Constraints to Women's Entrepreneurship and Welfare*

Cho Euphrasie Monique Angbo
Institut National Polytechnique Félix Houphouët Boigny

Dorothée Boccanfuso
GRÉDI - Université de Sherbrooke

Jonathan Goyette
GRÉDI - Université de Sherbrooke

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Abstract

The purpose of this article is to examine the impact of women's entrepreneurship on welfare in 120 countries between 2005 and 2010. Using a panel estimation, we have chosen an instrumental variable approach to take into account the endogenous relationship between women's entrepreneurship and welfare indicators. Because they align themselves with exclusion restrictions, some constraints to entrepreneurship were used as instruments. Our results demonstrate that the variation in the proportion of women entrepreneurs has a considerable impact on welfare. In fact, a 1% increase in the proportion of women entrepreneurs generates a 0.015% reduction in infant mortality rates. This also generates increases of 0.009% per capita to the GDP, of 0.04% to the HDI and of 0.035% to levels of education. However, the impact of women's entrepreneurship on those indicators does not trickle down to the lowest economic stratum of those countries studied since available data is essentially based on formal firms. These results were strong when measured against alternate specifications, particularly the inclusion of control variables with regards to the characteristics of those firms, the quality of the institutions and to macroeconomic aggregates.

Keywords: Women, welfare, formal entrepreneurship, power outages, macroeconomics.
JEL Classification:

*E. Angbo: Institut National Polytechnique Félix Houphouët Boigny - Département GCEA, Section Agroéconomie, email: euphraze@yahoo.fr ; D. Boccanfuso: Department of economics and GRÉDI, Université de Sherbrooke, 2500 boul. de l'Université, Sherbrooke, Québec J1K 2R1, Canada, email: dorothee.boccanfuso@usherbrooke.ca ; J. Goyette: Department of economics and GRÉDI, Université de Sherbrooke, 2500 boul. de l'Université, Sherbrooke, Québec J1K 2R1, Canada, email: jonathan.goyette@usherbrooke.ca.

1 Introduction

In order to ensure their family's welfare, women in developing countries invest a larger part of their income in their children's nutrition, health and education (Hoddinott and Haddad, 1995; Guérin, 2000; Strauss, Mwabu and Beegle, 2000; Chant, 2003; Gammage, 2006; Mayoux, 2006; Quisumbing and McClafferty, 2006; Buisson, 2012). For exemple, Thomas (1990) demonstrated that in Brazil, when family patrimony income was in the hands of the mother, its marginal effect was approximately 20 times larger on the family's welfare than when it was under the father's control. Financial resources acquired by the woman also appeared to bring forth a long-time reduction in fertility and birth-spacing as well as the allocation of resources towards the family's children, generating an improvement in welfare (Dyson and Moore, 1983; Mason, 1984; Caldwell and Caldwell, 1987; Hogan, D.P., Betemariam B. and Hailemariam A., 1999; Eswaran, 2002; Schady and Rosero, 2008; Mukhopadhyay and Chaudhuri, 2011). In this study, we have examined the effect of the variation in the proportion of women entrepreneurs on welfare in 120 countries between 2005 and 2010.

According to the World Bank (2011), almost 35.3% of companies are in the hands of women throughout the world. Therefore, since the year 2000, these women have owned and operated a large percentage of companies in developing countries (Jones, 2012). We have calculated the impact of the proportion of women entrepreneurs based on four welfare indicators: rate of infant and child mortality, Gross Domestic Product (GDP) per capita, Human Development Index (HDI) and the level of education indicator of the HDI.

To the best of our knowledge, there was no empirical evidence of the impact of women entrepreneurs on welfare for a large group of countries. This was largely due to the difficulty caused by the endogeneity between these two variables. Firstly, we suspected that there existed a reverse causality relationship between these variables. The increase in the proportion of women entrepreneurs may cause an increase in welfare because these women invest in the health and education of their children. However, an increase in the levels of education and health in a country have their own impact on the proportion of those women who choose to become entrepreneurs. Secondly, we believed there was a joint determination problem in that the level of women entrepreneurs and the level of welfare may be the result of a third, unobserved, factor.

Other than Aterido, Beck and Iacovone (2011), few empirical studies have tried to estimate the causal effect of women's entrepreneurship. These authors demonstrated that in

37 African countries, few companies having women as part-owners resorted to the use of financial services. This may have been due to the level of responsibility and the role played by these women in their household, to their poor level of education, as well as to their low income in the face of interest rates which may have been too high.[1]

Unlike these authors, we have chosen to examine the impact of the proportion of women entrepreneurs on social welfare in 120 countries between 2005 and 2010. The data was provided by the World Business Environment Survey (WBES) and was solely based on formal and manufacturing firms. Created on a panel-based estimation model, our approach used instrumental variables to take into account the endogenous relationship between women's entrepreneurship and those welfare indicators. We have used as instruments certain constraints to women's entrepreneurship which reflect the exclusion restrictions, i.e. these constraints were only correlated to the depending variable (welfare) through their direct effect on the proportion of women entrepreneurs within a given economy. These constraints reflected the percentage of annual sales lost to the average number of power outages (electricity), the percentage of annual sales lost to criminality and the theft of merchandises stored within the company (criminality), and the amount paid to ensure the safety of assets (security). [2]

In order to take into account the problem of joint determination, we have examined various specifications where, with fixed effects, we monitored for those factors which varied from country to country and year to year and which, in our estimation, introduced a bias. We also analyzed a certain number of characteristics previously identified as being important in order to explain the effect of women on welfare, particularly with regards to expenses pertaining to health, to institutions and for some macroeconomic variables.

[1]Some authors studied the constraints to entrepreneurship in general (Brunetti et al., 1997; Batra, Kaufmann and Stone, 2003; Banerjee and Duflo, 2004; Klapper, Laeven and Rajan, 2006; Safavian and Wimpey, 2007; Ayyagari, Demirgüç-Kunt and Maksimovic, 2008; De Mel, McKenzie and Woodruff, 2008; Aterido, Hallward-Driemeier and Pages, 2009; Beck, Demirgüç-Kunt and Maksimovic, 2009; Hallward-Driemeier, 2009. Others preferred to study specific constraints to women's entrepreneurship (Guérin and Palier, 2005; Guérin and Palier, 2006; Mayoux, 2006; Naidoo and Hilton, 2006; Hampel-Milagrosa, 2010; Hallward-Driemeier, 2001; Aterido, Beck and Iacovone, 2011; Jones, 2012. In general, these constraints may be economic, financial, institutional or structural, and may be more restrictive for small businesses.

[2]The private sector is defined by the activity of an entrepreneur who is exposed to a certain number of constraints. In economic theory, he/she is often perceived as a person able to take professional and financial risks (Knight, 1967; Drucker, 1970) to bring forth an innovation by combining the resources at his or her disposal (Schumpeter, 1994). The development of activities which generate a company's income depends on its size, its age, its area of activity and its marginal productivity (Brunetti, Kisunko and Weder, 1997. Thus, a constraint to entrepreneurship may be defined as a limiting factor which dictates a company's production or sales within an environment within which it interacts.

Our results demonstrated that the effect of women's entrepreneurship on welfare is considerable. More specifically, an increase of 1% in the proportion of women's entrepreneurship generates a 0.015% reduction in infant mortality rates, while generating increases of 0.009% per capita to the GDP, 0.04% to the HDI and 0.035% to education levels. The rest of this article is presented in the following manner: the next section includes data and variables; estimation methods are outlined in the third section, and Section IV is devoted to results analysis and interpretation. The article concludes with recommendations and future directions for research.

2 Data and variables

2.1 Description of data sources

In order to explore the relationship between women's entrepreneurship and welfare, five data sources were used. The first was obtained from the World Bank database. This data was culled from the results of surveys on business environment conducted by the World Business Environment Survey's (WBES) "Enterprise Survey". These surveys were based on polls using standardized survey instruments as well as a uniform sampling methodology used in almost 140 countries since 2002. They contained data reflecting the major constraints within the business environment, identified by entrepreneurs themselves. These surveys also offered detailed information on the characteristics of those firms, their financing methods as well as their management structure (men/women); the "gender" aspect was one of their main components. In this study, we have worked with formal and manufacturing firms interviewed between 2005 and 2010 in 120 countries, depending on the availability of those survey results. Information concerning Human Development Index (HDI) measurement indicators was provided by the UNDP (UN Data). This other database provided information on the Human Development Index (HDI), literacy levels among adults and the education index included in the HDI. The data was available for 135 countries for the period comprised between 1970 and 2010.

The third source included data on development indicators for each country and stemmed from the World Development Indicators (WDI) database which provided miscellaneous time

series for development indicators for approximately 200 countries between 1960 and today. The indicators used in this report are as follows: Gross Domestic Product (GDP), Inflation rate, public expenses, health and education expenses and the rate of infant and child mortality. Data for this last indicator was obtained from two sources: that of the World Bank combined with that of Global Development Finance (GDF). The fourth source provided information on indicators of the quality of institutions; those were culled from the Worldwide Governance Indicators (WGI) database. The data was collected in 210 countries as far back as 1996 and presents six governance indicators which provided information on the efficiency of public authorities, political stability and the absence of violence, quality of regulation, expression and accountability, rule of law and the control of corruption. The fifth and last data source was provided by the appendices to articles by La Porta et al. (1999) and Alesina et al. (2003). These appendices contained a summary of numerous structural determinants of fractionalization recorded between 1995 and 2001 in more than 200 countries. These determinants provided information on the degree of ethno-linguistic fractionalization[3], religious divide (Catholics, Muslims, Protestants and other religions), legal origin (French, British, Socialist, German, Scandinavian) and physical latitude of the country calculated as the distance between it and the equator. All these variables are described in the following paragraphs.

2.2 Sampling description

Designed to estimate the impact of women's entrepreneurship on welfare, the database encompasses numerous interest variables. In this database, the proxy used to designate "women entrepreneurs" represents the percentage of firms with women participating in ownership. This proxy was identified among variables in the gender category of the WBES database and varied between 2.8 and 86.8%. In this sampling, women's entrepreneurship represented on average 33% of private companies. This variable came from surveys undertaken within 1 to 25 national regions, which resulted in an average of approximately five cities (4,969) surveyed per country, or approximately 81,000 companies surveyed in 120 countries between 2005 and 2010.[4] The list of those 120 countries used in our sampling is presented by regional

[3]It is designated in English as: Ethno-Linguistic Fractionalization (ELF)

[4]In 2005, 10,713 firms were surveyed in 33 countries; in 2006, there were 35 countries and 20,586 firms; in 2007, 14,042 firms for 17 countries, and 5,440 firms for 8 countries in 2008. In 2009, the survey covered

group in Appendix 1. The resulting panel contains data on a period of six years for countries in sub Saharan Africa, in the North and in the Middle-East (29.65%), in Latin America and the Caribbean (20.93%), in Eastern Europe and Central Asia (26.16%) and in Eastern Asia and the Pacific (23.26%). Among these countries, 50 were studied twice and one country was examined on three occasions. As for the 69 other countries, they were observed only once. Because it is impossible to obtain individual effects for those 69 countries, this diminishes the explanatory strength of our results as regressions include at the most 51 countries being repeated. However, the final sampling includes 172 observations in total and seems sufficiently important to allow a robust statistical inference. Furthermore, we have examined various specifications in order to test the strength of our estimations.

2.3 Description of variables

2.3.1 Constraints to entrepreneurship

Numerous variables may prevent women from becoming entrepreneurs. We studied the effect of various constraints on the proportion of women entrepreneurs in a preliminary analysis (see results in Appendix 2). Some constraints such as access to financing and corruption have a negative impact on the proportion of women in the field of entrepreneurship. However, these variables may be correlated with welfare indicators. We have thus identified three constraints which comply with inclusion restriction as they are correlated to the dependent variable (welfare) only through their direct effect on the proportion of women entrepreneurs. These constraints are the average number of power outages (electricity), the percentage of annual sales lost to criminality, the theft of merchandises stored within the company (criminality) and the amount paid to ensure the safety of assets (security). Descriptive statistics show that on average 3.52% is lost in annual sales due to power outages, and 3.72% to criminality. Furthermore, 2.30% of sales go to cover security costs. These constraints account for 172 observations, just as the proportion of women entrepreneurs for which they serve as instrumental variables.

20,218 firms in 54 countries and in 2010, 10,568 firms in 25 countries.

2.3.2 Welfare indicators

Four indicators were used to analyze the impact of the proportion of women entrepreneurs on welfare: the level of infant and child mortality, the Gross Domestic Product (GDP) per capita, the Human Development Index (HDI) and the levels of education for the HDI. The rate of infant and child mortality indicates the number of children dying before reaching 5 years of age for every 1000 births, per year in a given country. The GDP per capita identifies produced wealth and thus the average standard of living within a country. The Human Development Index (HDI) is a composite index of the UNDP which provides a comparison of the development level between countries; this index represents a geometric average of these three indexes: life expectancy at birth, level of education and standard of living measured from the actual per capita Gross National Income (GNI)[5] in terms of Purchase Power Parity (PPP) in US dollars (USD).[6] The level of education index is measured by two indicators: average length of schooling among adults and estimated length of schooling among children.

The rate of mortality expressed in "per thousand" was expressed as a percentage and the GDP per capita was transformed in a logarithm. The two other indicators vary between 0 and 1. However, for a better interpretation of the results, those indicators were converted in percentages by multiplying the data of the variable by 100. The descriptive statistics of welfare indicators are summarized in Table 7. This table represents the average percentage of welfare indicators and the average proportion of women participating in ownership of firms and includes specific minimums and maximums for our sampling obtained from the above-mentioned conversions. Afghanistan and Micronesia represent those countries having respectively the lowest (2.80%) and highest (86.80%) percentage of women entrepreneurs in our sampling.

2.3.3 Control variables

In order to better analyze the impact of the proportion of women entrepreneurs on welfare, numerous control variables had to be taken into account since they could concurrently affect the proportion of women entrepreneurs and one of the welfare indicators. Omitted variables

[5]Gross National Income (GNI) per capita replaces the GDP per capita used in the old calculation method of the HDI

[6]Since 2010, IDH calculation method has changed. In this study, data is consistent and derive from calculations based on the new HDI formula which differs from that established in 1994; it covers the period between 1970 and 2010.

may be among the following: characteristics of those firms surveyed by the WBES, the quality of institutions and the macroeconomic aggregates. Taking into account the characteristics of the firms provided a better control of the impact of each firm's specificity within its country. Taking into account the legal status, the size, the type of ownership, the average age of the company, etc., provided a better control for those institutional variables. The World Bank's six KKZ governance indicators measure the quality of governance within a country. These institutional controls vary from 0 (low) to 5 (high). The indicator dealing with government efficiency is used to identify the level of corruption by measuring the quality of public services. The rule of law identifies the level of confidence and the respect afforded to society's rules, and the quality of enforcement for contracts as well as for property rights of entrepreneurs. Expression and accountability help measure civil society's involvement and its genuine participation in the decisions of its political leaders through freedom of expression. Political stability and the absence of violence or terrorism are among the first conditions to the development of private sector activities and welfare. The quality of regulation intervenes in the context of professional practices such as women's entrepreneurship. By measuring the government's ability to enact well-adapted policies and regulations, these variables should raise their impact on the development of the private sector and the welfare of populations within the 120 countries identified. Among structural controls, the GDP appears to be the one to indicate wealth or the level of development within a country. GDP per capita and the level of economic growth per person are respectively measured as Purchase Power Parity (PPP) and annual percentage (constant international 2000 $). The level of inflation is measured by the Consumer Price Index (CPI). Public, health and education expenses are expressed as percentages of the GDP. We have used delayed variables for expenses, the GDP and the literacy level among adults to prevent endogeneity among those indicators and the ones used to measure welfare. Descriptive statistics of control variables are presented in Appendix 5.

3 Linear modeling

To answer the main question brought forth in this study, we have created a panel data model for the 120 countries surveyed between 2005 and 2010. This modeling allowed us to study the impact of women's entrepreneurship on four predefined welfare models. This section presents

an econometric model as well as the approach used to resolve the problem of endogeneity which is suspected between women's entrepreneurship and the welfare indicators used for this study.

3.1 Description of the model

We analyzed the impact of the proportion of women entrepreneurs on welfare in developing countries within an unbalanced panel with the help of the previously described data. Conceptually, the function presented as such:

$$Y_{it} = \alpha + \beta F_{it} + \delta X_{it} + \lambda_i + \lambda_t + \epsilon_{it}, \tag{1}$$

Where Y_{it} was the welfare indicator as a percentage within country i at the time t, Fit being the proportion of women entrepreneurs varying between 0 and 100, X_{it} being a vector of delayed control variables in connection with the characteristics related to the type of ownership of the firms, the quality of institutions and the macroeconomic aggregates of the countries studied. Data may be observed for the company and the country, a being the constant term between countries within the sampling, λ_i identifying country-fixed effects per year, while ϵ_{it} represented the error term. These fixed effects should allow for the purging of unobserved structural characteristics within in each country such as social, religious and ethnic structure. As for temporal effects, they helped control the temporal effect on the dependent variable. Coefficient β was used to evaluate the impact of women's entrepreneurship on welfare. Its sign is a function of the type of welfare indicator. We expected β to be negative and significant in regressions with regards to mortality rate. However, where income per capita, human development and level of education were concerned, a positive and significant coefficient of the variable for women entrepreneurs was hoped for. Because we assumed a problem of endogeneity between the proxy representing the proportion of women entrepreneurs and those welfare indicators, it became necessary to try to resolve it in order to obtain a better estimation of the model presented by equation (2). Knowing that an endogeneity problem may become a bias for selection, omitted variables and/or inverted causality, we explored these aspects in the following.

3.2 Endogeneity problem

Women's entrepreneurship and welfare are probably endogenously-related variables. Initially, it is quite possible that some omitted variables affected these two variables simultaneously. Suspected endogeneity between welfare indicators and the proportion of women entrepreneurs may be due to institutional constraints or regulatory policies which seem to restrict private sector development by reducing economic growth and welfare in developing countries, which explains the use of those control variables mentioned before. Taking into account some development indicators such as delayed GDP per capita, level of economic growth, quality of institutions, etc. may help control some omitted variables. In the second phase, there may exist an inverted causality relationship between the proportion of women entrepreneurs and the various welfare indicators. A reduction of the infant and child mortality rate may affect women's entrepreneurship by increasing the number of children in maternal care thereby undermining the work that woman might do outside the home. A higher level of education would allow better-educated women to bypass some constraints to entrepreneurship, especially with regards to business regulations. Thus, this inverted causality relationship would justify the use of an instrumental variable approach. In these conditions, the interest variable of our study (proportion of women entrepreneurs) would be correlated to the error term of equation (1). In order to sever the endogeneity link between F_{it} and Y_{it}, we used an instrumental variable approach in a panel estimation using the two-stage ordinary least squares method (2OLS). In order to examine the inverted causality between women's entrepreneurship and welfare, the constraints identified by the WBES in the business environment of companies between 2005 and 2010 were used as instrumental variables since they reflected the inclusion restriction. Indeed, these constraints only affected welfare through their impact on the proportion of women entrepreneurs. In order to obtain 2OLS regressions, the constraint "electricity" was used for all selected welfare indicators. This constraint was selected to purge endogeneity from women's entrepreneurship since the F-test in the first stage is higher than 10 and since, at 20%, Cragg Donald's statistics are generally higher than the critical values identified by Stock and Yogo (2005). In order to perform the over-identification Hansen-J test, we used the "criminality" or the "security" variables, identified as instrument, as well as the "electricity" constraint. In this case, the F-test was superior to 10 and the P-value of the Hansen-J test remained superior to 0.15 for the four welfare indicators. In order to take into account the inverted causality between F_{it}

and Y_{it}, the first stage of the 2OLS method was modeled as such:

$$F_{it} = \alpha' + \Phi C_{it} + \gamma X_{it} + \theta_i + \theta_t + \mu_{it}, \tag{2}$$

Where C_{it} was the vector which included the two constraints, X_{it} was a vector of the exogenous control variables. Φ was the coefficient vector for each constraint used as instruments to purge endogeneity out of the variable identified as the proportion of women entrepreneurs (F_{it}) intervening in the second stage (2OLS) of the predetermined pattern regression. In equation (2), Y was the constant term between the countries in the sampling, θ_t identified fixed effects by country, and θ_t identified fixed effects by year, when mu_{it} represented the error term.

4 Result and discussion

This section analyses and discusses the results of the effect of the proportion of women entrepreneurs' impact on the four welfare indicators. Ideally, the results will be presented by fixed effect for all those indicators in the odd-numbered columns; then, on to those with 2OLS with fixed effects in the even-numbered columns. Some specification tests are described to demonstrate the strength of the results obtained from the data.

The results of the impact of women's entrepreneurship on the rate of mortality in children are represented in Table 1. The coefficient of the variable of interest was significant and negative. According to those results, when the number of firms with women as owners increases, the rate of mortality in children of less than five years of age diminishes. In fact, with the introduction of the control variables, the coefficient of the variable identified as women's entrepreneurship remained negative and significantly different from zero (Columns 3 to 14). An increase of 1% in the proportion of women entrepreneurs should then generate a reduction of 0.012% to 0.020% in the rate of infant and child mortality (Columns 12 and 14). It should be noted that taking endogeneity into account in even-numbered columns increases the OLS coefficient by 0.022 to more than double its value, or 0.040% (Column 2), which represents more than twice the value of Column 1. This coefficient also tends to lean towards the base results (0.018), once the controls are introduced. These results indicate that an increase in income among women increases expenses in children's health (Thomas, 1990; Hoddinott and Haddad, 1995; Strauss and Beegle, 1996).

Table 1: Women's entrepreneurship on the rate of mortality in children

VARIABLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Womens entrepreneuship	-0.018***	-0.040***	-0.015***	-0.027***	-0.014***	-0.023***	-0.013***	-0.022***	-0.013***	-0.020***	-0.019***	-0.012***	-0.021***	-0.020***
	[0.003]	[0.007]	[0.003]	[0.007]	[0.003]	[0.006]	[0.002]	[0.005]	[0.002]	[0.004]	[0.003]	[0.002]	[0.005]	[0.004]
R adults literacy rate			-0.143***	-0.136***	-0.140***	-0.135***	-0.118***	-0.118***	-0.131***	-0.131***	-0.131***	-0.133***	-0.127***	-0.127***
			[0.049]	[0.040]	[0.044]	[0.037]	[0.043]	[0.033]	[0.030]	[0.024]	[0.024]	[0.031]	[0.027]	[0.027]
$R3$ gdpgrowth					-0.039***	-0.035***	-0.041***	-0.037***	-0.033***	-0.030***	-0.031***	-0.033***	-0.031***	-0.031***
					[0.005]	[0.007]	[0.006]	[0.006]	[0.004]	[0.006]	[0.006]	[0.004]	[0.007]	[0.006]
$R2$ dpgovgdp							-0.024	-0.027	-0.016	-0.018	-0.017	-0.017	-0.016	-0.016
							[0.020]	[0.020]	[0.023]	[0.023]	[0.023]	[0.024]	[0.023]	[0.023]
Gov. Efficiency									-0.671***	-0.694***	-0.690***	-0.682***	-0.676***	-0.677***
									[0.236]	[0.248]	[0.245]	[0.246]	[0.249]	[0.247]
National property												-0.004	0.005	0.005
												[0.004]	[0.006]	[0.005]
Constant	5.649***	No	17.342***	No	17.190***	No	15.505***	No	16.277***	No	No	16.841***	No	No
	[0.113]		[4.048]		[3.671]		[3.543]		[2.497]			[2.654]		
Observations	171	103	143	95	143	95	137	89	137	89	89	137	89	89
R2	0.300	-0.127	0.516	0.389	0.622	0.539	0.671	0.546	0.755	0.687	0.707	0.758	0.685	0.695
Nbre of countries	119	51	95	47	95	47	92	44	92	44	44	92	44	44
F test		15.64		14.73		13.09		13.02		15.59	35.06		18.25	34.77
Cragg Donald		16.035		13.324		12.277		15.156		15.695	17.593		16.332	13.438
Hansen J											0.6859			0.8199
Instruments (2OLS)	No	Electricity	No	Electricity	No	Electricity	No	Electricity	No	Electricity	Electricity Criminality	No	Electricity	Electricity Criminality

Source: Calculations done by the authors.

Statistics (Strong) of Student in brackets: *** p<0.01 : significant coefficients to 1%, ** p<0.05 : significant coefficients to 5%, * p<0.1 : significant coefficients to 10%

Note : R : variable delayed by one year, $R2$: variable delayed by two years, $R3$: variable delayed by three years. GDPgrowth : GDP growth rate per capita, dpgovgdp : government expenses as % of GDP, Gov. : Government. (Governance indicators).

The F-test in the first stage of the 2OLS is superior to 10 (even-numbered columns (2 to 10) and Columns 11, 13 and 14). Cragg-Donald (CD) F statistic is close to the critical value of Stock and Yogo at 10% (16.33) Column 13, and superior to 15% (11.59) (Column 14). Hansen J statistic allows for the validation of instruments with a P-value of 0.8199 superior to 0.15 (Column 14).

The effect of women's entrepreneurship on education levels is presented in Table 2. Both models (OLS and 2OLS) present the interest variable (women entrepreneurs) with a significant and positive coefficient. Thus, an increase of 1% in the proportion of women entrepreneurs should generate an increase of 2.029% with the fixed-asset model, and of 0.106% in the levels of education with the 2OLS model as shown respectively in Columns 1 and 2. Thus, by taking into account the inverted causality relationship, we noted that the coefficient was three times higher than for the base results (Column 1) and made a correction for the standard bias related to the OLS method. However, the introduction of controls brought back the coefficient to the base results (Column 14).

According to UNICEF (2012), an increase in the level adult literacy and a wider access to media by parents might foster better education, especially for young girls in developing countries. Some authors have demonstrated that among women who have access to ownership or who own assets, investments tend to increase in matters such as the education (and health), nutrition and clothing of their children, which also tends to go hand in hand with better results in school (Strauss and Beegle, 1996; Quisumbing and Brière, 2000; Katz and Chamorro, 2003; Mayoux, 2006). Women entrepreneur's income thus contributes to the development of human capital in general and to the increase of education levels, particularly in developing countries. These results confirm the importance women's role and that of education in the development process of developing countries, more specifically in Africa (UNESCO, 1991; UNDP, 1995 in Clevenot and Pilon, 1996). These results seemed to remain solid when introducing control variables such as the growth rate of the GDP and urbanization.

Table 3 presents the impact of women's entrepreneurship on human development. As before, the coefficient for the variable of interest was significant and positive for both models. Our results demonstrated that women's entrepreneurship was beneficial to human development in developing countries. More precisely, an increase of 1% in the number of firms with women in ownership should translate as an increase of 0.051% (Column 1). It should also be noted that the coefficient of interest increased to 0.125% when the endogenous relationship between those two variables was taken into consideration, which more than doubled the results obtained in Column 1 before once more leaning towards the base results after the inclusion of controls.

Table 2: Women's entrepreneurship on levels of education

VARIABLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Womens entrepreneuship	0.029	0.106*	0.022**	0.047**	0.019*	0.044**	0.021**	0.051**	0.022*	0.049**	0.022*	0.031**	0.022*	0.034**	0.042**
	[0.018]	[0.056]	[0.011]	[0.020]	[0.010]	[0.022]	[0.011]	[0.022]	[0.013]	[0.019]	[0.012]	[0.012]	[0.011]	[0.015]	[0.012]
$R2$ adults literacy rate			0.696***	0.681***	0.724***	0.695***	0.749***	0.724***	0.745***	0.715***	0.857***	0.844***	0.870***	0.862***	0.856**
			[0.098]	[0.097]	[0.108]	[0.105]	[0.099]	[0.094]	[0.104]	[0.095]	[0.093]	[0.078]	[0.108]	[0.098]	[0.103]
Urbanization					0.527*	0.241	0.669**	0.389	0.711**	0.623*	1.115**	1.082***	1.151**	1.134***	1.121**
					[0.306]	[0.429]	[0.318]	[0.422]	[0.294]	[0.325]	[0.452]	[0.418]	[0.463]	[0.417]	[0.403]
Expression and responsability							1.382	1.862	1.357	1.658	1.641	1.765*	1.659	1.815*	1.929*
							[1.088]	[1.240]	[1.112]	[1.210]	[1.020]	[0.999]	[1.048]	[1.055]	[1.053]
National property									-0.008	-0.034	-0.010	-0.019	-0.010	-0.021	-0.029
									[0.032]	[0.028]	[0.029]	[0.021]	[0.029]	[0.020]	[0.021]
$R3$ dpgovgdp											0.220**	0.221***	0.210**	0.205**	0.202**
											[0.084]	[0.077]	[0.090]	[0.084]	[0.080]
R gdpgrowth													0.013	0.020	0.025
													[0.029]	[0.036]	[0.036]
Constant	72.220***	No	13.856*	No	10.593	No	8.334	No	9.234	No	-3.888	No	-4.993	No	No
	[0.598]		[8.239]		[9.341]		[8.627]		[10.269]		[9.794]		[11.057]		
Observations	142	93	142	93	142	93	142	93	142	93	138	91	138	91	91
R2	0.064	-0.377	0.667	0.620	0.676	0.632	0.687	0.628	0.687	0.645	0.760	0.754	0.761	0.753	0.737
Nbre of countries	95	46	95	46	95	46	95	46	95	46	92	45	92	45	45
F test		14.59		14.40		11.25		10.28		14.37		12.76		10.80	12.89
Cragg Donald		13.196		12.988		10.382		9.376		12.324		12.107		10.625	8.999
Hansen J															0.4226
Instruments (2OLS)	No	Electricity	No	Electricity	No	Electricity	No	Electricity	No	Electricity		No	Electricity	No	Electric Securit

Source: Calculations done by the authors.

Statistics (Strong) of Student in brackets: *** p<0.01 : significant coefficients to 1%, ** p<0.05 : significant coefficients to 5%, * p<0.1 : significant coefficients to 10%

Note : R : variable delayed by one year, $R2$: variable delayed by two years, $R3$: variable delayed by three years. GDPgrowth : GDP growth rate per capita, dpgovgdp : government expenses as % of GDP, Gov. : Government. (Governance indicators).

The F-test in the first stage of the 2OLS is superior to 10 (even-numbered columns and column 15). Cragg-Donald (CD) F statistic is close to the critical value of Stock and Yogo at 15% (8.96) Column 14, and superior to 20% (8.75) (Column 15). Hansen J statistic allows for the validation of instruments with a P-value of 0.4226 superior to 0.15 (Column 15).

Table 3: Women's entrepreneurship on human development (HDI)

VARIABLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Womens entrepreneuship	0.051***	0.125***	0.048***	0.097***	0.039***	0.084***	0.040***	0.071***	0.039***	0.070**	0.038***	0.057***	0.036***	0.055***	0.049**
	[0.010]	[0.027]	[0.010]	[0.017]	[0.012]	[0.019]	[0.011]	[0.013]	[0.011]	[0.013]	[0.011]	[0.013]	[0.007]	[0.009]	[0.010]
$R2$ adults literacy rate			0.349***	0.316***	0.435***	0.379***	0.428***	0.390***	0.431***	0.386***	0.535***	0.505***	0.453***	0.424***	0.433**
			[0.080]	[0.073]	[0.088]	[0.093]	[0.088]	[0.098]	[0.091]	[0.099]	[0.074]	[0.078]	[0.054]	[0.055]	[0.056]
Urbanization					1.617*	1.092	1.563*	1.208	1.524*	1.379	1.763**	1.671*	0.813***	0.735***	0.760**
					[0.912]	[1.019]	[0.853]	[0.924]	[0.872]	[0.910]	[0.839]	[0.861]	[0.248]	[0.223]	[0.214]
Gov. Efficiency							2.546***	2.663***	2.560***	2.602***	2.823***	2.840***	1.961***	1.994***	1.984**
							[0.741]	[0.730]	[0.716]	[0.752]	[0.593]	[0.612]	[0.454]	[0.488]	[0.464]
National property									0.007	-0.024	0.010	-0.009	0.014	-0.005	0.002
									[0.037]	[0.034]	[0.038]	[0.036]	[0.025]	[0.022]	[0.025]
$R3$ dpgovgdp											0.098	0.096	0.096**	0.093**	0.094**
											[0.072]	[0.073]	[0.047]	[0.046]	[0.045]
$R3$ gdpgrowth													0.181***	0.178***	0.179**
													[0.021]	[0.022]	[0.021]
Constant	64.213***	No	34.998***	No	24.978***	No	26.154***	No	25.413***	No	14.859*	22.248***	No	No	No
	[0.341]		[6.548]		[8.298]		[8.368]		[9.540]		[8.860]		[5.796]		
Observations	143	95	143	95	143	95	143	95	143	95	139	93	139	93	93
R2	0.242	-0.247	0.425	0.201	0.530	0.354	0.612	0.532	0.612	0.540	0.657	0.631	0.836	0.808	0.823
Nbre of countries	95	47	95	47	95	47	95	47	95	47	92	46	92	46	46
F test		14.60		14.17		11.11		13.25		17.99		16.49		16.12	17.95
Hansen J		13.254		12.873		10.264		10.979		13.387		13.318		12.977	13.777
Cragg Donald															0.3536
Instruments (2OLS)	No	Electricity	No	Electricity	No	Electricity	No	Electricity	No	Electricity	No	Electricity	No	Electricity	Electric Securit

Source: Calculations done by the authors.

Statistics (Strong) of Student in brackets: *** p<0.01 : significant coefficients to 1%, ** p<0.05 : significant coefficients to 5%, * p<0.1 : significant coefficients to 10%

Note : R : variable delayed by one year, $R2$: variable delayed by two years, $R3$: variable delayed by three years. GDPgrowth : GDP growth rate per capita, dpgovgdp : government expenses as % of GDP, Gov. : Government. (Governance indicators).

The F-test in the first stage of the 2OLS is superior to 10 (even-numbered columns and column 15). Cragg-Donald (CD) F statistic is close to the critical value of Stock and Yogo at 15% (8.96) Column 13, and superior to 15% (11.59) (Column 15). Hansen J statistic allows for the validation of instruments with a P-value of 0.3536 superior to 0.15 (Column 15).

Table 4: Women's entrepreneurship on GDP per capita

VARIABLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Womens entrepreneuship	0.008***	0.016***	0.006***	0.011***	0.004***	0.011***	0.004***	0.009***	0.004***	0.008***	0.004***	0.008***	0.004***	0.008***	0.009**
	[0.002]	[0.003]	[0.001]	[0.002]	[0.002]	[0.003]	[0.001]	[0.003]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]	[0.002]
$R3$ gdpgrowth			0.031***	0.027***	0.026***	0.024***	0.022***	0.021***	0.026***	0.029***	0.025***	0.029***	0.025***	0.029***	0.029**
			[0.007]	[0.009]	[0.006]	[0.009]	[0.006]	[0.009]	[0.004]	[0.004]	[0.004]	[0.005]	[0.004]	[0.005]	[0.005]
$R10$ lngdp3pc					0.319***	0.181**	0.376***	0.245**	0.370***	0.210**	0.378***	0.217**	0.375***	0.211**	0.186*
					[0.098]	[0.091]	[0.103]	[0.100]	[0.096]	[0.096]	[0.096]	[0.095]	[0.097]	[0.091]	[0.100]
Politic stability							0.168***	0.119*	0.185***	0.146**	0.175***	0.143***	0.172***	0.142***	0.137**
							[0.053]	[0.066]	[0.050]	[0.058]	[0.045]	[0.054]	[0.043]	[0.051]	[0.054]
R adults literacy rate									0.021***	0.020***	0.024***	0.021**	0.026***	0.021**	0.021**
									[0.006]	[0.007]	[0.007]	[0.008]	[0.007]	[0.009]	[0.010]
Urbanization											0.060	0.025	0.037	0.021	0.018
											[0.053]	[0.065]	[0.051]	[0.060]	[0.061]
National property													0.004	0.001	0.000
													[0.004]	[0.005]	[0.005]
Constant	8.224***	No	8.168***	No	5.708***	No	5.337***	No	3.619***	No	3.170***	No	2.755***	No	No
	[0.050]		[0.059]		[0.731]		[0.773]		[0.763]		[0.687]		[0.762]		
Observations	169	103	169	103	166	101	166	101	142	95	142	95	142	95	95
R2	0.276	0.009	0.629	0.515	0.706	0.574	0.747	0.652	0.803	0.761	0.808	0.766	0.815	0.765	0.749
Nbre of countries	117	51	117	51	115	50	115	50	94	47	94	47	94	47	47
F test		15.64		14.07		14.54		11.73		11.90		10.95		12.71	12.66
Cragg Donald		16.035		12.763		11.397		9.461		9.779		8.626		11.291	10.235
Hansen J															0.6202
Instruments (2OLS)	No	Electricity	No	Electricity	No	Electricity	No	Electricity	No	Electricity	No	Electricity	No	Electricity	Electric Securit

Source: Calculations done by the authors.

Statistics (Strong) of Student in brackets: *** p<0.01 : significant coefficients to 1%, ** p<0.05 : significant coefficients to 5%, * p<0.1 : significant coefficients to 10%

Note : R : variable delayed by one year, $R3$: variable delayed by three years, $R10$: variable delayed by ten years. GDPgrowth : GDP growth rate per capita, dpgovgdp : government expenses as % of GDP, Gov. : Government. (Governance indicators).

The F-test in the first stage of the 2OLS is superior to 10 (even-numbered columns and column 15). Cragg-Donald (CD) F statistic is close to the critical value of Stock and Yogo at 15% (8.96) Column 14, and superior to 20% (8.75) (Column 15). Hansen J statistic allows for the validation of instruments with a P-value of 0.6202 superior to 0.15 (Column 14).

Activity among women, and particularly the income they derive from work seem to benefit human development, as is the case with various income sources managed by women in the household (money transfers, family assets, etc.). Our results corroborated those of Buisson (2012) which demonstrated that development brought forth by women was desirable since their income helped provide better consumption stability and an increase in long-term welfare in contexts where frequent shocks were observed. These results tended to be solid in the presence of control variables such as growth rate of the GDP and the quality of governance represented by government effectiveness in the countries surveyed (Columns 3 to 15). The analysis of the impact of the proportion of women entrepreneurs on the GDP per capita is presented in Table 4. The interest variable outlined a significant and positive coefficient. These results indicated that an increase of 1% in the percentage of women entrepreneurs seemed to increase the GDP per capita by 0.008% (Column 1), or 0.016% (Column 2) with an approach using instrumental variables. Thus, taking into account the endogenous relationship corrected the standard bias linked with fixed effects However, the introduction of control variables lowered that level by half, which then reverted to the base results of 0,008% (Columns 1 and 14). In the same manner, taking into account some control variables (Columns 3-14) reduced the importance level of the interest variable by half (odd-numbered column). These results seemed strong in the presence of controls dealing with the level of GDP per capita delayed by ten years and that of the growth rate per capita (Column 5).

Numerous specification tests were conducted to justify the choice of model established in Section 3. Breusch-Pagan's test and F-test were mandatory to first examine the relevance of a fixed effects model. Later in the process, the Hausman fixed effects test against random effects was needed to identify the specification in the presence of individual errors. Finally the Breusch-Pagan test helped detect the presence or the absence of heteroscedastic errors. When faced with heteroscedasticity, adding the strength option became necessary as per White's proposition (1980) for the four regressions of welfare. In order to test the hypotheses of endogeneity on panel data in equation (1), the approach by instrumental variables with a two-stage model was privileged. Among the constraints to women's entrepreneurship, the "electricity" variable appeared to be a "non weak" instrument. At 20%, Cragg-Donald's statistic obtained after those regressions was generally superior to Stock and Yogo (2005)'s critical values, which demonstrated the "non-weakness" of the instruments (Tables 6 to 9).

The F-test (at the first stage of 2OLS) allowed testing for the presence or absence of the exogeneity hypothesis for the interest variable (Fit) while using the "electricity" variable as an instrument. In order to run the over-identification restrictions test, the "security" or the "criminality" variable was also taken into account in addition to the "electricity" constraints. Both constraints seemed valid as per Hansen-J (2009)'s statistics. The results of the Hansen-J test helped validate the relevance of those instruments with a P-value superior to 0.15, which helped reassure us of the exogeneity of our instruments in the face of various welfare indicators.

5 Conclusion

The object of this study was to examine the impact of women's entrepreneurship on four welfare indicators in 120 countries on a period of six years. In order to do so, we have used one of the four variables in the category "gender" of the World Bank's Enterprise Survey as proxy for the proportion of women entrepreneurs. We have demonstrated, with the help of a panel estimation, that this income-generating activity for women significantly improved the welfare of populations. In fact, a 1% increase in the proportion of women entrepreneurs appears to bring a reduction of 0.015% in the child mortality rate, an increase of 0.009% in the GDP per capita, an increase of 0.04% in the HDI and of 0.035% in the level of education. Control variables which were introduced allowed us to confirm the strength of the results. By integrating some governance and development indicators, the interest variable remained significant and maintained its sign. However, even if some control variables lost their significance, no counter-intuitive sign was noted in their coefficients. This macroeconomic analysis complements the efforts set forth to implement intervention policies aimed at reducing the constraints impacting women's entrepreneurship. It was particularly interesting to note that by promoting increased opportunities in women's entrepreneurship, these women will benefit from a personal salary income which will help them better contribute to the welfare of their family and particularly that of their children while actively participating in the sustainable development of their society.

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7 Appendices

Table 5: List of countries by regional areas

Sub-saharian Africa	**East Europa and Central Asia**	**Latin America and Carabbean**	**East Asia and Pacific**	**North Africa and Middle East**	**OECD**	**South Asia**
Angola	Albania	Argentina	Fiji	Algeria	Czech Republic	Afghanistan
Benin	Armenia	Bahamas	Indonesia	Egypt	Greece	Bangladesh
Botswana	Azerbaijan	Bolivia	Lao PDR	Jordan	Hungary	Bhutan
Burkina Faso	Belarus	Brazil	Malaysia	Lebanon	Ireland	India
Burundi	Bosnia and Herzegovina	Chile	Micronesia, Fed. Sts.	Morocco	Korea	Nepal
Cameroon	Bulgaria	Colombia	Mongolia	Syrian Arab Republic	Portugal	Pakistan
Cape Verde	Croatia	Costa Rica	Philippines	West Bank and Gaza	Slovak Republic	
Chad	Estonia	Ecuador	Samoa	Yemen	Spain	
Congo, Dem. Rep.	Georgia	El Salvador	Timor-Leste			
Congo, Rep.	Kazakhstan	Grenada	Tonga			
Ivory Cost	Kosovo	Guatemala	Vanuatu			
Eritrea	Kyrgyz Republic	Guyana	Vietnam			
Ethiopia	Latvia	Honduras				
Gabon	Lithuania	Jamaica				
Gambia, The	Macedoni	Mexico				
Ghana	Moldova	Nicaragua				
Guinea	Montenegro	Panama				
Guinea-Bissau	Poland	Paraguay				
Kenya	Romania	Peru				
Lesotho	Russian Federation	Uruguay				
Liberia	Serbia	Venezuela				
Madagascar	Slovenia					
Malawi	Tajikistan					
Mali	Turkey					
Mauritania	Ukraine					
Mauritius	Uzbekistan					
Mozambique						

Continuation of Table 5

Sub-saharian Africa	**East Europa and Central Asia**	**Latin America and Carabbean**	**East Asia and Pacific**	**North Africa and Middle East**	**OECD**	**South Asia**
Namibia Niger Nigeria Rwanda Senegal Sierra Leone South Africa Swaziland Tanzania Togo Uganda Zambia						

Source: WBES - World Bank.

Table 6: Factors of Women's entrepreunership

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
finance access	-0.672**	-0.695**	-0.772**	-0.800**	-0.752**	-0.733**	-0.643**	-0.346
	[0.289]	[0.314]	[0.336]	[0.334]	[0.331]	[0.315]	[0.313]	[0.348]
electricity	-0.969***	-0.981***	-1.041***	-1.038***	-0.960***	-1.020***	-0.898***	-0.715**
	[0.270]	[0.292]	[0.315]	[0.312]	[0.312]	[0.293]	[0.295]	[0.334]
licences	-1.557***	-1.511***	-1.505***	-1.564***	-1.354***	-1.667***	-1.451***	-1.208**
	[0.451]	[0.454]	[0.461]	[0.458]	[0.476]	[0.472]	[0.483]	[0.510]
politics instability	-0.801***	-0.875***	-0.962***	-1.010***	-0.940***	-0.926***	-0.827***	-0.707**
	[0.269]	[0.277]	[0.296]	[0.295]	[0.295]	[0.280]	[0.279]	[0.307]
criminality	-0.684**	-0.655*	-0.706*	-0.745**	-0.819**	-0.735**	-0.780**	-0.641*
	[0.325]	[0.335]	[0.356]	[0.353]	[0.350]	[0.341]	[0.337]	[0.360]
custom regulation	-1.408**	-1.461**	-1.629**	-1.718**	-1.807**	-1.611**	-1.698**	-1.494**
	[0.687]	[0.687]	[0.711]	[0.707]	[0.697]	[0.697]	[0.686]	[0.709]
tribunal	-1.904*	-1.955**	-2.068**	-2.470**	-2.662***	-1.976**	-2.149**	-2.040**
	[0.965]	[0.952]	[0.977]	[1.005]	[1.001]	[0.951]	[0.945]	[0.991]
tax rates	-0.624**	-0.578*	-0.668*	-0.727**	-0.736**	-0.608*	-0.571*	-0.264
	[0.311]	[0.318]	[0.352]	[0.352]	[0.347]	[0.318]	[0.314]	[0.357]
acces land	-1.086**	-1.204**	-1.296**	-1.329**	-1.209*	-1.289**	-1.098*	-0.809
	[0.514]	[0.591]	[0.630]	[0.625]	[0.619]	[0.595]	[0.590]	[0.623]
labor regulation	-2.061**	-1.829**	-1.954**	-1.915**	-1.683**	-1.862**	-1.583**	-1.274
	[0.805]	[0.802]	[0.838]	[0.842]	[0.835]	[0.801]	[0.795]	[0.866]
corruption	-1.225***	-1.016**	-1.047**	-0.940**	-0.939**	-1.141***	-1.130***	-0.821*
	[0.379]	[0.395]	[0.403]	[0.404]	[0.398]	[0.408]	[0.401]	[0.438]
informal practice	-0.659*	-0.549	-0.620	-0.662*	-0.558	-0.521	-0.352	-0.348
	[0.365]	[0.368]	[0.396]	[0.393]	[0.395]	[0.368]	[0.371]	[0.410]
transport	-0.572	-0.770	-0.793	-0.857	-1.063*	-0.944	-1.136*	-0.872
	[0.553]	[0.567]	[0.594]	[0.590]	[0.589]	[0.585]	[0.581]	[0.601]
taxe admin	-0.723	-0.786	-0.830	-0.750	-0.590	-0.734	-0.556	-0.557
	[0.517]	[0.513]	[0.525]	[0.525]	[0.527]	[0.514]	[0.514]	[0.563]
indiv. firm			-0.044	-0.067	-0.071			
			[0.076]	[0.077]	[0.077]			
Partnership			-0.179	-0.214	-0.231			
			[0.204]	[0.204]	[0.201]			
Sponsors company			-0.100	-0.124	-0.120			
			[0.139]	[0.138]	[0.136]			
Listed company			-0.096	-0.170	-0.234			
			[0.185]	[0.189]	[0.189]			
Ln firm age				5.858	4.862			
				[5.908]	[5.859]			

Continuation of Table 6

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Religion					18.758**		18.916**	15.616*
					[7.886]		[7.707]	[7.879]
Regulation quality						-3.981	-4.752	
						[3.401]	[3.359]	
Small firms								0.407*
								[0.214]
Medium firms								0.929**
								[0.378]
Macro controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	117.16***	131.97***	149.95***	144.50***	132.98***	122.08***	99.76**	39.28
	[25.952]	[36.261]	[40.441]	[41.541]	[42.116]	[37.160]	[38.099]	[47.121]
Obs.	137	136	136	135	133	136	134	129
R2	0.417	0.446	0.457	0.467	0.499	0.454	0.488	0.497

Source: Calculations done by the authors.
Statistics (Strong) of Student in brackets: *** p<0.01 : significant coefficients to 1%, ** p<0.05 : significant coefficients to 5%, * p<0.1 : significant coefficients to 10%
Note : Macro controls : R ln gdp, GDP per capita en PPA et R2 gdp growth, GDP growth rate (per capita); variable delayed by 1 or 2 years.
Reference constraint : *badly trained workers.*

Table 7: Descriptives statistics of welfare indicators

Variable	Observations	Mean	Std. Dev.	Min	Max	Sources
Womens entrepreneurship	172	32.80	15.06	2.80	86.80	WBES
Rate of mortality in children	171	5.06	5.07	0.31	18.86	WDI
HDI hybride	143	65.93	15.48	27.72	90.10	UN Data
Education index	142	73.20	15.83	25.88	92.01	UN Data
GDP per capita (ln)	169	8.50	1.10	5.66	10.56	WDI

Source: Calculations done by the authors.