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How Do Gender Inequalities Hinder Development? Cross-Country Evidence

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Using cross-country and panel regressions, this paper investigates how gender inequality hinders economic and human development: a one standard deviation change in the Multidimensional Gender Inequality Index (MGII) will increase long-run per capita income by 3.4% and the Human Development Index (HDI) by 4.6%. These results are mainly driven by inequalities in the identity dimension and in the access to economic activity for economic development, and by inequalities within the family and in the access to education for human development. Gender inequality may then explain differences in economic development: 10% of the long-run income difference between South Asia and East Asia & the Pacific can be accounted for by the difference in gender inequality. Moreover, this paper provides evidence of a vicious circle between gender inequality and long term income. Gender inequality is measured by a composite index with endogenous weightings: the MGII. These results are robust to changes in specifications and controls for potential endogeneities.*

I. Introduction

In 2010, the Democratic Republic of Congo had a GDP per capita in purchasing power parity (PPP) terms of $351, compared to $86,175 in Luxembourg. A massive income gap persists between developed and the least-developed countries. While some economies have converged, as in Solow's theory, others continue to sink into poverty. The growth literature has shown that economic growth can be explained by physical and human capital accumulation and technological change. Other economic and political factors, such as trade and governance, as well as cultural factor, such as gender inequality, may explain why some countries grow more rapidly than others.

This paper suggests that gender inequality may be one explanation of development gaps as a determinant of economic and human development.

Results show that gender inequalities reduce long term income per capita by 3.4% and the human development index by 4.6%. These results are mainly driven by inequalities in the identity dimension and in the access to economic activity for economic development, and by inequalities within the family and in the access to education for human development. The effect on long-run income per capita is large in size, as gender inequality can explain 10% of the long-run income difference between South Asia and East Asia & the Pacific. Moreover, a vicious circle between gender inequality and economic development occurs: higher inequality hinders economic development which in turns leads to more inequality.

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Gender inequality refers to inequalities based on the individual's sex which is an "ascriptive characteristic they are born with" (KLASEN [2007]). Gender inequality has two aspects: inequality of opportunities and inequality of outcomes. The first one suggests that inequalities due to circumstances beyond the control of individuals differ from inequalities resulting from preferences and choices. If gender differs in their attitudes, preferences and choices, differences in outcomes cannot be solely attributed to differences in opportunities. The second one suggests that these differences in attitudes, preferences and choices as learned, internalized by individuals in their socialization. In practice, it is difficult to measure opportunities separately from outcomes, especially as they describe the same phenomenon (WORLDBANK [2012]).

While gender roles assigned to males and females vary across cultures, men have enjoyed privileges everywhere. This suggests the existence of a number of widespread causes lying behind gender inequalities. The chains of causality remain however complex and difficult to establish, rendering the explanation of gender inequality and its persistence challenging.

This task is all the more difficult as gender inequality is multidimensional, appearing in different forms across regions, countries and cultures. The first contribution of this paper is to use a composite indicator, the Multidimensional Gender Inequality Index (MGII, see FERRANT [2013]), including eight[1] dimensions in which gender inequality appears in developing countries to analyse its relationship with development. To the best of our knowledge, current evidence only relates some of the dimensions of gender inequality to economic development. The literature has focused on the relationship between economic development and gender inequality in education (e.g. DOLLAR and GATTI [1999]; KLASEN [2002]; KNOWLES, LORGELLY, and OWEN [2002]), in employment (ESTEVE-VOLART [2004]; KLASEN [2008] among others), etc. This growing literature continues to analyse one dimension of gender inequality at a time (see LORGELLY [2000] for a summary). However, these dimensions may be substitutes or complements. In a given country, less gender inequality in education may be accompanied by considerable inequality in politics: only a composite indicator can capture the overall phenomenon of gender inequality. To come to more general conclusions regarding gender inequality and economic performance, we need a composite index, and in general a number of variables are often needed to capture aggregate phenomena.

FORSYTHE, KORZENIEWICZ, and DURRANT [2000] propose a taxonomy of the growing literature focusing on the relationship between gender inequality and economic development. It opposes two main approaches: the '*modernization-neoclassical*' and the '*women in development*'. The *'modernization-neoclassical'* approach assumes that economic development reduces gender inequality (CHARLES [1992]; CLARK [1991]; WEISS, RAMIREZ, and TRACY [1976]). Economic development leads to less gender differences in human-capital accumulation explaining gender inequality in employment, wages, poverty, etc. (MINCER and POLACHEK [1974]; O'NEILL and POLACHEK [1993]). From this point of view, economic development increases the demand for workers and the cost of discriminatory practices (DARITY [1980]). Following BECKER [1985], competition hence drives out discriminatory practices. The expansion of markets which allocate resources by market mechanisms has reduced female exclusion. Market mechanisms are based on capabilities and productivity whatever the gender. As such, improving

1. Namely identity, autonomy of the body, intra-family laws, political representation, economic activity, and the access to health, education and economic resources.

women's access to human capital will reduce gender inequality in economic activity (RAMIREZ, SOYSAL, and SHANAHAN [1997]). The *'women in development'* strand started with BOSERUP [1970]. Her contribution to the discourse surrounding gender and development practices was to argue that women's contributions, both at home and in the paid workforce, contribute to the national economy and growth.

Whatever the direction of causality, a correlation exists between gender inequality and economic development (LAGERLOF [2003]). The second contribution of this paper is to examine the bi-directional impact between gender inequality and economic development. It suggests the existence of a vicious circle, whereby a complex of events is self-reinforcing via a feedback loop: the loop implies that the consequence in turn feeds the cause.

The third contribution of this paper is to examine which dimensions of gender inequality matter the most for development. If gender inequality appears in various forms in developing countries, some of them have a higher explanatory power regarding first economic development and second human development.

To deal with potential endogeneities, this paper uses the country's ratification date of the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) and country attitudes towards gender equality as instruments for gender inequality. This paper then assumes that government's and citizen's attitudes may help determine the level of discrimination against women in daily life. After appealing to 2SLS estimation to determine the impact of gender inequality on long-run per capita income and vice versa, we turn to 3SLS to model this potential vicious circle. Lastly, we use data from 1998 and 2008 and introduce country and year fixed effects in panel regressions.

This paper proceeds as follows. SECTION II briefly presents the expected links between gender inequality and development; SECTION III then presents the data and SECTION IV the empirical framework; SECTION V presents the empirical results. Last, SECTION VI concludes.

II. The Expected Link between Gender Inequality and Development

Economists have long asked why some countries are poor and others rich, why some develop and others stagnate. Even if growth theory has blossomed, we remain unable to explain the huge differences in GDP per capita between countries. Explanations based on greater technological progress, more investment and saving, and better education, skill levels and infrastructure in developed countries leave unanswered the question of where these differences come from (WEIL [2005]). The literature is currently moving towards explaining growth gaps between developed and poor countries via factors like the social infrastructure (HALL and C. JONES [1999]), values (GUISO, SAPIENZA, and ZINGALES [2003]), trust (KNACK and KEEFER [1997]), religion (BARRO and MCCLEARY [2003]) and other aspects of culture (WEIL [2005]). These yield a better understanding of the roles, status and behaviour of this somewhat neglected to date half of the population: women.

II.1. *Gender Inequality: an Economic Cost*

The growth literature suggests that the accumulation of physical and human capital is the main determinant of economic development. The return on these assets in turn depends on both

technological progress and the efficiency of the institutional framework of production. By influencing the way in which these assets are generated, as well as technological progress and production efficiency, gender inequality matters.

II.1.1. *Gender Inequality and Productivity*

Gender inequality reduces productivity first by reducing the level and quality of human capital (DOLLAR and GATTI [1999]; KLASEN [1999; 2002; 2006]; KLASEN [2008]). Klasen's logic is the following: given a similar distribution of innate abilities between girls and boys, gender inequality in education means giving educational opportunities to boys who are less able than some girls. Gender inequality matters as it creates a distortion analogous to a distortionary tax. The average innate ability of the educated is hence lower than it would have been under gender equality. As DOLLAR and GATTI [1999]; KNOWLES, LORGELLY, and OWEN [2002] show, this distortion leads to the misallocation of educational resources which reduces a country's level and quality of human capital. Spillovers ensue, as countries with lower human capital invest less.

Moreover, women's education is highly correlated with the fertility rate which is linked to population growth (LAGERLOF [2003]). GALOR and WEIL [1996] analyse the relationship between gender inequality, fertility rates and economic development: a smaller gender wage gap, due to a higher female wages, reduces fertility by raising the cost of children more than household income, which in turn increases the level of capital per worker. In addition to the accounting logic, suggesting that the more people there are the thinner the cake slices are, evidence of a 'demographic gift' is provided by BLOOM and WILLIAMSON [1997]: the working-age population grows at a much faster rate than the dependent population, which leads to an increase in the per capita productive capacity of these economies.

Then, gender inequality affects productivity via health. For example, AINSWORTH, FRANSEN, and OVER [1998] show that the HIV infection rate is higher in towns where there is a greater gender gap in the school-enrolment rate. Violence leads to other negative consequences, whose cost is difficult to assess: lower productivity, absenteeism and so on (WORLDBANK [2012]).[2] According to A. MORRISSON and ORLANDO [1999], domestic violence is equivalent to a reduction in women's pay, corresponding to over 2% of Chile's GDP in 1996, and 1.6% of that in Nicaragua.

Finally, gender inequality affects productivity through the efficiency of asset allocation. For example, WORLDBANK [2012] claims that equal access to fertilizers and other inputs would increase maize yields by almost one-sixth in Malawi and Ghana; equal access to economic activity could increase labour productivity by as much as 25 percent in some countries by improving female workers' access to certain sectors or occupations.

Moreover, if we consider that men and women in developing countries carry out separate activities, inequality means less physical accumulation for female activities, producing a lower-quality capital stock and lower productivity. With gender inequality women's activities are

2. It is not always easy to determine the extent to which violence can be linked to gender. Violence between two men can be interpreted as a way of resolving conflicts, while violence between a man and a woman can be seen as a way of reinforcing the traditional roles assigned to gender.

under-capitalised and men's overcapitalised. This misallocation of resources creates distortions that reduce the aggregate yield and technological progress. Lower production can also come from the misallocation of resources between men and women within the household. In Cameroon, gender imbalance in the control of income is linked to different crops. Women farmers prefer to work on their small plot of sorghum, where they control the income, rather than the rice fields, where they do not. However, if these women worked in the rice fields rather than on sorghum, family income would rise by at least 6% (S. JONES [1984]). In Burkina Faso, gender inequalities within the family over the fertilizer and labour allocated to plots managed by men or women are a constant source of misunderstandings and inefficiency, reducing their productivity. This latter would rise by 6 to 20% were resources to be equally distributed between men and women. However, gender customs regarding land ownership impede improvement (UDRY [1996]).

II.1.2. *Gender Inequality and Governance*

Gender inequality could affect growth via political decisions and governance, although it can be debated to what extent this reflects purely biological differences between men and women. Nevertheless, whatever the cause of this stylized fact, we do have evidence regarding women and corruption. In general, women are more likely than men to show generosity and altruism and have a greater sense of belonging to a community (ECKEL and GROSSMAN [1996]). SWAMY *et al.* [2001] show that women are less likely than men to adopt and accept dishonest or illegal behaviour. It is shown in DOLLAR, FISMAN, and GATTI [2001] and WORLDBANK [2012] that women are less prone to corruption and nepotism than are men. CHATTOPADHYAY and DUFLO [2001] suggest that female policy makers tend to invest more in productive infrastructure which in turn promotes growth. For example, women in India invest more in time-saving infrastructure or education, and in the provision of public goods, such as water and sanitation. Empowering women as economic, political, and social actors can change policy choices (WORLDBANK [2012]). Making institutions more representative favours investment which matters more to women. Greater equality can then improve the institutional decision-process. Here, both formal and informal institutions are considered, as the latter have considerable influence in some developing regions.

II.1.3. *Gender Inequality and the Next Generation*

Finally, gender equality affects economic development in a long-run way by influencing the well-being of the next generation. A broad literature has provided evidence on the key role of mothers on children and development outcomes, namely education and health (see for example AINSWORTH, FRANSEN, and OVER [1998]; BEHRMAN *et al.* [1999]; HILL and KING [1995]; ROSENZWEIG and WOLPIN [1994]; THOMAS [1993]; THOMAS and STRAUSS [1997]).[3] Gender inequalities in employment and income reduce female bargaining power, so women have less power in decision-making within households. This implies less productive investment in the families (KLASEN and WINK [2002]), especially with respect to the health and education of

3. We do not here discuss the intra-generational transmission of values, nevertheless, this would suggest persistence or improvement in attitudes towards gender inequality.

future generations (THOMAS and STRAUSS [1997]). HODDINOTT and HADDAD [1995] show that as the share of family income attributed to the woman rises, the share of the household budget allocated to food rises dramatically, while spending on cigarettes and alcohol falls.

Considering health, gender equality reduces infant mortality and malnutrition: a 10% rise in female enrolment in primary schools corresponds to lower infant mortality equivalent to 4.1 deaths per 1,000 births; the same increase in enrolment of women at the secondary level results in a fall of 5.6 deaths per 1,000 births (HILL and KING [1995]). KLASEN [1999] shows that if SSA had the same rate of female to male enrolment as Eastern Europe, the mortality rate for children under five years old would fall by over 25% compared to the 1990 figure (167 per 1,000).

Mothers' education also affects their ability to protect their children against the adversities of life (THOMAS and STRAUSS [1992]). In Bangladesh, borrowing by women affects the enrolment of children in school and have a significant impact on food consumption (KHANDKER [1998]). As noted by BOONE [1996], autonomy is a key determinant of the relative status of women.[4] He shows that greater female autonomy leads to lower infant mortality rates. A one-point fall in the autonomy index from 4 (the lowest degree of autonomy) to 3 reduces infant mortality by 50% in countries where income per capita is $500 or less. The same implications hold in terms of education. The school achievement of mothers indicates their innate abilities which have a positive effect on those of their children and the importance the latter attach to schooling. In the United States, each additional year of mother's schooling before her child birth adds 1.6 points to the child's maths and reading scores, 2.1 points to the vocabulary score, and increased the probability of going on to higher education (ROSENZWEIG and WOLPIN [1994]). This also holds in developing countries: in India, children whose mothers are better educated study almost two hours more per day than the children of uneducated women (BEHRMAN *et al.* [1999]).

This section has briefly presented a literature review regarding the impact of gender inequality on development and highlights a paradox: existing work is unidimensional while gender inequality is multidimensional. Even though the literature covers part of this field by analysing the impact of gender inequality on a number of dependent variables, it focuses on one dimension of the phenomenon at a time. This was the main motivation for the current paper. If gender inequality appears in different forms, all of them are restrictive for one half of the population. And if each form of gender inequality negatively affects on development, what about the overall phenomenon? Does this also affect development? What happen when gender inequality appears simultaneously in a number of different forms? What is the cost in terms of economic and human development of this multidimensional phenomenon? Do all dimensions affect development? If these dimensions are highly correlated, as gender inequality reflects general attitudes towards women, when researchers consider only one dimension, do they capture the effect of that particular dimension, or rather of another? When we use composite indicators, which dimension drive the results? In order to delve further into the relationship between gender inequalities and economic performance, a composite index is needed that combines a number of dimensions of inequalities. Our contribution is thus to use a composite indicator to improve our understanding of why gender inequality is costly. This moreover allows us to evaluate which kinds of gender inequality matter the most for economic and human development.

4. Female autonomy is defined as the ability of women to lead their own lives, make decisions and have influence on projects that affect them.

II.2. *Economic Development: a Tool to Promote Equality*

As noted above, gender inequality is one of the great puzzles of modern society. In addition to "the modernization-neoclassical" approach, DOLLAR and GATTI [1999] show that economic development may reduce gender inequality. This paper adopts this logic: discrimination against women involves increasing costs as the country develops, which is an incentive to reduce it. Growth and globalization create market employment opportunities in less-developed countries, which helps women.

REES and RIEZMAN [2012] suggest that economic growth and globalization promote gender equality both directly and indirectly. First, they create market opportunities. Second, if the latter are for women, this reduces fertility and increases human-capital formation, which in turn promotes equality. Finally, globalization that produces job opportunities for women increases growth which produces a long-run steady state with higher per capita consumption than would prevail either without globalization, or with globalization that creates jobs only for men.

The persistence in gender equality is analysed in WORLDBANK [2012], noting that even if economic development reduces gender inequality, income growth by itself is not sufficient. Gender equality also depends on how markets and formal/informal institutions have evolved, how growth has played out, and how all these factors have interacted through household decisions. Economic development is one way of promoting gender equality by loosening constraints, improving market opportunities, promoting market mechanisms, and so on. Economic development itself contributes to gender equality, as households have more resources available. There is less economic pressure to discriminate against women or girls who tend to do worse in resource allocation under conditions of poverty (MIKKOLA and MILES [2007]). Empirical evidence indicates that if women, instead of men in the same household, gain more economic resources, there will be movement towards women's empowerment and equality. This suggests that economic opportunities have the potential to break down even the most deeply-ingrained cultural practices keeping women in subordinate positions.

To conclude this section, existing literature suggests a bi-directional relationship between gender inequality and economic development. Is there a vicious circle whereby two phenomena interact to produce a further deterioration in some situation? It supposes that the market failures and restricted opportunities which rule out the "fairer" sex may diminish with development. Obviously, these are not the only determinants of gender inequality. Culture, religion and traditional agricultural practices have also historically influenced gender roles and may be behind current gender inequality (ALESINA, GIULIANO, and NUNN [2011]). Nevertheless, with market failures and restricted opportunities, gender inequality may be more accepted by the women themselves.

III. Data

Data used here come from two main sources. The Multidimensional Gender Inequality Index (MGII) is used to measure gender inequalities in various dimensions. While the MGII was built in a previous paper (FERRANT [2013]), other data comes from standard sources.

It is worth to note that the model is estimated for pooled data, with two observations by country.[5] The panel estimates include two years which differ according to the dependent variable concerned due to the lag structure. When the dependent variable is economic or human development income, control and dependent variables are observed in 2000 (2010), while the interest one, the MGII, and its instruments are observed in 1998 (2008). When the dependent variable is gender inequality, control and dependent variables are observed in 1998 or 2008, while the interest one, the GDP, is an average on 1990-1998 (2000-2008).

The data used come from the PWT 6.3 (Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.3, Centre for International Comparisons of Production, Income and Prices at the University of Pennsylvania, August 2009) for GDP per capita (in 2000, 2010, average 1990-1998 and 2000-2008), average investment rates for 1990-2000 and 2000-2010, and the average population rate for 1990-2000 and 2000-2010. Second, we measure steady-state human capital by the percentage of the population attaining at least secondary school in 2000 and 2010 (World Development Indicators).

The HDI is provided by the UNDP for 2000 and 2010. It measures development by combining indicators of life expectancy, educational attainment and income into a composite index. The HDI used here is composed of data on life expectancy at birth, education (*i.e.* a combination of the adult literacy rate and school enrolment rates for primary through university years) and GDP per capita adjusted for purchasing-power parity (PPP US$).[6] The HDI is measured on a 0 to 1 scale, where higher HDI means higher human development levels.

Religious affiliation is measured as the proportion of individuals who declare themselves as practising a religion (Buddhists, Muslims, Hindus, Christians or Jews). The Freedom House Index is used for civil liberties, which measures the freedoms of expression, assembly, association, and religion. Freedom House rates civil liberties on a scale of 1 to 5, with 1 representing the most free and 5 representing the least free countries.

The CEDAW ratification date is provided by the UN. For countries that did not ratify such conventions, the variable is coded 3000. This date is transformed into a 1 to 5 scale, with 1 representing the earliest ratification and 5 no ratification.[7] Using alternatively the ratification date and the categorical variable allows us to control for this type of coding. Whatever the measure used the results are quite similar, meaning that the coding value for non-ratifier countries does not affect our estimates.

Attitudes towards gender inequality includes two questions from the World Value Survey: (i) in case of job scarce men should have more right to a job than women (WVS1) and (ii) men make better political leaders than women. Finally, geographical variables (a dummy variable for the country being landlocked and latitude) from CEPII are used.

5. Actually, the model is estimated for two years separately and then for pooled data. Only pooled data estimations are reported here for sake of brevity and as the results are quite similar. This estimation period could not be extended as the MGII is only available for 1998 and 2008.

6. It is worthy to note that HDI components have changed in 2010. Currently, HDI includes an education component measured by mean of years of schooling for adults aged 25 years and expected years of schooling for children of school entering age. Moreover, the decent standard of living component is now measured by GNI per capita (PPP$) instead of GDP per capita (PPP$). See http://hdr.undp.org/en/statistics/hdi/

7. Quantiles are used to discretize the continuous variable. 1 for ratification before 1986; 2 for ratification before 1990; 3 for ratification before 2000, 4 for ratification after 2000 and 5 for no ratification.

III.1. *The Multidimensional Gender Inequality Index (MGII)*

The first contribution of this paper is to use a composite index to measure the multidimensional phenomena of gender inequality. In addition to including various forms in which gender inequality appears, the MGII has appropriate properties to deal with the economic cost of gender inequality.

The MGII is a weighted measure of the multidimensional concept of gender inequality including eight dimensions in which gender inequality appears in developing countries.[8] As our knowledge of the relevant dimensions of gender inequality is limited, the Hague Workshop[9] aimed to identify the aspects of gender inequality which hold in different countries, regions and cultures. Researchers from a number of different countries[10] and disciplines tried to set out the main dimensions of gender inequality to be used in cross-country comparisons (WIERINGA [1997]). While no consensus arose, the MGII focuses on the following dimensions: identity, autonomy of the body, intra-family laws, political activity, education, health, access to economic resources, and economic activity.[11]

Let us describe briefly what measures each dimension, while TABLE I presents variables included in each MGII components. First, the *identity* dimension describes cultural issues such as the socialization of girls and boys, and the rigidity of the sexual division of roles. It refers to social behaviour conveyed by society and internalized by individuals in the process of socialization, via social norms. Identity constitutes an economic variable by defining the role of each individual according to his/her gender, his/her economic opportunities and the sexual division of labour (ELSTER [1989]). Second, the *autonomy of the body* dimension refers to the absence of violence against women, the control of their sexuality and access to contraception. This dimension constitutes an economic concern as a determinant of an individual's productivity, which in turn affects economic development. Third, the *intra-family laws* dimension measures gender inequality within the household in terms of the right to divorce, inheritance rights and decision-making. This dimension can be considered as a key determinant of economic opportunities in the access to social and material resources, as well as economic rights. Moreover gender inequality within families means inequality in bargaining power and therefore in decision-making. It is generally believed that women's decisions within families are more productive than men's. Finally, women's decisions encourage education and health, and therefore economic growth. Fourth, the *political activity* dimension describes political representation and decision-making which are crucial to economic opportunities, rights, power and economic growth, if women are considered as being less-inclined to corruption. Then, the *education* and *health* dimensions retain attention as productivity and human capital accumulation depends on investment in education and health. Seventh, the *access to economic resources* dimension refers to access to economic resources such as land, housing, and credit. These assets determine the economic role and the pool of possibilities of each gender. Finally, the *economic*

8. For more details on the MGII construction, see FERRANT [2013].
9. The Workshop was held at the Institute of Social Studies in the Hague (13th-18th January 1997).
10. In particular from Bhutan, Benin, Costa Rica, the Netherlands, the United Kingdom and Vietnam.
11. The last dimension put forward in this workshop was 'time', which includes relative access to leisure and sleep. Due to a lack of data, we are not able to take this dimension into account here.

activity dimension refers to the distribution of paid and unpaid work, wage differentials, formal and informal labour.

These eight dimensions are considered in the literature as the key determinants of economic development as they create distortions in the same way as a distortionary tax. Men who are less able than women have better access to education, political, social and economic resources, and the labour market, and therefore to economic opportunities. Thus productivity, capital accumulation, technological progress and the institutional framework of production are all affected by gender inequality.

Each sub-index is constructed so as to produce a summary measure of gender inequalities for each dimension as follows. First, we calculate the association between the variables included in the sub-index via Kendall Tau-B tests. Second, we standardize all variables.[12] Third, we calculate the unweighted sum of the standardized variables.[13] Finally, we rescale the sub-index so that 0 refers to low inequality and 1 to high inequality.

Multiple Correspondence Analysis (MCA) determines the weight of each dimension endogenously in the aggregated MGII. These weights describe how each dimension contributes to overall gender discrimination. The greater the weight, the more severe the dimension is for women. In MCA terms, each weight corresponds to the relative contribution to the variance of the composite indicator and is calculated as the sum of the absolute contribution to the inertia of the first axis for each modality. This contribution can be computed as a linear combination of weights associated with the principal components: the relative contribution of a modality to the first axis is equal to the square of its coordinates on this axis, divided by the eigenvalue of this axis. For each axis, the sum of the relative contributions of all of the variables equals 100 per cent.

This method of aggregation improves the index qualitatively, as the MCA minimizes the statistical bias or imperfection in the data. Second, while the objective of a composite indicator is to describe an overall trend, statistical bias and redundancy should be corrected appropriately. Using MCA allows us to extract the common features of the sub-index and the main message from them. Finally, linear indices allow for total compensation between the various forms of discrimination. However, gender inequalities correspond to the deprivation experienced by women who are affected (PERMANYER [2010]), and BRANISA, KLASEN, and ZIEGLER [2009] suggest that deprivation is a non-linear function of inequality. As such, the partial compensation – so that more inequality in one dimension can be only partially offset by less inequality in another dimension – provided by non-linear indices is to be preferred.[14]

12. Standardization means subtracting the mean and dividing by the standard deviation for continuous variables. The results from an ordered probit model are used to standardize the categorical variables.

13. The weights given by PPCA for sub-index construction do not differ from $1/n$, where n is the number of variables included in each sub-index.

14. The quadratic form is justified by: 1) the partial-compensation requirement; 2) our wish to obtain a measure that is sensitive to the distribution of values between dimensions; and 3) an aversion to particularly low values of the indices used in each dimension. This quadratic form is analogous to a parameter ε which reflects the degree of aversion in terms of gender inequality (BRANISA, KLASEN, and ZIEGLER [2009]; PERMANYER [2010]). Moreover, the value of 2 used here is easily interpretable, yielding square functions. Finally, this aggregation rule satisfies the requirements of the axiomatic of inequalities: 1) the MGII is a normalized, weighted sum of equality shortfalls, where a value of zero can be thought of as a goal and the distance from zero describes the extent of gender inequality (deprivation is precisely the shortfall in equality); and 2) the value of 2 satisfies both the transfer principle and the transfer-sensitivity principle (BRANISA, KLASEN, and ZIEGLER [2009]).

TABLE I. – Data Definitions and Sources

Dimension	Data name	Definition	Data source	Year
Identity	MAR	% of ever-married women over that of men (age: 15-19)	WISTAT.4 UN	1996; 2006
	WSOC	CV measuring gender inequality in social rights	CIRI Human rights	1997; 2008
	MOVE	CV measuring gender inequality in the freedom to move outside the home	GID OECD	1998; 2008
Autonomy of the Body	VIO	% of women who are beaten by their partners	GID OECD	1998; 2008
	MUT	% of genital mutilation	WISTAT.4 UN	1996; 2006
	SECU	CV measuring physical security of women included the existence of laws against domestic violence, rape and sexual assault, murder and honour killings	WISTAT.4 UN	1996 ; 2006
	CONTRA	% of women who have access to contraception	WISTAT.4 UN	1996; 2006
	ADO	Fertility rates of adolescent (births per 1,000 women aged 15-19)	WB	1998; 2008
Intra-Family Law	AUTH	CV measuring gender inequality in parental authority in legal and customary practices regarding the legal guardianship of a child during a marriage and after divorce	GID OECD	1998; 2008
	FAM	CV measuring gender inequality in family law (marriage, divorce and filiation legal conditions)	WISTAT.4 UN	1996; 2006
	INHER	CV measuring gender inequality in inheritance	GID OECD	1998; 2008
Political Representation	MINI	% of women in ministerial posts	WISTAT.4 UN	1998; 2006
	LEGI	% of women legislators	WISTAT.4 UN	1998; 2006
	WPOL	CV measuring gender inequality in political rights	CIRI Human rights	1997; 2008
Access to Education	PRIM	Ratio female / male in primary-school enrolment rates	WISTAT.4 UN	1998; 2006
	SEC	Ratio female / male in secondary-school enrolment rates	WISTAT.4 UN	1998 ; 2006
	TER	Ratio female / male in tertiary-school enrolment rates	WISTAT.4 UN	1998; 2006
	LIT	Ratio female / male in literacy rates	WISTAT.4 UN	1998; 2008
	TEACH	% of female teachers	WISTAT.4 UN	1996; 2008
Access to Health	LEXP	Ratio of female / male life expectancy	WISTAT.4 UN	1995-2000; 2005-2008
	MISS	Missing women	GID OECD	1998; 2008
Access to Economic Resources	LAND	CV measuring gender inequality in access to agricultural land	GID OECD	1998; 2008
	LOANS	CV measuring gender inequality in access to credit	GID OECD	1998; 2008
	PROP	CV measuring gender inequality in access to real property other than agricultural land	GID OECD	1998; 2008
Economic Activity	WECO	CV measuring gender inequality in economic rights	CIRI Human rights	1997; 2008
	POP-ACT	Female share of active population	WISTAT.4 UN	1998; 2008
	ACTI	Ratio of female/ male activity rates	WISTAT.4 UN	1998; 2008
	TECH	% of female in technical managerial and administrative positions	WISTAT.4 UN	1998; 2008
	UNPAID	% of female unpaid family workers	WB	1996-1998; 2005-2008
	EARN	Ratio of female / male earned income	WISTAT.4 UN	1995-2000; 2005-2008

The column "Years" indicates the years for which the variables are available for the construction of the MGII in 1998 and 2008, respectively. CV for a categorical variable and % for a percentage; WISTAT: the Women's Indicators and Statistics Database of the United Nations; CIRI: Cingranelli-Richards Human Rights Data; WB: World Bank Development Indicators; UN: United Nations; and GID: Gender Development and Institutions. WSOC includes the right to enter into marriage on a basis of equality with men, to travel abroad, to obtain a passport, to confer citizenship to children or a husband, to initiate a divorce, to participate in social, cultural and community activities, and to choose a residence/domicile. MOVE measures the freedom of women to move outside the home without a male guardian, including freedom to travel, freedom to join a club or association, freedom to do the groceries (and other types of shopping) and freedom to see one's family and friends outside without a male guardian. WPOL includes equal rights to vote, run for political office, hold elected and appointed government positions, join political parties, and petition government officials. WECO includes the right to equal pay for equal work, free choice of profession or employment without the need to obtain husband's or male relative's consent, right to gainful employment without the need to obtain husband's or male relative's consent, equality in hiring and promotion practices, job security (maternity leave, unemployment benefits, no arbitrary firing or lay-offs, and so on), the right to work at night, the right to work in occupations classified as dangerous, and the right to work in the military and the police force.

The MGII is:

$$\begin{aligned} MGII = {} & 0.181\ \text{Family}^2 + 0.156\ \text{Identity}^2 \\ & + 0.156\ \text{Health}^2 + 0.146\ \text{Economic Resources}^2 + 0.118\ \text{Education}^2 \\ & + 0.116\ \text{Autonomy of body}^2 + 0.068\ \text{Economic activity}^2 \\ & + 0.06\ \text{Political representation}^2 \end{aligned} \quad (1)$$

A growing literature criticized existing gender-specific measures which include female absolute level of well-being. They do not measure gender equality as such, because they compute some combination of absolute levels of achievement and a penalty for inequality (DIJKSTRA and HANMER [2000]; KLASEN [1999]). For these reasons, the MGII is a relative measure including only variables that measure the gap between male and female situations. Hence, in the following regression, we focus on inequality instead of absolute female well-being. First, the latter could capture country characteristics that are not related with inequality issues. As poverty and income inequalities vary widely across countries, absolute female situation could capture country ability to provide public goods or infrastructure. For example, richer countries provide better standard of living which leads to higher life expectancy levels for both men and women than in poorer countries. Comparing female life expectancy across countries would result in comparing country health provision instead of comparing gender equality in access to health. Second, as 60% of the poor are female, variables measuring absolute female well-being could capture income and poverty effect, which are not the purposes of the paper.

III.2. *Descriptive Statistics*

We sample 109 countries for which we could observe all interest variables, *i.e.* the GDP, the HDI and the MGII, for the two years concerned.[15] TABLE II presents mean income per capita and its determinants in the whole sample and by region for the first year considered. Standard deviations in parentheses reflect the dispersion within the sample or sub-samples. All development levels are considered, as GDP per capita in 2000 was $5,723 on average for the whole sample, $12,692 for MENA countries and $2,229 for Sub-Saharan Africa. Region is not a good proxy for development since there is considerable variability within regions. Furthermore, there are various different ways of accumulating economic assets. The investment rate varies between 22.40% and 10.57% according to region, with an average figure of 15.75%. The last row shows the HDI around the world. The correlation between economic and human development is high (0.9274), as GDP per capita is one component of the HDI. As the HDI ranges between 0 and 1, the standard deviation of 0.17 shows there is great variation between countries. LAC countries have the highest level of human development, with a mean of 0.76, and are the most homogeneous with a standard deviation of 0.064, while Sub-Saharan African countries are "the least developed" and the most heterogeneous.

The descriptive statistics allow a preliminary analysis of gender inequality around the world. TABLE III presents average MGII scores for the developing sample, and by region and

15. TABLE D.1 in appendix listed the 109 countries included in the sample and their income group.

TABLE II. – Descriptive Statistics by Region in 2000

	All	EAP	LAC	SSA	MENA	SA	ECA
GDP	5,722.86 (6,854.31)	6,285.7 (8,347.76)	7,208.255 (3,650.06)	2,530.83 (2,864.16)	12,692.18 (1,2142.38)	2,228.66 ((1,187.76)	5,686.56 (3,913.75)
INV	15.75 (9.08)	19 (10.37)	22.4 (8.2)	10.57 (6.56)	14.60 (7.65)	19.66 (11.79)	17.25 (7.82)
POP	0.7 (0.1)	0.07 (0.06)	0.066 (0.007)	0.077 (0.016)	0.076 (0.119)	0.071 (0.0119)	0.051 (0.01)
EDU	27.17 (18.16)	27.15 (17.73)	26.66 (11.45)	20.7 (17.5)	24.55 (11.1)	20.27 (13.93)	60.77 (8.88)
HDI	0.63 (0.17)	0.68 (0.13)	0.76 (0.064)	0.48 (0.13)	0.73 (0.12)	0.57 (0.1)	0.75 (0.06)
Obs.	109	13	21	37	17	7	14

Standard deviations in parentheses. EAP refers to East Asia and the Pacific, LAC to Latin America and the Caribbean, SSA to Sub-Saharan Africa, MENA to the Middle East and North Africa, SA to South Asia and ECA to Europe and Central Asia.

TABLE III. – MGII Around the World in 1998

MGII	Obs	Mean of MGII	Std. Dev.	Min	Max
Developing	109	0.33	0.26	0.004	0.975
EAP	12	0.17	0.11	0.034	0.392
LAC	21	0.09	0.05	0.027	0.264
SSA	39	0.48	0.21	0.021	0.869
MENA	16	0.48	0.18	0.156	0.886
SA	7	0.63	0.28	0.213	0.975
ECA	14	0.08	0.05	0.004	0.164
Muslim	40	0.5	0.25	0.034	0.975
Hindu	4	0.42	0.33	0.114	0.751
Buddhist	9	0.14	0.08	0.043	0.272
Christian	76	0.18	0.21	0	0.669

EAP refers to East Asia and the Pacific, LAC to Latin America and the Caribbean, SSA to Sub-Saharan Africa, MENA to the Middle East and North Africa, SA to South Asia and ECA to Europe and Central Asia.

religion.[16] The MGII scores vary from 0.016 (Belarus) to 0.975 (Afghanistan), with an average of 0.28 in 1998, and from 0.009 (Serbia) to 0.96 (Chad) with a mean of 0.24 in 2008. The standard deviation shows the wide range of gender inequality between the countries under consideration. Moreover, development (as measured by GDP per capita) is highly correlated with gender inequality (with a correlation coefficient of -0.66). FIGURE 1 presents MGII per income group.[17] The correlation is confirmed as the higher income group has a lower MGII score, except for MENA countries, which seem to be particular in this respect.

16. Here the majority religion is used.

17. Income group: Economies are divided according to 2008 Gross National Income (GNI) per capita, calculated using the World Bank Atlas method. The groups are: low income, $975 or less; lower-middle income, $976 - $3,855; upper-middle income, $3,856 - $11,905; and high income, $11,906 or more. Source: the World Bank.

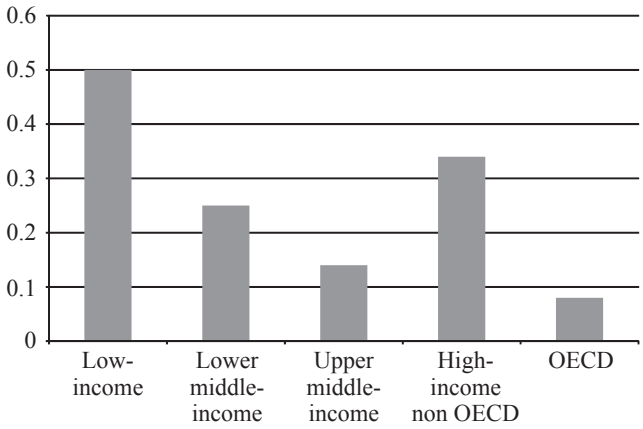

FIGURE 1. – MGII by Income in 1998

FIGURE 2 also attest to a negative correlation between gender inequality and development. FIGURE 2 presents the boxplot for average GDP per capita (in logs) and HDI between 2000 and 2010, according to their average level of gender inequality between 1998 and 2008. The MGII distinguishes countries where gender inequalities are relatively low (0), medium (0.5) or high (1). For the most equal countries of our sample, the median GDP as well as the median HDI are significantly higher than for others country groups. There is a negative correlation between gender inequalities and development: the higher the MGII the lower the GDP and HDI medians. It is also interesting to note that highly unequal countries are characterised by outliers. Those countries[18] are particular as they are associated with high gender inequalities and high GDP. However, it is worth to note that such countries are not identified as outliers when considering human development. It suggests those countries have high GDP per capita but medium life expectancy scores and literacy rates relatively to other countries in the sample. Moreover, observing the minimum and the maximum of each box suggests that the richer and the most "developed" countries are also the most equal, while the poorer and the "least developed" are also the least equal. Finally, the HDI boxplot indicates that the more equal country group is homogeneous, while the less equal one is heterogeneous. It implies that other variables could explain the low level of human development.

Finally, TABLE IV presents the attitudes toward gender inequality used as instruments for the MGII. The first one asks if in case of job scarcity men should have more right to a job than women. On average, 47% in 1998 and 45% in 2008 of the respondents agree, while 40% disagree. The second one asks if men make better political leaders than women do. In 1998, almost 60% of the respondents agree versus 55% in 2008. Surprisingly, female respondents do not differ from the male point of view. The public attitude is highly correlated with both, level of gender inequality measured by the MGII and the ratification date of the CEDAW. It suggests that these country features could be good proxies for gender inequality.

18. i.e MENA countries classified as high-income non-OECD countries by the World Bank (See TABLE D.1).

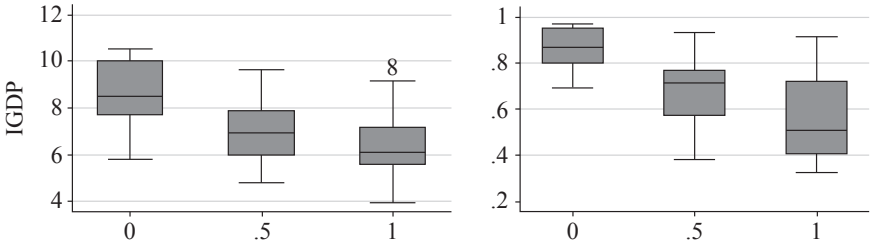

FIGURE 2. – GDP and HDI by MGII Tertiles

TABLE IV. – Attitudes Towards Gender Inequality

		1998	2008
Jobs scarce: Men should have more right to a job than women (WVS1)	Agree	46.90%	45.10%
	Disagree	40.70%	40.30%
	Neither	12.40%	14.60%
Men make better political leaders than women do (WVS2)	Agree	58.30%	55.60%
	Disagree	41.70%	44.40%

Source: World Value Survey.

IV. Empirical Framework

We aim to test three hypotheses: (i) there is a vicious circle between gender inequality and economic development; (ii) gender inequality hinders human development; (iii) some dimensions drive these relationships between gender inequality and development. Economic development is measured by GDP per capita instead of growth rate first, because the level captures differences in long-run economic performance that are most directly relevant for welfare issues (HALL and C. JONES [1999]). Second, EASTERLY *et al.* [1993] documented the relative low correlation of growth rate across decades which suggests that differences in growth rate across countries may be mostly transitory. Human development is measured by UNDP's Human Development Index (HDI). The empirical framework is based on three equations. Equations (2) and (3) describe the feedback between gender inequality and income per capita, while equation (5) describes the impact of gender inequality on human development. Using the same set-up, the impact of each sub-component of the MGII on economic and human development can be analysed.

IV.1. *Gender Inequality and Economic Development*

IV.1.1. *The Influence of Gender Inequalities on Income*

The growth model augmented by human capital developed by MANKIW, ROMER, and WEIL [1992] was widely used as empirical specification in the growth literature (BARRO [1991]; BARRO and SALA-I MARTIN [1995]; BAZILLIER [2008]; MANKIW, ROMER, and WEIL [1992]; MURDOCH and SANDLER [2002]): income per capita regression includes a number of structural factors, that are investment rate, population growth rate, initial income and human capital.

Here, instead of using a reduced form equation in which proximate determinants of long run income per capita are omitted from regressions, both investment rate, the level of human capital and population growth rate are included. The growth literature provided evidence regarding their significant explanatory power: high investments in capital and human capital are associated with higher income per capita, while population growth dampens it (BARRO [1991]; BARRO and SALA-I MARTIN [1995]; KLASEN [1999; 2002]; MANKIW, ROMER, and WEIL [1992]; SEGUINO [2000]).

Following both, the theoretical and the empirical literature, the model included population growth as determinant of long-term income level. TAYLOR [1998] emphasized that population growth may have a direct impact on economic growth and also influence economic growth through its impact on the investment rate or the accumulation of human capital. Moreover, BANK [1997] has found that high population growth depressed per-capita growth in Sub-Saharan Africa by 0.7% per year between 1965 and 1990. They highlighted the key role of population growth in determining long-term income level as this factor alone accounted for about 15% of the difference in growth performance between Sub-Saharan Africa and South-East Asia. Similarly, BLOOM and WILLIAMSON [1997] results attest the existence of a "demographic gift": early fertility transition in East and South-East Asia is an important contributing factor in accounting for East Asia's economic miracle.

Population growth is included as regressors instead of growth rate of active population, because four mechanisms explain the demographic impact on economic development, including the effect of labour force growth (KLASEN [1999]). First, population growth is largely correlated with fertility rates and the dependency burden, which influences the level of savings in an economy. Second, the increasing workforce, as a result of previous high population growth, boosts investment that promote economic development in a context of increased domestic savings or capital inflows. Third, it could also increase incomes through higher wages, if this increased workforce is absorbed in increased employment. In that case, more workers have to share their wages with fewer dependants, thereby boosting average per capita incomes.[19] Fourth, LAGERLOF [2003] suggests that population growth through fertility impacts economic development mainly via human capital investments for the next generation.

The influence of gender inequalities on per capita income is estimated using the following equation:

$$GDP = \beta_0 + \beta_1 inv + \beta_2 pop + \beta_3 edu + \beta_4 MGII + \beta_5 trade + \beta_6 rule + \beta_7 region + \beta_8 GDP_{90} + \beta_9 lat + \beta_{10} land + \delta_c + \phi_t + \varepsilon_1 \quad (2)$$

where *GDP* is the GDP per capita adjusted for purchasing power parity, *inv* is the fraction of income invested in physical capital,[20] *pop* is the rate of population growth, *edu* the level of human capital, *MGII* our composite indicator of gender inequality, δ_c and ϕ_t the country and year fixed effects and ε the error term.[21]

19. This is referred to by BLOOM and WILLIAMSON [1997] as a "demographic gift".
20. It is worth to note that the initial capital stock is not included in equation (2), as that is proxied by the level of GDP per capita in 1990.
21. Note that all variables are considered in logs.

The other regressors include additional controls such as the degree of openness (trade), a rule of law indicator (rule), regional dummies (region) and geographic variables (the latitude (lat) and a dummy if the country is landlocked). Indeed, the growth literature emphasizes their key role in the story. For example DIAMOND [1997]; SACHS and WARNER [1997], among others, show how geography impacts on the income per capita level as a key determinant of the climate, natural resources endowment, health quality, agricultural productivity, etc. On the other hand, DOLLAR and KRAAY [2004]; FRANKEL and ROMER [1999], for example, provide evidence regarding the significant impact of trade and openness on economic development. RODRIK, SUBRAMANIAN, and TREBBI [2004] highlight the primacy role of institutions quality. Finally, the log GDP per capita in PPP in 1990 (log GDP_{90}) to control for initial production characteristics, as the initial capital stock for example.

A short lag structure is used as gender inequality influence is not contemporaneous. More precisely, in panel estimates of Equation (2), two years are included where the GDP per capita in 2000 (2010) is a function of the MGII in 1998 (2008, respectively).

As a last step to understand what is driving the results, Equation (2) is estimated using each sub-index of the MGII instead of the total MGII. This allows us to explore which dimensions of gender inequality have the greatest impact on income per capita. A two-step procedure is adopted to do so. We first run the regressions with the individual sub-indices one at a time. All of the sub-indices which were significant singly are then included simultaneously in the regression.

IV.1.2. *The Influence of National Income on Gender Inequalities*

In a second step, Equation (3) estimates the impact of income per capita on gender inequality using OLS and 2SLS:

$$MGII = \gamma_0 + \gamma_1 Cedaw + \gamma_2 att_1 + \gamma_2 \text{ att}_2 + \gamma_4 GDP + \gamma_5 rel + \gamma_6 civil + \eta_c + \mu_t + \varepsilon_2 \quad (3)$$

where *Cedaw* includes the ratification date or five dummies for CEDAW ratification, alternatively[22] and *att* the attitudes toward gender inequality, while η_c and μ_t are the country and year fixed effects, respectively.

In Equation (3), when running the regressions explaining the MGII, I used lagged GDP (average GDP of 1990-1998) as influence is not contemporaneous. More precisely, in panel estimates of Equation (3), two years are included where the MGII in 1998 (2008) depends on the average GDP per capita in 1990-1998 (2000-2008).

Religion (rel) and civil liberties (civil) are used as control variables. DOLLAR and GATTI [1999] and BOONE [1996] ask if gender inequality reflects different social or cultural preferences regarding gender roles. BOONE [1996] estimates gender inequality measured by an index of women's legal rights from HUMANA [1999], and finds that religious preference is useful in explaining gender inequality. As such, gender inequality in education can to some extent be explained by religious preferences and societies' underlying characteristics, such as the degree of civil liberties (DOLLAR and GATTI [1999]).

22. The results do not differ between these two CEDAW variables.

When running MGII regression by 2SLS estimation, income per capita is instrumented by geographical characteristics, namely latitude, and a dummy for the country being landlocked. As explained previously, a wide literature has considered geography as a key determinant of economic growth (DIAMOND [1997]; GALLUP, MELLINGER, and SACHS [1998]; SACHS and WARNER [1997]). For example, SACHS and WARNER [1997] argued for a direct effect of climate and access to the sea on economic performances. GALLUP, MELLINGER, and SACHS [1998] and HALL and C. JONES [1999] document the correlation between distance from the equator and long-term income per capita. The significant effect of geography remains even if we control for institutions quality ACEMOGLU, JOHNSON, and ROBINSON [2001]; RODRIK, SUBRAMANIAN, and TREBBI [2004][23]

IV.1.3. *Gender Inequalities and Income: A Vicious Circle*

In a third step, feedback is tested. To deal with the simultaneity problem and the correlation between ε_{gdp} and ε_{mgii},s a 3SLS (Three Stage Least Squares) estimator is used. The system (4) includes Equations (2) and (3), where all model parameters are jointly estimated:

$$\begin{cases} GDP = \beta_0 + \beta X + \beta_4 MGII + \beta_9 lat + \beta_{10} land + \delta_c + \phi_t + \varepsilon_4 \\ MGII = \gamma_0 + \gamma_1 CEDAW + \gamma_2 att_1 + \gamma_2 att_2 + \gamma_4 GDP + \gamma Z + \eta_c + \mu_t + \varepsilon_5 \end{cases} \quad (4)$$

where X includes the investment share, the population growth rate, the level if human capital, the degree of openness, the rule of law indicator, the log of GDP per capita in PPP in 1990 and regional dummies as control variables, while Z includes religion and civil liberties as control variables. To resume, the mechanisms hypothesized in this paper are the following: average GDP 1990-1998 (2000-2008) $\rightarrow$ Gender inequalities: MGII 1998 (2008) $\rightarrow$ GDP 2000 (2010).

Some worry could rise about the validity of cross-section regression. GHALI and AL-MUTAWA [1999] considers the relationship between fixed-capital formation and economic development, due to the contradictory results in the existing literature. Empirically the causal pattern is found to vary widely between countries, raising questions about the validity of a cross-country regression in which varying estimated values are reduced to a common mean. They conclude that causality is country-specific, and may run in either direction. Accounting for potential heterogeneity bias and vicious circles should reduce our worries about the validity of cross-section regressions. Moreover, BECK, DEMIRGUC-KUNT, and LEVINE [2005] show that if we control for country-specific characteristics we can garner useful information from them. Cross-section regressions can then be considered as a starting point for the estimation of the relationship between gender inequality and development. Adding country-specific characteristics and accounting for both causality directions is one way of then alleviating doubts about their validity.

Therefore, to deal with unobserved heterogeneity, country (δ_c, η_c) and year fixed effects (ϕ_t, μ_t) are included.[24] Fixed-effect estimation explores the relationship between gender inequality

23. This is relevant as HALL and C. JONES [1999] argues that "good" institutions are correlated with the "Western influence".

24. It is worthy to note that country and year fixed effects refer to sets of dummies: 109 country dummies and 2 year dummies.

and the outcome variables within a country. We here assume that some within-country variables (observed and unobserved) may impact or bias the predictor or outcome variables. This is the rationale behind the assumption of a correlation between the country's error term and the MGII. Adding country-fixed effect removes the effect of those time-invariant characteristics from the predictor variables, so we can assess the predictors' net effect. Fixed effect models allow us to control for year-specific characteristics as well, as one particular year could drive the results.[25]

IV.2. *Gender Inequality and Human Development*

We now estimate the impact of gender inequality on human development, measured by the well-know Human Development Index (HDI) (see Equation (5)). This composite index is a frame of reference for both social and economic development which measures the average achievements of a country in a long and healthy life, access to knowledge and a decent standard of living.

The same strategies are used: OLS and 2SLS are estimated on 1998 and 2008 simultaneously with country and year fixed effects (ν_c and ζ_t). A short lag structure is used as gender inequality influence is not contemporaneous. More precisely, in panel estimates of Equation (5), two years are included where the HDI in 2000 (2010) is a function of the MGII in 1998 (2008). Finally, Equation (5) is estimated using each sub-index of the MGII instead of the total MGII.

$$HDI = \varphi_0 + \varphi_1 MGII + \varphi_2 gov + \varphi_3 inv + \varphi_4 trade + \varphi_5 rule + \varphi_6 region + \nu_c + \zeta_t + \varepsilon_3 \quad (5)$$

where region is regional dummies, ν_c and ζ_t the country and year fixed effects, respectively and ε the error term.

Equation (5) includes four sets of control variables, which reflect economic policies aiming to improve human development (BINDER and GEORGIADIS [2010a]). First, government consumption per capita (*GOV* in logs) measures fiscal policies and incentives to improve the quality and the quantity of education and health. Second, the investment (private and public) rate reflects policy incentives for private-sector saving and investment and government's willingness to invest in infrastructure (*INV*). This investment in infrastructure leads in turns to improve life expectancy and education components of the HDI, by improving the quality and quantity of health and education services. Third, policy incentives to stimulate international trade are reflected in the logarithm of per capita imports and exports (*TRADE*). There is little doubt that trade openness could be a powerful source of economic growth (DOLLAR and KRAAY [2004]; FRANKEL and ROMER [1999]). Beyond its direct benefits for human development through improving income per capita, trade has also an indirect effect. It could affect government and

25. Another important assumption of the fixed-effect model is that the time-invariant characteristics are unique to the country and should not be correlated with other characteristics. Each country is different therefore the country's error term and the constant (which captures country characteristics) should not be correlated with the others. If the error terms are correlated then the fixed effect model is unsuitable since inferences may be incorrect and the relationship needs to be modelled; this is the main rationale for the Hausman test. Therefore, I also used random-effects. Nevertheless, the Hausman test suggests that the fixed effect model is preferred. With four degrees of freedom, the χ^2 is 73.25 and 76.03 for the GDP and HDI regressions respectively. For both, the tests confirm that unique errors are correlated with the regressors, and that fixed-effect models are preferred. Even if fixed effect models in a panel with only 2 time series observations could lead to inconsistent results, it is important to control that the results are not driven by country or year-specific characteristics.

household incomes and increase employment, which lead to higher public and private spending on education and health. BINDER and GEORGIADIS [2011] show that increased trade openness also has positive long-horizon effects on the HDI. In addition to its impact on economic growth, trade also influence others components of the HDI, since it is viewed as a transmission mean of new ideas, new technology and best practices. (BALIAMOUNE-LUTZA and BOKOC [2013]) investigate whether trade and institutions contribute to human development beyond their effects through income. They find a statistically significant association between trade and life expectancy, literacy and income.

Last, the rule of law index captures the government's ability to implement these policies (*RULE*).[26] BINDER and GEORGIADIS [2011] provide evidence that strong scores on quality of governance strengthen the long-run development effects both of investment in physical capital and of trade, both for HDI and GDP. In BINDER and GEORGIADIS [2010b], the authors show the significant impact of institutions on human development.

IV.3. *Instruments for Gender Inequality*

The MGII's instruments have to be a key determinant of gender inequality but have no direct effect on economic development. We introduce citizen and government attitudes toward gender inequality as instrument. The first one is measured by the proportion of respondents that agree that in case of job scarcity, men should have more right to a job than women and that men are better political leaders than women. The second one is measured by the ratification date of the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW). Countries ratifying the CEDAW recognize the legitimacy of reducing gender inequality. This ratification leads to changes in government behaviour toward gender inequality, which in turn influences collective and individual behaviour. Early ratification can be considered as showing greater sensitivity to this issue.

Good instruments often come from policy changes. CEDAW ratification meant that countries pledged to respect its terms, notably to transcribe its terms into national policy. In addition to being an international statement of women's rights, the convention also sets out an action program for the countries which have ratified it to guarantee the implementation of these rights. By ratifying the Convention, countries commit themselves to undertake a series of measures to end discrimination against women in all forms, including incorporating the principle of gender equality in their legal system, abolishing all discriminatory laws and adopting appropriate ones prohibiting discrimination against women; establishing tribunals and other public institutions to ensure the effective protection of women against discrimination; and ensuring elimination of all acts of discrimination against women by persons, organizations or enterprises. The implementation of the Convention is monitored by the Committee.

The government commitment induces change in attitudes towards gender inequality. The level of gender discrimination and the prevalence of these practices will also depend on their legality. Policies can make a difference via legal reform. Harmonization, full implementation and enforcement of laws to guarantee equality and protection from harmful practices, provision

26. See BINDER and GEORGIADIS [2010a] for a review of some of the theoretical growth literature discussing the mechanisms through which these control variables may affect the level of human development.

of judicial training, legal services and so on can explain the level of gender inequality. For example in 2007, Venezuela enacted a law prohibiting rape, spousal rape, domestic violence and sexual harassment, which not only includes punishment and prosecution but also requires that the authorities implement a program to raise awareness and change attitudes. The law led to a steep increase in recorded complaints of violence against women in the country. This means that attitudes towards violence against women had changed. The CEDAW denounced the prevalence of early marriage in some countries. Many countries have thus changed this legal age which in turn has reduced the prevalence of such practices: the average prevalence of early marriage across developing countries has decreased to 17% in 2012 from 21% in 2009 (CERISE, FERRANT, and GAGNON [2012]).

This paper considers the citizen and government attitudes toward gender inequality as a cause of the level of gender inequality. Second, the exogeneity of GDP per capita is rejected by the Wu-Hausman test at the 5% level.[27] Third, the validity (i.e $Cov(CEDAW, \varepsilon_g) = 0$) and the relevance (i.e $Cov(CEDAW, MGII) \neq 0$) of these instruments are tested. These instruments are correlated with the endogenous variable, the MGII. Simple estimation of the MGII including additional controls and instruments result in a relatively high partial R. An F-test is used to check that instrumental regressions are not null. The F-statistic is always higher than 0.10, suggested by the rule of thumb (STOCK and YOGO [2002]). Finally, the Sargan test does not reject the validity of our instrument sets (See TABLES V and VI).

Exogeneity of the instrument set is hard to test. In income regressions, there is no evidence of correlation between errors and our instruments. We do not reject the null hypothesis that the coefficients are equal to zero when we regress the residuals. Exogeneity supposes that the influence of attitudes on economic and human development is only indirect via gender inequality. Another question arises about the exogeneity of these instruments: do richer countries ratify the CEDAW before poorer ones? do richer countries disagree with unequal statements? There is no evidence on this. Richer countries are characterised by lower levels of gender inequality but it is not a reason that they accept less unequal situation. Finally, when running GDP regressions, the coefficient of these three instruments becomes insignificant when the MGII is added.

V. Empirical Results

V.1. *A Vicious Circle between Gender Inequalities and Economic Development*

To analyse the relationship between gender inequality and economic income per capita we use a number of different estimators (OLS, 2SLS and 3SLS) and specifications (for pooled data, with country and/or year fixed effects). TABLE V presents the estimated effect of gender inequality on GDP, and TABLE VI the impact of GDP on gender inequality, using OLS and 2SLS on pooled data in turn.[28] OLS estimations (columns (1) - (3) of TABLES V and VI) suggest a negative relationship between gender inequality and income per capita in all specifications. Including additional controls or country and/or year fixed effects does not change the result:

27. The Durbin-Wu-Hausman score is 5.6 with a p.value of 0.018. Under the null hypothesis, GDP per capita is exogenous.

28. 109 countries are included in the sample, however, only 100 are used in the IV regressions due to lack of information about instruments used.

multidimensional gender inequality hinders economic development, and lower income per capita is linked to less equality.

The MGII coefficients in GDP estimation are fairly stable (between −0.352 and −0.386). The control variables have the expected signs: more investment in physical and human capital improves economic development, while greater population growth reduces GDP per capita. The coefficient on lagged GDP (log GDP per capita in PPP in 1990) confirms the significant role of initial production characteristics. Surprisingly, only gender inequality and investment in physical capital remain significant when we add the country and year fixed effects.

In the MGII estimates reported in TABLE VI, the coefficients on GDP are always negative and significant, varying between −0.096 and −0.203. Whatever the religion, as more people claim to belong to the largest religious group gender inequality increases. Nevertheless, this effect is no longer significant when we add country fixed effects. The civil liberties sub-index seems to be highly correlated with gender inequality in all specifications. Finally, citizen and government attitudes toward gender inequality are significantly associated with the level of gender inequality. On one hand, the more citizens accept gender inequality, the higher is the MGII; and on the other hand, the earlier the country ratified the CEDAW, the lower is the MGII. It means that the later the ratification the greater the inequality. The intuition is that early ratification signals the positive government attitudes towards gender equality. The ratification implies implementation of laws and practices which promotes equality and reduce the MGII level. It is claimed in WORLDBANK [2012] that when economic development is well redistributed, incomes increase and budget constraints are relaxed. This implies fewer restrictions for the household and therefore for women and girls. Nevertheless, this effect depends on how economic development comes about. This could explain why the GDP coefficient increases when we add country fixed effects, which captures the way in which economic development is redistributed within the country.

Parameter tests reject the null hypothesis that all of the country or year coefficients jointly equal zero. Therefore country-and year-fixed effects are required to control for unobserved heterogeneity. The results seem to be robust to their introduction[29], so our results are not driven by country or year specificities.

The 2SLS estimations (columns (4), (5) and (6) of TABLES V and VI) deal with endogeneity. The OLS estimations confirm this reverse causality. Furthermore, omitted variables could bias the results by explaining both development and gender inequality. For example, return migration exerts considerable influence on the migrants' countries of origin. Migration is a powerful way of transmitting ideas across borders (SPILIMBERGO [2009]). When emigrants return, they bring back cultural values from the host country. Return migration could thus affect attitudes towards gender inequality. The sign of this influence will depend on the host country. While Egyptians migrate predominantly towards other Arab countries which are characterised by high gender inequality, West Africans migrate more towards European countries where gender inequality is relatively lower (see FERRANT [2013]). Migration may influence education investment (BEINE, DOCQUIER, and RAPOPORT [2001]), economic and human development.

29. The results using random effects are not presented as the Hausman test confirms that the fixed-effect model is preferred.

TABLE V. – OLS and 2SLS Specifications for Economic Development

	(1) OLS	(2) OLS FE	(3) OLS FE	(4) IV	(5) IV FE	(6) IV FE
Panel A. Second-stage: Dependent variable = GDP per capita (log)						
MGII	−0.352**	−0.386***	−0.363***	−0.193***	−0.239***	−0.204***
	(0.148)	(0.141)	(0.138)	(0.078)	(0.096)	(0.070)
GDP_{90}	−0.123**	−0.145**	−0.166**	−0.231***	−0.198***	−0.179**
	(0.0534)	(0.0632)	(0.0691)	(0.085)	(0.0701)	(0.0702)
Investment	0.005	0.013***	0.014***	0.008*	0.01	−0.020
	(0.004)	(0.004)	(0.005)	(0.004)	(0.008)	(0.014)
Population growth	−0.219***	0.005	0.011	−0.241***	−0.062	0.111
	(0.027)	(0.024)	(0.017)	(0.033)	(0.05)	(0.099)
Human Capital	0.009***	0.004**	0.001	0.011***	0.012***	−0.014
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.009)
Constant	7.428***	7.181***	8.018***	7.062***	8.153***	11.366***
	(0.175)	(0.18)	(0.156)	(0.331)	(0.408)	(1.247)
Observations	218	218	218	200	200	200
R-squared	0.85	0.59	0.52	0.84	0.99	0.84
Country Fixed effects	No	Yes	Yes	No	Yes	Yes
Year Fixed effects	No	No	Yes	No	No	Yes
Panel B. First-stage for endogenous variable: Dependent variable = MGII (log)						
Hindu proportion				0.018***	0.023**	0.024**
				(3.43)	(2.31)	(2.36)
Muslim proportion				0.016***	0.012**	0.012**
				(3.09)	(2.97)	(2.89)
Civil liberties 2				1.453***	1.360***	1.369***
				(3.27)	(3.22)	(3.24)
Civil liberties 3				2.694***	2.534***	2.523***
				(6.14)	(6.05)	(6.02)
Civil liberties 4				3.547***	3.198***	3.225***
				(8.19)	(7.51)	(7.57)
Civil liberties 5				3.557***	3.060***	3.114***
				(8.47)	(7.07)	(7.15)
WVS1				0.362***	0.355***	0.341***
				(6.63)	(5.51)	(5.55)
WVS2				0.219***	0.222***	0.214***
				(6.66)	(4.43)	(4.40)
CEDAW				1.538***	0.676***	0.200***
				(2.66)	(2.50)	(2.45)
Constant				−2.258***	−4.904***	−5.066***
				(12.28)	(12.94)	(7.46)
Observations				200	200	200
F-stat				15.14	12.34	11.49
Over-identifying restrictions				17.81	11.36	18.25
(p-value)				0.007	0.013	0.023
R-squared				0.54	0.59	0.60

Absolute robust standard errors in parentheses for the second stage. Absolute t-statistics in parentheses for the first stage. * significant at 10%; ** significant at 5%; *** significant at 1%. The data are pooled: for MGII and its instruments in 1998 and 2008, for GDP and controls in 2000 and 2010. Additional controls are included in all specifications. For the sake of brevity, only the variables of interest are presented, but obviously all control variables are included in the first stage. Civil liberties 1 is omitted. 109 countries are included in the sample, however, only 100 are used in the IV regressions due to lack of information about instruments used.

TABLE VI. – OLS and 2SLS Specifications for Gender Inequality

	(1) OLS	(2) OLS FE	(3) OLS FE	(4) IV	(5) IV FE	(6) IV FE
Panel A. Second-stage: Dependent variable = MGII (log)						
GDP (log)	−0.096***	−0.203***	−0.084**	−0.116***	−0.130***	−0.130***
	(0.014)	(0.06)	(0.037)	(0.036)	(0.027)	(0.021)
Hindu proportion	0.01615***	0.0195	0.02405	0.0095***	0.013	0.013
	(0.0055)	(0.01625)	(0.020)	(0.00327)	(0.0108)	(0.0108)
Muslim proportion	0.01275***	0.00975	0.012025	0.0075***	0.0065	0.0065
	(0.0043)	(0.0081)	(0.01)	(0.00258)	(0.00541)	(0.0054)
Civil liberties 2	1.24015***	1.0185***	1.2681***	0.7295***	0.679***	0.6855***
	(0.4276)	(0.3512)	(0.4373)	(0.2515)	(0.234)	(0.236)
Civil liberties 3	2.2729***	1.9155***	2.3319***	1.337***	1.277***	1.2605***
	(0.783)	(0.660)	(0.804)	(0.461)	(0.4403)	(0.4346)
Civil liberties 4	3.01665***	2.39925***	2.986***	1.7745***	1.5995***	1.6145***
	(1.040)	(0.827)	(1.02)	(0.611)	(0.551)	(0.5567)
Civil liberties 5	3.03195***	2.37***	2.8897***	1.7835***	1.58***	1.562***
	(1.0455)	(0.817)	(0.996)	(0.615)	(0.5448)	(0.538)
WVS 1	0.551***	0.597***	0.525***	0.575***	0.585***	0.575***
	(0.194)	(0.238)	(0.169)	(0.176)	(0.195)	(0.188)
WVS2	0.515***	0.457***	0.645***	0.422***	0.681***	0.667***
	(0.172)	(0.147)	(0.217)	(0.128)	(0.223)	(0.223)
CEDAW	1.2223***	0.4995***	0.206275***	0.719***	0.333***	0.1115***
	(0.4214)	(0.1722)	(0.0711)	(0.2479)	(0.1148)	(0.0384)
Constant	1.059***	−1.093***	1.017***	1.261***	0.680***	0.618***
	(0.3651)	(0.3768)	(0.350)	(0.434)	(0.234)	(0.213)
Observations	218	218	218	200	200	200
R-squared	0.33	0.88	0.43	0.35	0.87	0.93
Country Fixed effects	No	Yes	Yes	No	Yes	Yes
Year Fixed effects	No	No	Yes	No	No	Yes
Panel B. First-stage for endogenous variable: Dependent variable = GDP per capita (log)						
Latitude				1.672***	1.674***	1.686***
				(4.62)	(4.67)	(4.86)
Landlocked				−0.674***	−0.671***	−0.681***
				(2.97)	(2.89)	(3.18)
Constant				8.666***	8.626***	8.272***
				(70.22)	(72.28)	(62.73)
Observations				200	200	200
F-stat				10.86	16.38	11.91
Over-identifying restrictions				16.01	12.06	16.05
(p-value)				0.008	0.003	0.005
R-squared	0.62	0.67	0.69	0.41	0.47	0.43

Absolute robust standard errors in parentheses for the second stage. Absolute t-statistics in parentheses for the first stage. * significant at 10%; ** significant at 5%; *** significant at 1%. The data are pooled: for MGII and controls in 1998 and 2008, for GDP and its instruments in 1990-1998 and 2000-2008. Additional controls are included in all specifications. Civil liberties 1 is omitted. 109 countries are included in the sample, however, only 100 are used in the IV regressions due to lack of information about instruments used.

TABLE VII. – A Vicious Circle (3SLS Results)

	3SLS		3SLS		3SLS	
	(1)	(2)	(3)	(4)	(5)	(6)
	GDP (log)	MGII (log)	GDP (log)	MGII (log)	GDP (log)	MGII (log)
MGII	−0.143**		−0.108***		−0.142**	
	(0.0632)		(0.036)		(0.051)	
Population growth	−0.190***		−0.040*		−0.076***	
	(0.057)		(0.024)		(0.017)	
Investment	0.021***		0.016***		0.011***	
	(0.006)		(0.004)		(0.002)	
Human Capital	0.027***		0.011***		0.009***	
	(0.004)		(0.002)		(0.001)	
Latitude	−0.003		−0.001		0.050***	
	(0.003)		(0.003)		(0.003)	
Landlocked	−0.361***		−0.131		−0.810***	
	(0.123)		(0.220)		(0.176)	
GDP (log)		−0.154***		−0.149***		−0.128**
		(0.021)		(0.054)		(0.079)
WVS 1		0.455***		0.197***		0.262***
		(0.157)		(0.063)		(0.084)
WVS2		0.3861***		0.357***		0.4204***
		(0.129)		(0.111)		(0.144)
CEDAW		0.23***		0.139***		0.59**
		(0.085)		(0.032)		(0.33)
Constant	5.691***	1.528***	8.355***	−1.101*	12.652***	2.288**
	(0.475)	(0.170)	(0.247)	(0.570)	(0.250)	(0.948)
Observations	200	200	200	200	200	200
Country Fixed effects	No	No	Yes	Yes	Yes	Yes
Year Fixed effects	No	No	No	No	Yes	Yes

Absolute robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The data are pooled: for MGII and its instruments in 1998 and 2008; for GDP and its instruments in 1990-1998 and 2000-2008 when the dependent variable is the MGII, in 2000 and 2010, when the dependent variable is GDP. Additional controls are included in all specifications. 3SLS is the Three-stage least squares estimation with CEDAW, and attitudes toward gender inequality as instruments for the MGII, and latitude and landlocked as instruments for the log of GDP per capita. 109 countries are included in the sample, however, only 100 are used in the IV regressions due to lack of information about instruments used.

To deal with the endogeneity from reverse causality and omitted variables, the MGII and GDP are instrumented. Only results using the three sets of instruments for MGII and the two sets for GDP are presented. even if we control for potential endogeneities, the MGII coefficients are negative and highly significant (TABLES V). This means that greater gender inequality reduces long-run income. In TABLE VI, the negative impact of economic development on the MGII remains even after controlling for endogeneity. To address instrument validity, TABLES V, VI present the first stages of the 2SLS estimation. All of the instruments have significant explanatory power on the dependent variables. As a heuristic test, the instruments were included in the main regression (where endogenous variables are also included without being instrumented); they come out non-significant. Finally, the Sargan test does not reject any of the sets of instruments used at the 5% level.

TABLE VII considers the simultaneous estimation (Equ. 4) of the two effects and thus the existence of a vicious circle: high gender inequality results in low income per capita, while income in turn negatively affects the level of gender inequality, and so on. Simultaneity and correlation between the error terms were not behind the previous results. The negative relationship remains significant in the 3SLS specifications. The size of the GDP coefficients remains quite similar while those on MGII are smaller. The MGII coefficient varies according to the 3SLS specification, with a mean of (−0.131) and can be interpreted as an elasticity. To

TABLE VIII. – Results with Sub-Indices for Economic Development

Sub-indexes	OLS	IV	OLS	IV	OLS	IV
	Dependent variable = GDP per capita (log)					
Identity	−0.103**	−1.352**	−0.0717**	−2.772***	−0.104**	−1.091***
	(0.047)	(0.572)	(0.0341)	(0.778)	(0.0488)	(0.314)
Autonomy of the body	−0.716***	−0.804	−0.133	−4.781**	−0.0459	−8.605
	(0.233)	(1.295)	(0.0919)	(2.167)	(0.0820)	(6.180)
Intra-family Law	−0.00396	−1.376*	−0.0926**	−1.101***	−0.226***	−2.393***
	(0.107)	(0.714)	(0.0439)	(0.263)	(0.0594)	(0.610)
Political representation	−0.230	−3.028*	−0.0108	−1.977	−0.00113	−2.913
	(0.183)	(1.773)	(0.0527)	(1.380)	(0.0458)	(2.346)
Access to economic resources	−0.294	−0.857	−0.0760	−0.691	−0.0626	−3.453
	(0.195)	(0.694)	(0.0839)	(0.454)	(0.0730)	(2.137)
Access to health	−0.334*	−3.405**	−0.0668	−2.489**	−0.103*	−3.905
	(0.196)	(1.640)	(0.0630)	(1.133)	(0.0542)	(2.387)
Access to Education	−0.262	−0.684	−0.142***	−1.823*	−0.0997**	−1.566***
	(0.162)	(3.013)	(0.0432)	(0.930)	(0.0391)	(0.577)
Economic activity	−0.0269**	−2.685**	−0.0684*	−1.653*	−0.0614*	−2.367***
	(0.0124)	(1.340)	(0.0382)	(0.085)	(0.0341)	(0.725)
Country Fixed effects	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	Yes	Yes
Observations	218	200	218	200	218	200

Absolute robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional controls are included in all specifications. OLS refers to ordinary least squares estimation. IV refers to two-stage least squares estimation with CEDAW as the instrument for each sub-index. 109 countries are included in the sample, however, only 100 are used in the IV regressions due to lack of information about instruments used.

provide a quantitative assessment of this result, a one standard-deviation change in the log variable of gender inequality (−0.26) increases long-run income per capita by 3.4%.[30] As such, 10%[31] of the long-run income difference between South Asia and East Asia & the Pacific can be accounted for by differences in 2000 gender inequality. This effect is sizeable when compared to the other determinants of long-run income. A one standard-deviation change in the log variables of investment and education increases income per capita by 28% and 31% respectively.[32] For the sake of brevity, the coefficients on the other controls are not shown in the Tables.

Last, TABLE VIII presents the results using the MGII components as explanatory variables. For the sake of simplicity, the results are presented in columns. Nevertheless, each dimension was introduced singly. In a second step, the singly significant dimensions were introduced together. Only two dimensions attract significant negative coefficients, independently of the specification used: gender inequality in identity and economic activity. The preceding results were thus likely driven by these two MGII sub-indices. Promoting gender inequality in economic roles could hence promote economic development. High inequality in the identity dimensions and in economic activity is often correlated with the persistence of traditional gender roles. Nevertheless, women contribute to the development of the national economy. Involving women in market activity seems to have a significant impact on GDP.

30. (0.26×0.131).
31. $(0.63 - 0.17) \times 0.131$.
32. If 0.48 and 0.38 are considered as the mean estimated coefficients for investment and education respectively, and 0.61 and 0.82 as the standard deviations of the log variables, then the impact is calculated as mean coefficient x standard deviation.

Gender inequality in economic activity hinders economic development more than other dimensions. These results are consistent with previous findings. In a growth-accounting exercise of the East Asian economies, YOUNG [1995] provides evidence regarding the growth impact of female economic activity. He found that the increasing workforce linked with the increasing female participation accounted for between 0.6 and 1.6% of annual per capita growth in the four East Asian tiger economies between 1966 and 1990. This illustrates the key role of greater female economic activity in the formal economy. KLASEN [1999] highlights that reducing the women's access to economic activity is likely to ensure that the average ability of the work force will be lower than in the absence of such gender inequality in employment. Moreover, it may contribute to higher labour costs and lower international competitiveness, as women are effectively prevented from offering their labour services at more competitive wages. In this context, it may be important to point out that a considerable share of the export success of South East Asian economies was based on female-intensive light manufacturing. For KLASEN [2007], gender gaps in economic activity implies distortions on the economy as it artificially reduces the pool of talent from which employers can draw that. In turn, this reduces the average ability of the workforce and the human capital level. In a related way, gender gaps in access to managerial positions and employment more generally distort the allocation of talent and the production and productivity of human capital, all of which serve to reduce economic growth (KLASEN [2006]).

Furthermore, gender inequality in the identity dimension has a significant and negative impact on the GDP per capita. By restricting the female role to the traditional one, informal institutions hinder economic development. Gender identity is defined by social norms and informal institutions that define the economic and social activities of men and women (BIERSTEDT [1963]). The idea is that the economic role of each gender is heavily influenced by a set of laws, norms, codes of conduct, and traditions (WORLDBANK [2001]). Social institutions may impose direct constraints on individuals' activities, for instance, by not allowing them to move outside the house without a male guardian. As pointed out by EASTERLY [2002], women have different incentives than male, as social norms differ for men and women. Not accounting for the incentives individuals face can explain failures in development policy. Moreover, by restricting the social and economic role of women, inequality in gender identity reduces the talent pool as well as economic development. C. MORRISSON and JUTTING [2005] provide evidence on the negative impact of such social institutions linked to the identity dimension on the economic role of women, which in turn affects economic development.

TABLE A.1 in the Appendix presents the robustness checks. We first include the OECD European countries for which we have MGII scores in 1998.[33] It is worth noting that OECD countries are not included in all specifications, first due to data unavailability and second as they are outliers. OECD Europe countries have lower MGII scores than developing countries and higher levels of GDP per capita. Second, MENA countries are excluded. The results remain the same: the MGII has a negative and significant impact on long-run income and vice-versa. Nevertheless, the size of these coefficients is larger, so that our previous quantitative assessment was an underestimate. The sample is then restricted by including only the more developed countries (HDI > 0.5) and the more equal (MGII > median) successively. The negative

33. We can only calculate MGII scores for OECD countries in 1998, as some of the variables are not available in later years.

relationship between gender inequality and economic development is always very significant. Finally, in unreported regressions, the Gini coefficient and the percentage poor individuals are added as control variables. The results continue to show the same negative sign and remain significant. This means that even if 60% of the poor are women, the correlation estimated here captures the impact of gender inequality, and not the nature of poverty itself.

V.2. *Promoting Gender Equality within Family and in Education to Improve Human Development*

This section presents the relationship between gender inequality and human development (see Equation (5)). TABLE IX presents the results for pooled estimation using OLS and 2SLS. The MGII coefficient is negative and significant in all specifications, with an average value of -0.179. In other words, a one standard deviation change in the log variable of gender inequality (-0.26) will increase the HDI by 4.6%. The size of these estimates should not be underestimated, as the HDI ranges from 0 to 1. Other regressors have the expected signs: better policies increase the human development level (BINDER and GEORGIADIS [2010a]). Here again, the Sargan test does not reject our instruments at the 5% level.

Finally, TABLE X presents the results using the MGII components as explanatory variables. For the sake of simplicity, the results are presented in columns. Only two dimensions have a significant and negative effect whatever the specification: gender inequality within family and in access to education. Our preceding results were then driven by these two MGII sub-indices. Hence, promoting gender equality in the household decision-making process and in access to human capital could be a way to improve the human development level.

This significant impact of gender inequality in education on the HDI is consistent with the previous findings. Gender equality in education is positively correlated with the education and health components of the HDI. Let us first talk about the direct impact of gender equality in education on the literacy rate. By creating distortions, gender inequality in education lowers the quality and the amount of human capital. For KLASEN [2002], assuming a similar distribution of innate abilities between girls and boys, gender inequality in education means than less able boys than girls have access to education. As a result, the average innate ability and the average human capital is lower than it would be in case of gender equality.

Moreover, previous findings attest that one of the causes for low enrolment and high drop-out rates for girls is the lack of female teachers (ASHURAEY [1995]; MEHRAN [1995]; RIHANI [1993]). In Yemen, ALIM *et al.* [2007] provide evidence that parents are more likely to allow girls to go to school if there are female teachers. They find a positive and significant impact of the recruitment of female teachers and girls' enrolment rates, especially in rural areas. This is a vicious circle as lower girl enrolment rates, less female teachers, lower girls at school, etc.

These two direct channels suggest that unequal school enrolment ratios lower literacy rates and in turn, lower the HDI. Moreover, gender inequality in education affects the knowledge component of the HDI through its impact on the education of the next generation. Mothers' education reflects their innate abilities which positively influences their children and the importance the child assignss to education. Additional year of schooling of the mother increases child outcomes at school, the probability of attaining tertiary level and the time devoted to learning.

TABLE IX. – Results for Human Development

	(1) OLS	(2) OLS FE	(3) OLS FE	(4) IV	(5) IV FE	(6) IV FE
Panel A. Second-stage: Dependent variable = HDI						
MGII	−0.235***	−0.093***	−0.046***	−0.193**	−0.281**	−0.226***
	(0.034)	(0.028)	(0.016)	(0.083)	(0.140)	(0.072)
Rule	0.061***	0.009	0.046***	0.061***	0.044***	0.015***
	(0.013)	(0.011)	(0.005)	(0.014)	(5.4)	(2.6)
Investment	0.004***	0.001*	0.004***	0.004***	0.001	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Trade	0.050***	0.042***	0.051***	0.055***	0.052***	0.059***
	(0.019)	(0.018)	(0.021)	(0.021)	(0.028)	(0.019)
Constant	0.514***	0.133***	0.527***	0.480***	0.680***	0.867***
	(0.035)	(0.039)	(0.02)	(0.052)	(0.252)	(0.148)
Observations	218	218	218	200	200	200
R-squared	0.75	0.98	0.58	0.74	0.81	0.91
Country Fixed effects	No	Yes	Yes	No	Yes	Yes
Year Fixed effects	No	No	Yes	No	No	Yes
Panel B. First-stage for endogenous variable: Dependent variable = MGII						
Hindu proportion				0.019***	0.026**	0.026**
				(3.54)	(2.42)	(2.31)
Muslim proportion				0.015***	0.013**	0.013**
				(3.09)	(2.97)	(2.89)
Civil liberties 2				1.459***	1.358***	1.371***
				(3.26)	(3.25)	(3.22)
Civil liberties 3				2.674***	2.554***	2.521***
				(6.24)	(6.35)	(6.09)
Civil liberties 4				3.549***	3.199***	3.229***
				(8.29)	(7.59)	(7.59)
Civil liberties 5				3.567***	3.160***	3.124***
				(8.57)	(7.17)	(7.05)
WVS1				0.392***	0.291***	0.241***
				(3.13)	(3.01)	(4.44)
WVS2				0.449***	0.346***	0.324***
				(4.46)	(4.43)	(3.90)
CEDAW				1.438***	0.666***	0.223***
				(2.69)	(2.57)	(2.65)
Constant				−2.208***	−4.004***	−5.236***
				(10.28)	(11.94)	(7.96)
Observations				200	200	200
F-stat				12.35	14.6	11.89
Over-identifying restrictions				13.43	12.46	13.76
(p-value)				0.012	0.033	0.028
R-squared				0.44	0.49	0.56

Absolute robust standard errors in parentheses for the second stage. Absolute t-statistics in parentheses for the first stage. * significant at 10%; ** significant at 5%; *** significant at 1%. The data are pooled: for MGII and its instruments in 1998 and 2008, for HDI and its instruments in 2000 and 2010. Additional controls are included in all specifications. 109 countries are included in the sample, however, only 100 are used in the IV regressions due to lack of information about instruments used.

Second, gender inequality in education also impacts the HDI through its influence on the health component. Better educated women have healthier children and husbands (SUMMERS [1994]). Greater education increases their health knowledge which improves their ability to promote the health of their family. An educated mother knows more about health and good practice. Having better educated mothers reduces infant mortality. Moreover, lower gender inequality improves society's health. For example, AINSWORTH, FRANSEN, and OVER [1998] investigate the impact of gender inequality in education on AIDS and find higher rates in cities with greater inequality. THOMAS [1993] notes that the level of maternal education greatly influences the quality of food and household health. The mother's education also affects her ability to defend her child against the adversities of life, as exogenous price changes, which could affect diet, for example.

The significant impact of gender inequality on the human development level is also consistent with previous findings. Indeed, a broad literature has provided evidence on the key role of mothers on children and development outcomes, namely education and health (AINSWORTH, FRANSEN, and OVER [1998]; BEHRMAN *et al.* [1999]; HILL and KING [1995]; ROSENZWEIG and WOLPIN [1994]; THOMAS [1993]; THOMAS and STRAUSS [1997]). One assumes that higher female bargaining power leads to greater investments in the health and education of their children (KLASEN [2006]; SEN [1990]). Female investments within the family are more productive than those of male, as women's decisions prioritize education and health cares (HODDINOTT and HADDAD [1995]; KLASEN and WINK [2002]; THOMAS and STRAUSS [1997]; UDRY *et al.* [1995]; WORLDBANK [2001]). Greater autonomy of women also reduces the infant mortality rate and increases income per capita (BOONE [1996])

TABLE X. – Results with Sub-Indices for Human Development

Sub-indexes	OLS	IV	OLS		OLS	IV
	Dependent variable = GDP per capita (log)					
Identity	−0.142***	−0.168**	−0.00479	−0.625***	−0.0159	−0.0930
	(0.0298)	(0.0811)	(0.0218)	(0.196)	(0.0109)	(0.0692)
Autonomy of the body	−0.197***	−0.266	−0.0301	−0.734**	0.0204	−0.753**
	(0.0339)	(0.167)	(0.0195)	(0.363)	(0.0135)	(0.367)
Intra-family Law	−0.0635***	−0.134**	−0.0427***	−0.207**	−0.0305**	−0.272***
	(0.0166)	(0.0645)	(0.00702)	(0.102)	(0.0150)	(0.0576)
Political representation	0.00395	−0.436	−0.000927	0.783	0.000334	0.983
	(0.0313)	(0.304)	(0.0106)	(1.151)	(0.00736)	(1.449)
Access to economic resources	−0.151***	−0.206**	−0.0118	−0.107	0.00791	−0.0566
	(0.0294)	(0.0956)	(0.0171)	(0.0742)	(0.00905)	(0.0555)
Access to Education	−0.0438***	−0.296**	−0.0189***	−0.127**	−0.0285**	−0.595***
	(0.0131)	(0.119)	(0.0063)	(0.0639)	(0.0117)	(0.170)
Access to Health	−0.0491*	0.678	−0.00407	0.285	0.00494	0.375
	(0.0264)	(0.849)	(0.00909)	(0.182)	(0.00627)	(0.246)
Economic activity	−0.0556*	−0.275	−0.0136	−0.748	−0.0127*	−0.924
	(0.0288)	(0.467)	(0.00988)	(1.095)	(0.00677)	(1.343)
Country Fixed effects	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	Yes	Yes
Observations	218	200	218	200	218	200

Absolute robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional controls are included in all specifications. OLS refers to ordinary least squares estimation. IV refers to two-stage least squares estimation with CHEW as the instrument for each sub-index. 109 countries are included in the sample, however, only 100 are used in the IV regressions due to lack of information about instruments used.

VI. Conclusion and Implications

The composite MGII indicator and its components uncover new evidence on the negative effect of gender inequality on development. While overall gender inequality reduces the level of development (GDP and HDI), it is gender inequality in identity and economic activity that drives the results for economic development, while gender inequality in education and family affects human development. The results show evidence of a vicious circle.

This paper highlights the interest in using composite indicators as an explanatory variable. First, it allows to estimate the overall effect of a multidimensional concept, and second, to compare the effect of each dimension. The MGII's explanatory power is compared to those of existing gender-specific composite indicators. TABLE B.1 in the appendix compares the impact of other well-known gender inequality indices.[34] Using the same specifications as before, this paper investigates the MGII added value. The higher R-squared suggests that the MGII has a higher explanatory power. Moreover, the MGII is always highly significant while the SIGI and GGG are almost never significant. Only the GII seems to fit well. Nevertheless, the magnitude of the coefficient is quite unstable, compared to the stability of the MGII coefficients.

The existence of an "inequality-development trap" may be supposed. As gender inequality reflects cultural characteristics, change can be triggered by a positive shock, which reverses the direction of the circle. For example the Plague of 1348 was a positive shock for women's empowerment and brought about lower gender inequality (MOOR and ZANDEN [2010]). The Black Death increased women's bargaining power by increasing their value in the marriage market, so the rate of gender inequality in the family fell. A virtuous circle took place: greater gender equality increased income per capita, which in turn promoted equality. Other improvements could be encouraged by legal reforms, community mobilization or economic incentives. Harmonization, full implementation and the enforcement of laws could guarantee more equality. Policies could also raise awareness of the negative consequences of gender discrimination for all, and so promote attitude changes. For example, the *Apni Beti Apna Dhan program* in India provides cash incentives to girls and their families conditional on the daughters remaining unmarried until age 18. The initial evaluation results suggest this program helped parents increase their investments in their daughters' human capital (SINHA and YOONG [2009]).

While gender inequality is costly in terms of economic and human development, improving the situation of women could reduce male well-being by doing away with their privileges. The country-level benefits of higher GDP per capita and better human development may be accompanied at the micro level by lower well-being for some men as gender discrimination becomes lower. This, in particular might apply to men who are less able than some women, who previously enjoyed benefits from discriminatory practices against women. For example, gender equality in inheritance rights between daughters and sons implies that siblings share inheritances equally, which reduces the share of sons. Also, recent reforms to family law in Morocco which have set ownership rights of husbands and wives equal over property acquired during the marriage have given rise to male opposition. Gender equality may therefore need to address such issues in order to be backed by men. Gender equality requires engaging men and

34. The Global Gender Gap of the World Economic Forum, the Gender Inequality Index of the UNDP and the Social and Institutions Gender Index of the OECD are used.

boys to transform discriminatory practices, especially in the identity dimensions and within the family, to in turn promote economic and human development.

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Appendix

A.

TABLE A.1. – Robustness Checks

	Long-run Income	MGII
1) Original Sample		
MGII	−0.143*** (3.1)	
GDP (log)		−0.154*** (5.1)
2) With OECD European countries		
MGII	−0.318*** (3.62)	
GDP (log)		−0.233** (2.08)
3) Without MENA countries		
MGII	−0.307*** (5.46)	
GDP (log)		−0.263*** (5.08)
4) Developed countries (HDI >0.5)		
MGII	−0.074*** (3.69)	
GDP (log)		−0.106** (2.55)
5) More Equal (MGII< Median)		
MGII	−0.114*** (5.26)	
GDP (log)		−0.188** (2.22)

Estimation carried out on pooled data with 3SLS. Absolute value of t-statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional controls are included in all specifications.

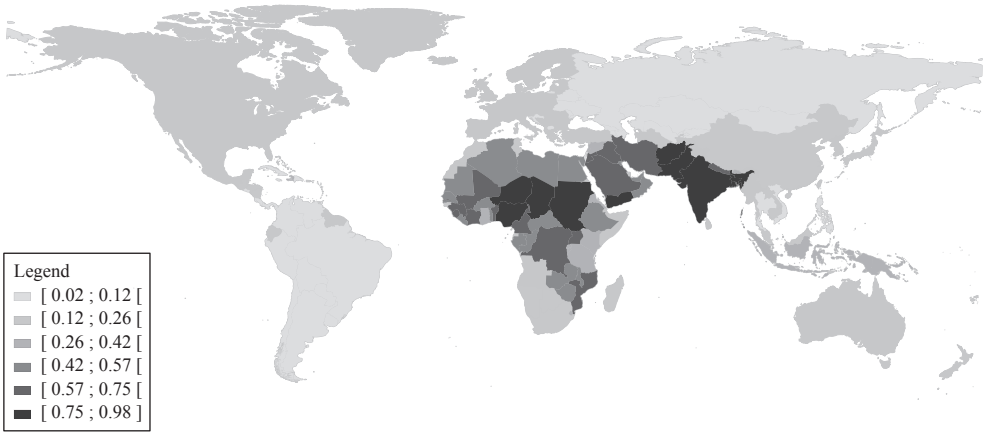
B.

TABLE B.1. – Comparison with Other Gender-Specific Composite Indicators

	OLS	IV	3SLS	OLS	IV
Gender-specific composite indicator		GDP			HDI
MGII	−0.352**	−0.193***	−0.143**	−0.235***	−0.193**
Standard errors	(0.148)	(0.078)	(0.0632)	(0.034)	(0.083)
R-squared	0.85	0.84	0.61	0.75	0.74
GGG	−1.521	−5.369	−5.336*	0.243	0.145
Standard errors	(1.072)	(3.330)	(3.225)	(0.167)	(0.437)
R-squared	0.473	0.341	0.339	0.521	0.457
GII	−0.868***	−2.761*	−3.012**	−0.202***	−0.352*
Standard errors	(0.236)	(1.441)	(1.411)	(0.0312)	(0.193)
R-squared	0.530	0.384	0.289	0.588	0.528
SIGI	−0.0671	0.146	0.156	−0.0495***	−0.0274
Standard errors	(0.0655)	(0.167)	(0.162)	(0.00880)	(0.0183)
R-squared	0.519	0.500	0.456	0.657	0.616

Estimation carried out on pooled data. * significant at 10%; ** significant at 5%; *** significant at 1%. Additional controls are included in all specifications.

C.



Carte réalisée avec Cartes & Données – © Articque

FIGURE C.1. – MGII Around the World

D.

TABLE D.1. – Countries by Income Group

High income: non-OECD	**Lower middle income**	**Low income**
Bahrain	Albania	Afghanistan
Israel(*)	Algeria	Bangladesh
Kuwait	Armenia	Benin
Oman	Azerbaijan	Burkina Faso
Saudi Arabia	Bhutan(*)	Burundi(*)
Singapore	Bolivia	Cambodia
Trinidad and Tobago	Cameroon	Central African Republic
United Arab Emirates	China	Chad
	Colombia	Congo, Dem. Rep.
Upper middle income	Congo, Rep.	Ivory Coast
Argentina	Dominican Republic	Eritrea(*)
Belarus	Ecuador	Ethiopia
Botswana	Egypt, Arab Rep.	Gambia, The
Brazil	El Salvador	Ghana
Chile	Georgia(*)	Guinea
Costa Rica	Guatemala	Haiti(*)
Croatia	Honduras	Kenya
Cuba	India	Kyrgyz Republic
Fiji(*)	Indonesia	Lao PDR
Gabon	Iran, Islamic Rep.	Liberia
Jamaica	Iraq	Madagascar
Kazakhstan	Jordan	Malawi
Lebanon	Macedonia, FYR	Mali
Libya	Moldova	Mauritania
Malaysia	Mongolia	Mozambique
Mauritius	Morocco	Nepal
Panama	Namibia	Niger
Russian Federation	Nicaragua	Nigeria
South Africa	Paraguay	Pakistan
Uruguay	Peru	Papua New Guinea
Venezuela, RB	Philippines	Rwanda(*)
	Sri Lanka	Senegal
	Sudan	Sierra Leone
	Swaziland	Tajikistan
	Syrian Arab Republic	Tanzania
	Thailand	Togo
	Tunisia(*)	Uganda
	Ukraine	Uzbekistan
		Vietnam
		Yemen, Rep.
		Zambia
		Zimbabwe

Income group: Countries are split up according to their 2008 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $975 or less; lower middle income, $976 - $3,855; upper middle income, $3,856 - $11,905; and high income, $11,906 or more. The 109 countries listed here are included in the OLS regressions. (*) refers to countries not included in the IV regressions.

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