Female Entrepreneurship, Access to Credit, and Firms’ Productivity in Senegal

RESEARCH PROPOSAL
Presented to
Partnership for Economic Policy (PEP)

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SENEGAL

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SECTION A – For all projects

1. Abstract (100 to 250 words)

The abstract should state the main research question, the context and its relevance in terms of policy issues/needs in relation to PAGE thematic foci, complete with a brief description of the data that will be used.

It is widely believed that female entrepreneurs, compared with their male counterparts, are more constrained in the credit markets, which consequently reduces the pace of their firms’ dynamics, through lower investment and productivity. This research sets out to: (i) explore the extent to which female entrepreneurs are discriminated against in the credit market across business activities and regions in Senegal, if any; (ii) analyze the underlying social, economic, cultural and institutional generating mechanisms; (iii) determine whether any gender-related differential in access to credit is translated into productivity differentials. Using available firm-level data collected in 2013 as well as the World Bank’s Enterprise Survey data for Senegal in 2007, the project will first use a non-parametric approach (data envelopment analysis) to compute allocative and technical efficiency scores. Then firms’ efficiency scores, access to credit and gender will be related using an endogenous switching regime model that deals with both endogeneity and selection biases as well as possible reverse causality, the candidate instruments being the branch density of credit suppliers and the average access to credit within the location. A matching comparison model is also considered. By providing a clear understanding of the functioning of the credit market and how it translates into firms’ performance, this research will add the corresponding findings to the public debate on women empowerment in Senegal, and provide reliable empirical foundations for designing targeted public policies aiming at promoting entrepreneurship.

2. Main research questions and contributions

Explain the focus (or key questions) of your research and its policy relevance.

2.1. Explain why you think this is an interesting research question and what the potential value added of your work might be (knowledge gaps). You might want to explain whether or not this question has been addressed before in this context (including key
Empowering women by promoting female entrepreneurship tends to be associated with both economic and social gains. Because they make more than half of the population, encouraging women in the business sector has a potential to enlarge the productive capacity of a nation by just adding into the number of business firms. This would tap into their seemingly higher propensity to start a business. In effect, a report by Global Partnership for Financial Inclusion (GPFI, 2011) clearly shows that women in developed countries are starting businesses at a faster rate than male, to the tune of 23 percent against 9 percent in the USA. In addition, a relatively large share of business firms are owned by female, as it is the case in Canada where some 47 percent of small enterprises are female-owned and about 70 percent of new start-ups are also female-owned businesses.

One can reasonably argue that such high business orientation is also a characteristic of females in the developing world, which would materialize only to the extent that the many constraints to female entrepreneurship allow. In Senegal for instance, the World Bank Enterprises Survey in 2007 reveals that close to a quarter (23.8 percent) of small and medium businesses are owned by females. The same survey indicates similar figure in 2003 (23.6 percent), but more recent data (Cissokho and Seck, 2013) showed a significant increase to 32.3 percent. At the same time, female entrepreneurs accounted for 38.1 percent of new start-up businesses in 2010, against 25 percent in 2000.

Moreover, a clear distinctive feature between business firms owned by male and female is their potentials for job creation. The recent data in Senegal indicate that on average, female-owned businesses employ 53.8 percent more workers than their male-owned counterparts. In addition, the employment profile in female-owned business firms tends to favor the segment of the population that have lower chances to succeed in the labor markets, namely workers with less skills. This shows the higher impact of female entrepreneurship on unemployment and poverty reduction in the country.

It is somehow paradoxical that the relatively wide recognition of these economic and social benefits associated with female entrepreneurship might be coupled with many forms of discrimination, chief among them being access to credit. There is large body of theoretical work that provides a clear understanding how market imperfections can generate credit rationing that may translate into some forms of discrimination against some loans applications (see for instance Stiglitz and Weiss, 1981; Binswanger and Rosenzweig, 1986; Gorman et al., 2005). For example, Stiglitz and Weiss’s theoretical insights suggest that credit rationing arise from information asymmetry between borrowers and lenders, which make the latter more prone to not always select good borrowers (adverse selection), and face a risk associated
to their behavior that is not always in line with their interest (moral hazard). As a consequence, price mechanisms will not guarantee equilibrium in the sense that some borrowers not willing to pay the relatively high interest rate will be constrained. Moreover, in the face of lack of full information about the borrower’s project (Gorman et al., 2005), lenders may resort to non-market mechanisms to discriminate against some borrowers. As far as gender-based discrimination is concerned, Becker (1971) argues that the (formal) credit market can discriminate against women entrepreneurs in various and often overlapping ways: it can charge higher interest rates on loans offered to women entrepreneurs; or it can require stronger contractual arrangements when considering to grant loans to women than to their male counterparts; or it may require better credit profile to female entrepreneurs seeking loans than to male.

The empirical literature suggests mixed results both in terms of the extent and direction of credit rationing along the gender line, if any, and in terms of its generating mechanisms. For instance, Bardasi et al. (2011) find no significant difference in credit access between male and female entrepreneurs by examining the widely used World bank Enterprises Survey data for Sub-Saharan Africa, Latin America, and Eastern Europe and central Asia.

Other studies did however document some discrimination in the credit market, and it is not always against female entrepreneurs. Kondo (2003) suggests that lenders in Philippines are more willing to lend to women entrepreneurs than to their male counterparts, for reasons having to do with the higher willingness of the former to preserve a stronger social capital, some elements of which are social ties and reputation. This ease of access to credit could in some cases lead to more borrowing and greater difficulties to repay the loans, resulting in lower credit worthiness and ultimately to credit rationing. In effect, Malpit (2010) suggests that when lenders screen borrowers with respect to their credit profile, women appear to be more credit constrained than men. Other mechanisms, especially non-market ones, that seem to underline discrimination against women have to do with firm size (Hansen and rand, 2012), age, marital status, family size, capital assets, interest rates, education, experience, attitudes towards risk (see for instance Messah and Wangai, 2011; Ajagbe, 2012; Garba, 2011).

Overcoming the many hurdles in the credit market could be one way to improve firms’ performance, and to the extent that female entrepreneurs are discriminated in the credit market, there is a presumption that their firms could be less productive than those of their male counterparts. In effect, access to credit spells an expansion of production possibilities through greater capital accumulation, be it physical or technological. Firms could now reach more efficient combination of productive inputs, allowing them to produce greater output for any given input cost (technical efficiency). Moreover, with cost structure exhibiting increasing returns to scale, an increase in the production possibilities will contribute to lower
the average cost, hence a greater allocative efficiency (the ability to produce a
given amount output with the lowest input cost). To the extent that a firm might be
constrained in the credit market, all of these efficiency gains could be
unreachable.

There is also some empirical literature that relates access to credit to firm
performance, thereby trying to translate any gender-based discrimination into
productivity differential between male- and female-owned firms. For instance,
Sabarwal and Terrell (2008) document a performance gap between female- and
male-managed firms: the latter tend to be larger (sales revenues-wise) and more
efficient (total factor productivity) than the former. The authors indicate that the
sub-optimal size of female-owned firms have to do with capital constraints. Bardasi
et al. (2011) afore-mentioned suggest that when it comes to firm size, there is a
significant difference between female- and male-owned companies. More
specifically, the latter tend to be bigger than the former. But as far as efficiency is
concerned, very small gap in favor of male-owned firms is found. In addition, they
suggest that one dollar received by male-owned firms is not translated into higher
returns in terms of sales or revenue than the one received by female-owned firms.

Furthermore Nwaru and Onuoha (2010) suggest in the case of farming activities in
Nigeria that credit does not contribute to increase farmers’ productivity. They
even find that farmers that benefit from credit tend to be less efficient than those
who do not, which could be indicative of inappropriate loans schemes. Khan et
al. (2013) suggest similar results for Pakistani farmers: those who benefits from credit
do not appear to be more productive or enjoy higher income than their
counterparts. Some of the hypothesized reason have to do with “high interest rate,
delay in credit disbursement and lengthy procedure of getting credit” (p. 1).

In the face of less conclusive empirical literature in terms of the extent and
direction of gender-based disparities in the credit market and the underlying
mechanisms, only country-specific studies could reveal how the phenomenon
play out in the country in question. This research project asks the following
questions in the specific case of Senegal: (i) To what extent are female
entrepreneurs constrained in credit markets in Senegal compared to their male
counterparts, and what are the forms of such constraints, if any? (ii) What are the
specific factors that generate such disparities in the credit market? (iii) To what
extent is any gender-based differential in the credit market translated into
differences in firms’ productivities? Are the answers to these questions varied
across business activities and across the different regions of the country?

As far as the Senegalese case is concerned, there is, to our knowledge, no formal
study addressing these issues by focusing solely on the potential specificities of the
country. Instead, the country often appears as a data point in studies that
average out over large pools of countries and firms. This is the case for instance in
Asiedu et al. (2013) that studies access to credit by firms in Sub-Saharan Africa and other developing regions (with a total of 90 countries and close to 35,000 firms), or in Bardasi et al. (2011) that looks at firms’ performance in three developing regions (Eastern Europe and Central Asia, Latin America, and Sub-Saharan Africa). These studies have the merit to produce relatively more robust results. But they generally fail to single out any potential effect of some country specifics, even when including fixed-effects. In effect, such an approach tends to generate an intercept effect, thereby trying to make the (conditional) average dependent variable (productivity or access to credit) vary across countries. The effect of a given explanatory variable (say, gender) is typically assumed to be identical across countries; or if some heterogeneity may be recognized, the reported coefficient estimate only indicates an average effect.

A policy implication for a specific country that has significant differences with the average profile of the sample may not always be accurate. A country-focused study has the benefit to offer a clear understanding of how the specific economic, social, cultural, and institutional mechanisms interact to generate the many specific constraints to female entrepreneurship in the credit market, if any, and how they translate into firms’ performance. The results could offer a strong basis for policy formulation and implementation. So far, to our knowledge, policy makers in Senegal have lacked such a strong empirical foundation for policy analysis. This could explain any persistence of gender-based disparities in the credit market, despite a clear political will to improve female entrepreneurship. By contributing to generate a significant research interest in the broader topic on women empowerment, especially the removal of barriers in the credit market, the project will also feed into the policy making process for greater effectiveness.

REFERENCES USED


Binswanger, H. P., and M. R. Rosenzweig, 1986. Behavioral and Material Determinants of
Promoting female entrepreneurship has been a crucial part in the general strategy of various governments in Senegal to empowering women. The country has gone so far as to set up a whole ministry in charge of female entrepreneurship in recent years, namely the “Ministry of Youth, Females, and Female Entrepreneurship”, which is now “Ministry of Commerce, Entrepreneurship, and Informal Sector” under the current government. This denotes a clear will of policy makers in Senegal to improve female conditions in general. This will is grounded on the recognition of the economic and social benefits that would be generated by empowering women, and the desire to bring fairer outcomes in the credit markets.
Despite these clear economic and social benefits and a relatively strong will of policy makers, there is the belief that female entrepreneurship still faces many constraints in Senegal, one of them being access to credit.

A first glance at the data seems to indicate that in Senegal, female-owned firms do not seem to be severely constrained in the credit market compared to male-owned firms, at least in the direct form of access to credit. In effect, data from World Bank Enterprises survey show that 23.5 percent of female-owned firms had either loans or a line of credit, against 21.2 percent for their male-owned counterparts. But with almost equal number of applications (1.85 - 1.82), female-owned firms face larger number of rejections than male-owned firms (33.1 percent more). For both groups of firms, the single most important reason for rejection had to do with collaterals or co-signature. But this constraint is relatively more pronounced in the case of female-owned firms (58.3 percent against 39.2 percent). In addition, the cost of loans appeared to slightly disadvantage women entrepreneurs: annual interest rates on their borrowing were 11.9 percent, against 11.7 percent for male-owned firms. Recent data tend to show similar trends.

Even if one may not rule out the existence of constraints against women in the Senegalese credit market, their existence is indicative of some inconsistencies in the public strategies to not only improve economic opportunities to women, but also to contribute to economic and social development of the society as a whole. Alternatively, the extent of such discrimination against women entrepreneurs in the credit market could be an indication of ineffective public policies which could be explained as it is often the case in Senegal by a lack of empirical work on which they could have been grounded. Therefore, the results of the study would offer reliable guide to design effective policies to improve female entrepreneurship and reap the associated economic and social benefits.

First, a result indicating that female entrepreneurs are less likely to access to credit that their male counterparts, eventually coupled with an associated unfavorable productivity differential, could make the case for a strong policy response. Second, by revealing any cross-sectorial differences in the extent of the credit constraints, the results could help in the design of a more targeted policy intervention: sector with greater constraints should receive greater focus of government intervention. Clearly targeted policies are more likely to be associated with greater effectiveness than broader ones, especially in the context of resource-constrained government. Third, by clearly identifying the other determinants of access to credit and firms’ productivity, the study can suggest various ways for the government to ease credit constraints and improve firms’ performance.

3. Methodology
Presentation of the specific techniques that will be used to answer the research questions and how exactly they will be used to do so. Explain whether you will use a particular technique normally used in other contexts or whether you intend to extend a particular method and how you will do so. Explain if these methods have already been used in the context you are interested in (including key references).

The empirical methodology consists mainly on three parts. First, a non-parametric approach will be developed to estimate firms’ productivity. The approach is known as the data envelopment analysis (DEA). It considers a production set $\Psi$ of physically attainable combinations of a vector of positive inputs $x$ and a positive output vector $y$ (a scalar in our case):

$$\Psi=\{(x,y)|x \text{ can produce } y\}$$

With the usual assumption of free dupability, convexity and no free lunches (Shephard, 1970), one can obtain two measures of efficiency, that is, how far away a firm is from its production frontier. As a radial measure of the distance to the boundary, the following Farrell-Debreu efficiency scores are then considered (Fare et al., 1985):

$$\theta(x,y) = \inf\{\theta \mid (\theta x,y) \in \Psi\} \quad (1)$$

$$\lambda(x,y) = \sup\{\lambda \mid (x,\lambda y) \in \Psi\} \quad (2)$$

The first measure is input-oriented: efficiency is viewed as the ability to obtain a given level of output with the lowest input cost. It is referred to as allocative efficiency. The second measure, on the other hand, is output oriented, and can be viewed as the dual optimization approach to the first: it is the ability of a given firm to maximize its output for a given level of input. It is known as the technical efficiency.

Using data on various inputs (mostly the workforce and the physical capital) and output for decision making units $i=1,\ldots,n$, the DEA method computes the efficiency frontier $\Psi$ as follows (see Farrell, 1957, and Charnes, et al., 1978):

$$\Psi = \{(x,y)|y \leq \sum \gamma_i y_i; x \geq \sum \gamma_i x_i, i=1,\ldots,n\} \quad (3)$$

with $\gamma_i > 0$; $\sum \gamma_i = 1$

Knowledge of the frontier then allows a computation of each measure of efficiency for a given unit $(x,y)$. Typically, the computation is done through linear programming.

A statistical analysis of the distribution of the efficiency scores will provide a quick sense of any gender-based differences: whether female-owned firms are less productive than male-owned firms, and how the productivity differential varies
across activities and regions. A more formal analysis going beyond the statistical correlation will be needed to derive more robust results.

The second step of the empirical approach consists of developing a parametric model that relates the productivity scores to a set of explanatory variables, chief among them being access to credit and gender. But including access to credit as a potential determinant of firms’ productivity is very likely to generate biased estimates. The issue can be viewed as an endogeneity bias: access to credit is either a voluntary choice on the part of a firm or a random process through which the market screens firms. A typical two-stage instrumental variable model will first model the probability that firms will have access to credit, and then relate the predicted probabilities to productivity scores. By including gender as an explanatory variable in both the first- and second-stage equations, the results will respectively tell whether female entrepreneurs are more constrained in the credit market than their male counterparts, and whether the marginal effect of access to credit is conditional on gender (through an interaction between the gender and access to credit variables). More specifically, this approach assumes that access to credit has only an intercept effect (parallel shift up or down of the productivity curves), eventually varying the latter across gender.

An alternative approach would view the issue as a sample selection bias: male-owned and female-owned firms self-select into the credit market. A selection model is therefore called for. A standard two-stage selection model will first analyze the process through which firms self-select into the credit market, and then, provided that they do obtain credit, determine the factors that affect firms’ productivity. Such a basic approach would only allow answering the first research question in the first-stage equation, that is, whether female-owned firms are less likely to be selected or discriminated against in the credit market. In effect, the second stage-equation is based only on the subsample of firms that do get credit (selected firms), therefore, it will not allow answering the second important research question, that is, whether any access to credit generates a productivity premium to the benefitting firms over those that are discriminated against.

Moreover, such a basic section model tends to ignore the endogeneity issue associated with the access to credit variable, thereby leading to biased estimates. An advanced selection model is therefore needed: it should not only account for the endogeneity of the process of access to credit, but also allows answering the second research question (in addition to the first one), that is, using the whole sample in the second-stage estimation. A readily available candidate is a selection model known as an endogenous switching regime model. The whole sample is split into two groups: firms that have access to credit and firms that do not. A productivity equation is then estimated for each subsample, accounting for the fact that each subsample is non-random. A two-step Heckman selection correction model is called for. The first stage models the transition probabilities of
the regime switching process, that is, the likelihood that a firm will have access to credit. This first-stage equation is specified as follows:

\[
AC_i = \alpha_0 + \alpha_1 GEN_i + \alpha_2 SEC_i + \alpha_3 REG_i + \alpha_4 (GEN_i \times SEC_i) + \alpha_5 (GEN_i \times REG_i) + \sum \alpha_j X_i + \varepsilon_i
\] (4)

\(AC_i\) is a dummy variable that takes the value of 1 if firm \(i\) has access to credit, and 0 otherwise. \(GEN_i\) is a dummy for male entrepreneurs, \(SEC_i\) is a dummy for the manufacturing sector (or the formal sector or gam activities), \(REG_i\) a dummy for the region of Dakar, and \(X_i\) a set of other controls, such as firms' size or employment, duration of the activity. An important set of control variables are the instruments, that is, variables that affects firms' access to credit but not correlated with firms' efficiency that will not only correct for the endogeneity issue but also the possible reverse causality between access to credit and efficiency in this cross-sectional setting (using an instrumental variable procedure simply eliminates possible reverse causality). Two such variables will be considered, in line with the literature. One is the average access to credit within the same location. Within each geographical location, say a region, this average is relevant in determining any given firm's propensity to access to credit as it captures location-specific incentives to apply and obtain credit, while at the same time having no potential impact on the firm's performance. Fissman and Svensson (2007) provide an extensive discussion of the benefits of using grouped averages to deal with endogeneity issues in using firm-level subjective data.

A second candidate for instrumenting for firms' credit constraints is the structure of local credit markets. The regional variation in credit provision can tell how constrained firms are when it comes to access to credit. In effect, greater competition among credit lenders has been shown to lower the cost of credit (Cetorelli and Strahan, 2006; Black and Strahan, 2002), hence improving firms' access to credit. But one may not expect the distribution of have an impact on firms' performance, except through the credit channel, which satisfies the exclusion restriction. More specifically, we use the ratio number of branches of banks and other credit institutions to alternatively the population and the size of the city in which a firm is located as a measure of branch density. A crucial assumption that underlie the use of branch density as an instrument for credit constraints is that firms are more likely to borrow from banks located in their locality. Such an approach is followed by Popov (2013), Popov and Udell (2012), and Gormley(2009), among others.

In equation (4), the coefficient \(\alpha_1\) will tell whether indeed there a difference between male and female entrepreneurs when it comes to access to credit, and \(\alpha_2\) and \(\alpha_3\) will indicate whether such a gender-based discrimination vary across sectorial activities or regions.

The second-stage equation deals with the determinants of efficiency scores. It
includes the inverses Mills’ ratio is included as a regressor, and is specified as follows:

\[ ES_i = \beta_0 + \beta_1 \text{GEN}_i + \beta_2 \text{SEC}_i + \beta_3 \text{REG}_i + \beta_4 \text{IMR} + \sum \beta_j X_{ij} + \epsilon_i \]  

(5)

with \( ES_i \) the (allocative or technical) efficiency score of firm \( i \), \( X_{ij} \) a set of firms’ characteristics, and IMR the inverse of Mills’ ratio. Because the whole sample is considered in this second stage regression, the difference in the intercept terms (of the second-stage productivity equation) across the two subsamples will be indicative of a productivity differential due to access to credit.

Moreover, unlike the instrumental variable model that puts forth the issue of endogeneity, this selection model allows not only the conditional mean productivity to vary from one group to another (difference in the intercept terms), it also allows the returns of other factors to differ between the two groups (difference in the slopes). Because the two groups are separated with respect to access to credit, each coefficient is viewed as that of an interaction between the corresponding variable and access to credit. It is therefore interpreted as the marginal effect of the corresponding variable on productivity, conditional on the firms having access to credit; or conversely, the marginal effect of access to credit conditional on that variable. A coefficient of interest is the one on the gender variable (\( \beta_1 \)). A significant estimate tells how the effect of access to credit on productivity varies between male and female entrepreneurs, or symmetrically, how any difference in access to credit between these two groups is translated into a productivity differential.

A clear advantage of this endogenous switching regime model over an instrumental variable model is the fact that it deals with a potential section bias, and still viewing the access to credit as an endogenous process. In contrast, an instrumental variable model will focus on the endogeneity issue, ignoring the possible selection bias, thereby leading to unreliable estimation results.

Whether the “appropriate” approach is to view the issue as an endogeneity bias or a sample selection bias depends upon how one hypothesizes about the effect of access to credit on productivity. If one believes that access to credit has only an intercept effect (parallel shift for different productivity profiles), then an instrumental variable model is called for. In contrast, if one favors the case in which access to credit brings not only an increase in the conditional mean productivity, but also in the returns to different observable attributes of firms (such as the gender of the owner), then a selection model appears to be more adequate. Any restriction test (Wald, likelihood ratio, Lagrange multiplier, etc.) would reveal whether all the coefficients but the intercept can be assumed to be significantly different between the two groups, pointing therefore to the appropriateness of the sample selection model. Otherwise, an instrumental variable model is more
efficient (see Maddala, 1983, and Amemiya, 1985, for more details on the theoretical underpinnings of these models).

As a way of checking the robustness of the results (the impact of access to credit on productivity), we will consider an alternative empirical approach from the wide range of impact evaluation techniques. In effect, obtaining credit can be viewed as a program that benefits some firms (treatment group) and not the rest (from which a control group will be developed). The issue of selection bias comes up again, for firms may self-select into the credit market, or some criteria set forth by lenders may decide which firms will end up “participating in the program”. If one believes that the mechanisms that generate the selection depend on both observable and non-observable variables, then a regression model like the one developed previously is called for. On the other hand, if the selection process depends only on observable characteristics, then we can use a matching comparison method.

The propensity score matching method consists of first generating the probability that a firm obtains credit, through a regular probit model for instance. Including the gender variable will tell whether there is any discrimination against female entrepreneurs when it comes to access to credit. In addition, interacting the gender variable with variables such as the region or the sectorial activities will tell whether the extent of any gender-based discrimination varies across the geographical regions or across the sectorial activities.

The predicted probabilities, known as propensity scores, are then used to match each credit beneficiary with one or more non-beneficiaries with similar scores. There are many matching criteria we can used, ranging from nearest neighbor matching, caliper or radius matching, stratification or radius matching, kernel or local linear matching, etc. By comparing efficiency scores between treated firms and their counterfactual constructed from their matched from the control group, one can tell whether any access to credit is associated with productivity differentials, or the average treatment effect.

Furthermore, one can combine the consistency advantages of the matching comparison method with the favorable variance properties of a regression-based method to generate fully efficient estimator of the effect of credit access on firms’ performance. One such approach suggested by Hirano, Imbens, and Ridder (2003) consists of a weighted least squares regression of the following equation:

\[ ES_i = \beta_0 + \beta_1 AC_i + \beta_2 GEN_i + \beta_3 (AC_i \times GEN_i) + \sum \beta_j X_{ij} + \varepsilon_i \]  

(6)

where \(X\) is a vector of other covariates unaffected by the selection process. The weighting scheme is based in part on the scores or predicted probabilities \(P(X)\), with a weight of 1 for benefitting firms, and \(P(X)/(1-P(X))\) for the control firms. As
before, the estimate of $\beta_1$ will indicate the effect of credit constraint of firms' efficiency, and $\beta_3$ a measure of the extent to which a gender-based differential in access to credit is translated into firms' productivity.

**REFERENCES USED**


4. **Data requirements and sources**

This is a critical part of the proposal. The key issue is to explain the reason for the use of the particular data. You must establish that they are ideal for the question you wish to address. Please consult the “Guide for designing a research project proposals” for more detail.

We will make use of the available firm-level data collected in 2013 as part of a research project that was concerned with firms’ productivity and electric power outages in Senegal. A sample of 625 firms was surveyed in four main regions: Dakar, Thies, Saint-Louis, and Kaolack. They happen to be the most economically advanced regions in Senegal, and because they concentrate a large proportion of businesses, they offer clear indications of the many constraints that firms face in
their regular activities.

The survey has collected detailed information on various aspects of firms’ activities. Initial questions relate to firms’ characteristics, one of them being the gender of the owner. Then, there is a whole set of questions that details firms’ activity and use of inputs: sectoral distribution, volume of output, price, inputs used and their quantity and price, investment, etc.

Another set of information is concerned with finance. Questions were related to whether firms had applied for credit, the type of lenders (banks, microfinance institutions), whether their demand was met, the conditions of the loans (collaterals, amount, interest rates, duration, etc.), and the reasons for rejection or no application for those that were denied or have not applied.

All of this rich set of statistical information will help answer the research questions. A statistical analysis of the data on finance will provide a first glance at the extent of gender-related discrimination in access to credit, if any, through various comparison tests.

Data on production and input usage will feed into the non-parametric model that will generate productivity scores. Firms' characteristics will be used to determine the probability of access to credit and how it affects productivity scores (first-stage regression), as well as the determinants of productivity (second-stage). As for the instrumental variables, we will use external information on bank geographical distribution in the cities that make up the region, as well as the census data of 2011 for the population to construct branch density, in conjunction with the collected Information on firms’ physical address. As for the second instrument, which is the average or proportion of firms that have access to credit within the location, it is constructed using the firms’ survey data on whether the firms have access to credit.

As a way of checking for the robustness of the results, we will also perform the empirical exercises using the dataset from the World Bank Enterprises Survey in Senegal in 2007. The comparison could tell whether any change in the main findings might be due to the data or whether they reflect structural or institutional change in the country over the period from 2007 to 2013.

5. Policy influence plan (or research communication strategy)
   - Identify potential users of your research findings, including policymakers and other key stakeholders. Provide a list of institutions and, whenever possible, specific individuals to be targeted for effective policy influence. Please also indicate whether you have already made contacts within the institution
• How, in the elaboration and execution of your project (from design to dissemination), will you consult/communicate with these users to both gather their inputs and keep them informed of your project (expected contributions and uses), in order to increase chances of your findings to be taken-up into policymaking?

You can refer to PEP’s research communications strategy and guidance to have a better idea of what is expected in terms of activities for policy outreach and dissemination.

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<td>Association Professionnelle des Banques et Etablissements Financiers du Sénégal (APBEFS)</td>
<td>Not yet</td>
<td>Financial institutions</td>
</tr>
<tr>
<td>Association Professionnelle des Systèmes Financiers Décentralisés du Sénégal (APSFD)</td>
<td>Not yet</td>
<td>Microfinance institutions</td>
</tr>
<tr>
<td>Université Cheikh Anta Diop de Dakar</td>
<td>Not yet</td>
<td>Research community in Senegal</td>
</tr>
<tr>
<td>Université de Thiès</td>
<td></td>
<td></td>
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<tr>
<td>Université Gaston Berger de Saint-Louis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Various research institutions in Dakar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
At all stages of the elaboration and execution of the research project, we will seek the inputs of all the main stakeholders and policy makers as well as share our findings with them. More specifically, as soon the project gets accepted, we will plan different meetings with the organisations listed above. We will share our preliminary results with them and get their valuable feedbacks. Once the study is complete, we plan to organize seminars which will allow us to generate a public debate on female entrepreneurship and the many constraints in the credit market in particular. We also plan to produce a policy brief, an issue brief, and as well as a press release for greater outreach.

6. List of team members

Indicating their age (or whether they are under 30), sex, as well as relevant/prior training and experience in the issues and research techniques involved (start with lead researcher).

Note that PEP favors gender-balanced teams, composed of one senior (or experienced) researcher supervising a group of junior researchers, including at least 50% female researchers contributing substantively to the research project. PEP also seeks gender balance in team leaders and thus positively encourages female-led research teams. (Each listed member must post an up-to-date CV in their profile on the PEP website – refer to “How to submit a proposal”)

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex (M,F)</th>
<th>Training and experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdoulaye Seck</td>
<td>38</td>
<td>M</td>
<td>- Ph.D. in Economics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- “Aggregation” in Economics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Associate professor, Cheikh Anta Diop University, Dakar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Economic Advisor, Senegalese Government (Ministry of Agriculture)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Visiting scholar (University of Ziguinchor, Senegal; University of Sonfonia, Conakry, Guinea; and University of Nouakchott, Mauritania)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Supervised/supervising Master and PhD theses related to gender, credit market, as well as firms performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Conducted a research project on firms’ performance (supported by TrustAfrica)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Conducted research projects currently and in the past for AERC, The World Bank, IFPRI, AGRODEP/IFPRI, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Published scientific papers in peer-reviewed journals (Journal of African Economies, Structural Change and</td>
</tr>
<tr>
<td>Name</td>
<td>Age</td>
<td>Gender</td>
<td>Position/Institutional Affiliation</td>
</tr>
<tr>
<td>--------------------------------</td>
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<td>---------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Fatoumata Lamarana Diallo      | 33  | F      | - PhD candidate (near completion)  
- Assistant Lecturer at UCAD  
- Junior researcher at the Consortium pour la Recherche Economique et Sociale (CRES)  
- Has conducted research with AERC  
- Has been a visiting Ph.D fellow at the United Nations University-Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT) in Maastricht, Netherlands.  
- Member of the Knowledge Platform Development Policies set up by the Ministry of Foreign Affairs, Netherlands since 2012. |
| Karamoko Camara                | 31  | M      | - PhD candidate  
- Assistant Lecturer at University G.L.C.-Sonfonia of Guinea  
- Plans to work on the functioning of financial markets and monetary unions issues for his PhD thesis |
| Rouba Thioye                   | 27  | F      | - Master degree (about to start PhD studies this year)  
- Plans to do research on female entrepreneurship for her PhD thesis. |
| Ndeye Khadidiatou Mouhamed Diop| 24  | F      | - Graduate student (Master)  
- Plans to work on labor market issues for her Master thesis  
- President, SYNAPS Business Club for university students  
- Received training on leadership  
- Internship at Post Office, Senegal |
| Founty Alassane Fall           | 28  | F      | - Graduate student (Master)  
- Plans to work on labor market issues for her Master thesis |

### 7. Expected capacity building

Description of the research capacities that team members (and potentially their affiliated institutions) are expected to build through their participation in this project. This is an important aspect in the evaluation of proposals and should be presented in some detail. What techniques, literature, theories, tools, etc. will the team and their institutions learn (acquire in practice) or deepen their knowledge of? How will these skills help team
members in their career development? Also indicate which specific tasks each team member would carry out in executing the project.

The research team expects greatly in terms of capacity building. Since most of the members are graduate students, it is hoped that the project will be a valuable opportunity to learn in great detail the research process at all its stages. More specifically, the following are expected:

- We will try and master the various aspects of gender economics, in particular as they play out in the credit market in developing countries. We will learn the various theoretical frameworks that have been developed in the literature to model the functioning of markets in developing countries with respects to information asymmetry and the process through which they generate discrimination against some borrowers. We will also learn about the empirical side of the literature to see the extent to which those various theories are able to portray the specific nature of the functioning of the markets in our country.

- We will also develop various statistical and modeling tools, such as the handling of survey data, regression analysis, hypothesis testing, etc. A particular interest will be how to regress and analyze selection models and instrumental variable models, and apply matching comparison methods.

- Research writing skills: through comments and feedbacks we will receive on the various drafts we will write, members are expected to learn specific rules pertaining to writing a proposal and a scientific paper

- Research communication skills: at various stages of the research project, we will have to share our results with various audiences, be they the scientific community, policy makers, major stakeholders, and the general public. We will learn how to effectively communicate with each of these segments in a way that will bring clear impact. We will specifically develop skills related to how to make good presentations at seminars or conferences, how to write policy brief, how to communicate with different media outlets (television, radio, newspapers, magazines, etc.)

<table>
<thead>
<tr>
<th>Name</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdoulaye Seck</td>
<td>Research planning; data analysis; methodology development for the parametric and non-parametric models; model estimation; hypothesis testing; results’ interpretations; report writing; communication (seminars, conferences, press, etc.)</td>
</tr>
<tr>
<td>Fatoumata Lamarana Diallo</td>
<td>Literature gathering and review, and summary reports; data analysis; econometric modeling; scientific writing (proposal, policy brief, paper); communication with</td>
</tr>
</tbody>
</table>
various stakeholders (seminar, conferences, press, etc.)

Karamoko Camara
- Literature gathering and review, and summary reports;
- data analysis; econometric modeling; scientific writing (proposal, policy brief, paper);
- communication with various stakeholders (seminar, conferences, press, etc.)

Ndye Khadidiatou Mouhamed Diop
- Literature gathering and review, and summary reports;
- data analysis; econometric modeling; scientific writing (proposal, policy brief, paper);
- communication with various stakeholders (seminar, conferences, press, etc.)

Founty Alassane Fall
- Literature gathering and review, and summary reports;
- data analysis; econometric modeling; scientific writing (proposal, policy brief, paper);
- communication with various stakeholders (seminar, conferences, press, etc.)

Rouba Thiioye
- Literature gathering and review, and summary reports;
- data analysis; econometric modeling; scientific writing (proposal, policy brief, paper);
- communication with various stakeholders (seminar, conferences, press, etc.)

8. List of past, current or pending projects in related areas involving team members
   Name of funding institution, title of project, list of team members involved

<table>
<thead>
<tr>
<th>Name of funding institution</th>
<th>Title of project</th>
<th>Team members involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>TrustAfrica</td>
<td>Electricity Power outages and the Productivity of Small and Medium Firms in Senegal</td>
<td>Abdoulaye Seck</td>
</tr>
<tr>
<td>African Economic Research Consortium (AERC)</td>
<td>Central Bank Independence and the Effectiveness of Monetary Policy in Sub-Saharan Africa</td>
<td>Abdoulaye Seck</td>
</tr>
<tr>
<td>AGRODEP/IFPRI</td>
<td>Fertilizer Subsidy and Agricultural Productivity in Senegal</td>
<td>Abdoulaye Seck</td>
</tr>
<tr>
<td>World Bank Institute</td>
<td>Regional Integration and Agricultural Trade in ECOWAS</td>
<td>Abdoulaye Seck</td>
</tr>
<tr>
<td>African Economic Research Consortium</td>
<td>Analysis of Multidimensional Poverty</td>
<td>Fatoumata Lamarana Diallo</td>
</tr>
</tbody>
</table>
9. Describe any ethical, social, gender or environmental issues or risks that should be noted in relation to your proposed research project.

None.