure 14 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.

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.

Figure 14: Productivity shock to male Sector in the first Scenario
6.2.1. b. Analysis of the first 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 realize 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 below the benchmark.

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.

Figure 15: LTV ratio shock to Male Sector in the first Scenario
6.2.1. c. Analysis of the first 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.

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.
Figure 16: Fiscal Policy shock in the first Scenario
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.

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

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

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.
Figure 19: Fiscal Policy shock in the second Scenario
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%.

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.
Figure 20: Household Preference shock in the last Scenario
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.

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.
Figure 21: LTV Ratio Shock Sector in the last Scenario

- Benchmark Economy
- Alternative Economy
Figure 22 denotes the reaction of the economy following the one standard deviation positive fiscal policy shock 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.

Once more this general results are justified 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. These 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.
Figure 22: Fiscal Policy Shock in the last Scenario
7. Conclusion 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-foundaion 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.

National authority should promote financial inclusion by reducing the cost of banking intermediation via the introduction of credit reporting system, granting exemptions for enormous requirements during the financial contract, and establishing more transparency and credit-information sharing.
8. Appendix

8.1. The pictogram of the DSGE model

Figure 11: The pictogram of the Theoretical DSGE model

8.2. 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

\[ R_D = \frac{1}{\beta_H} \]  

(1)
\[ R_L^F = R_d \]  
\[ R_L^M = R_d \]  
\[ q = 1 \]

- **Capital/output ratios**

\[ \frac{k^F}{y^F} = \frac{\alpha p^F}{\frac{1}{\beta_F} (1-\delta) (1-\beta_F R_L^F) \nu^F (1-\delta)} \frac{1}{\beta_F R_L^F} \]  
\[ \left( \frac{k^F}{n^F} \right) = \left( \frac{k^F}{y^F} \right)^{\frac{1}{1-\alpha}} \]  
\[ w^F = (1 - \alpha) \left( \frac{k^F}{n^F} \right)^\alpha \]  
\[ \frac{k^M}{y^M} = \frac{\alpha p^M}{\frac{1}{\beta_M} (1-\delta) (1-\beta_M R_L^M) \nu^M (1-\delta)} \frac{1}{\beta_M R_L^M} \]  
\[ \left( \frac{k^M}{n^M} \right) = \left( \frac{k^M}{y^M} \right)^{\frac{1}{1-\alpha}} \]  
\[ w^M = (1 - \alpha) \left( \frac{k^M}{n^M} \right)^\alpha \]  
\[ \left( \frac{n^F}{n^M} \right) = \left( \frac{w^F}{w^M} \right)^{-\tau} \left( \frac{1-\theta_H}{\theta_H} \right) \]

- **Relative price**

\[ \frac{p^F}{p^M} = \left[ \left( \frac{k^F}{n^F} \right)^\alpha \left( \frac{n^F}{n^M} \right) \left( \frac{1-\theta_y}{1-\theta_H} \right) \right]^{\frac{1}{\mu}} \]  
\[ p^M = \left[ (1 - \theta_y) \left( \frac{p^F}{p^M} \right)^{(1-\mu)} + \theta_y \right]^{\frac{1}{(\mu-1)}} \]  
\[ p^F = \left( \frac{p^F}{p^M} \right) p^M \]
\[ \frac{y}{n^F} = \frac{(\frac{k^F}{n^F})^\alpha (p^F)^\mu}{(1-\theta_y)} \] (15)

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

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

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

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

\[ \frac{1}{n^F} = \frac{n}{n^F} + \frac{c^H \theta (1-\theta_H) \frac{1}{\tau}}{w^F} \] (20)

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

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

\[ \lambda = \frac{1}{c^H} \] (23)

\[ \lambda^F = \frac{1}{c^F} \] (24)

\[ \lambda^M = \frac{1}{c^M} \] (25)

\[ \lambda^V_M = \beta_M \lambda^F R_L^F + \lambda^F \] (26)

\[ \lambda^V_M = \beta_M \lambda^M R_L^M + \lambda^M \] (27)
### 8.3. Some Stylized facts tables

#### Table 1: Net rate of school attendance in Secondary Cycle

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban area</th>
<th>Rural area</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>52.9</td>
<td>25.8</td>
<td>35.7</td>
</tr>
<tr>
<td>2004</td>
<td>54.6</td>
<td>21.6</td>
<td>33.9</td>
</tr>
<tr>
<td>2007</td>
<td>53.7</td>
<td>23.7</td>
<td>34.8</td>
</tr>
<tr>
<td>2010</td>
<td>59.6</td>
<td>14.9</td>
<td>45.1</td>
</tr>
</tbody>
</table>


#### Table 2: Repartition of active male and female according to institutional sectors

<table>
<thead>
<tr>
<th>Year</th>
<th>Public</th>
<th>Formal Private</th>
<th>Non-agricultural informal sector</th>
<th>Informal agricultural sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>8.7</td>
<td>14.7</td>
<td>24.3</td>
<td>52.4</td>
</tr>
<tr>
<td>2005</td>
<td>3.4</td>
<td>4.5</td>
<td>23.6</td>
<td>68.5</td>
</tr>
<tr>
<td>2007</td>
<td>6.1</td>
<td>9.7</td>
<td>34.7</td>
<td>60.3</td>
</tr>
<tr>
<td>2010</td>
<td>6.7</td>
<td>7.5</td>
<td>35.7</td>
<td>51.0</td>
</tr>
</tbody>
</table>


#### Table 4: Repartition of positions within the Municipality Committee

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of position</td>
<td>Number of position occupied by female</td>
<td>% of female</td>
</tr>
<tr>
<td>Mayor</td>
<td>339</td>
<td>10</td>
<td>2.9</td>
</tr>
<tr>
<td>First Deputy - Mayor</td>
<td>339</td>
<td>37</td>
<td>10.9</td>
</tr>
<tr>
<td>First Deputy - Mayor</td>
<td>339</td>
<td>88</td>
<td>26</td>
</tr>
<tr>
<td>First Deputy - Mayor</td>
<td>339</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>First Deputy - Mayor</td>
<td>01</td>
<td>01</td>
<td>100.0</td>
</tr>
<tr>
<td>Municipal Advisers</td>
<td>10632</td>
<td>1651</td>
<td>15.5</td>
</tr>
</tbody>
</table>

Source: Authors using data of INS (2012) and CT N°9844/6045 of 11/05/2011.
Table 5: Proportion of female in the Governance Agency

<table>
<thead>
<tr>
<th>Agency</th>
<th>2007</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>CONAC</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>ELECAM</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>SUPREME COURT</td>
<td>55</td>
<td>6</td>
</tr>
<tr>
<td>ANIF</td>
<td>22</td>
<td>10</td>
</tr>
</tbody>
</table>


“M” refers to Male. “F” refers to female. “%F” refers to in percentage to female. “T” refers to total.

8.5 Stylized facts figure

Figure 6: Constraints to entrepreneurship in Cameroon

Source: Authors using Cameron General Survey of Enterprises data (2009)
9. References


Henrik Hansen  and John Rand (2012). “Another Perspective on Gender Specific Access to Credit in Africa.” Institute of Food and Resource Economics, University of Copenhagen.


