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Gender Equality For Well-being: A Cross-country Analysis

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Gender Equality For Well-being

Abstract

This thesis explores the relationship between gender equality and national well-being across 60 countries from 1995 to 2014. Using OLS regressions, the empirical results suggest that gender equality in education, employment and politics has a positive and significant effect on life satisfaction and the Human Development Index. Results for life satisfaction are robust to the inclusion of time fixed effects and changes in controls, while estimates for the HDI are more sensitive to those modifications. Besides, OECD members are worse off in terms of national subjective well-being when the female labour force participation rises relative to men. Policies focusing on national well-being should consider promoting gender equality, starting with gender parity in politics.

Table of Contents

1. Introduction

According to the UN Gender Index, no country will reach gender equality by 2030. More precisely, 80 per cent of the world's girls and women live in countries that are barely passing or even failing on gender equality (Equal Measures 2030, 2019). The 2019 average of 65.7/100 stagnates in the "poor" category and none of the countries reach the "excellent" group of 90 or above. This alarming situation reinforces the need for a better understanding of the cost gender inequality imposes on a nation, and especially on its well-being. Although there already exists an extensive literature about the impact of gender inequality on economic growth, little is known about the effect it has on national welfare.

The aim of this thesis is thus to determine the various degrees of influence that some dimensions of gender inequality can have on a country's welfare: To what extent does gender inequality shape a country's level of well-being? How large is its effect? How can unequal countries benefit from reducing gender discrimination in their society? More precisely, this study will investigate the effect of discriminating against girls and women in the education system, labour market and political sphere on the welfare of nations. The analysis covers 60 countries[1] over twenty years, namely from 1995 to 2014. I use two categories of well-being to understand if they are influenced by the different gender gaps in a similar way. For the objective measure, the Human Development Index (HDI) was selected for its multidimensionality, international comparability and data availability. The index was created by the United Nations Development Programme (UNDP) and is based on observable, cardinal elements included in the following three indices: life expectancy, education and Gross National Income (GNI) (UNDP, 2018). The subjective well-being (SWB) is represented by the national mean of self-reported life satisfaction, according to the World Values Surveys (WVS, 2014). It is based on ordinal measures, attempting to reflect a person's satisfaction of his/her own life. To limit the likelihood of omitted variable biases, I include three different gender gaps, which are defined as follows. The educational gender gap is represented by the gender parity index for school enrolment in tertiary education. The ratio of female to male labour force participation rate indicates the gender gap in employment. The third gap in political outcomes is defined by the percentage of women in parliaments. The three macro-level indicators thus describe the extent to which women are deprived or excluded from action resources and societal opportunities. For simplicity reasons, this study will focus on a binary definition of genders: female and male. However, I personally acknowledge a more diverse

[1] Countries are listed in Appendix B.

definition of genders in the real world, outside economic models. It is important to note that the words "country" and "nation" will be used synonymously throughout this study, as well as for the concepts of "well-being" and "welfare". I further assume that the heterogeneity within country is low compared to heterogeneity between countries; that is, the different regions or states within a country are similar enough in terms of gender gaps and well-being.

The estimation strategy consists of identifying first the impact of each gender gap individually and then their collective influence, resulting in eight hypotheses. This thesis uses the linear OLS econometric method with and without fixed effects for the main regressions. Results confirm the hypotheses: individually and collectively, gender equality in tertiary education, labour force and parliaments lead to higher levels of both objective and subjective well-beings. In other words, perfect gender equality in action resources, opportunity and power structures would explain 0.432 and 0.139 of the total life satisfaction mean and HDI score, respectively. It should be highlighted that tertiary education is always statistically and economically significant in each regression, while gender gaps in the labour force and political outcomes vary substantially in terms of significance and magnitude throughout the various estimations. Although estimates for SWB were very robust to the inclusion of year fixed effects and health controls, the results for the HDI were quite sensitive to changes in the institutional quality variable and the addition of fixed effects. This might be due to the high correlation between the HDI score and national institutions. If the estimates are mainly positive, some negative trends are revealed when the sample is divided, resulting in new interpretations. In OECD countries, there is a negative relationship between the HDI and female labour force participation, while non-OECD nations exhibit a clear positive trend. Research suggested that it is due to the decline in women's subjective well-being in the industrialized world. Potential reasons include the burden of house production still borne by women, the comparison with men's achievements according to social norms, etc. Furthermore, nations in transition inherited high levels of female participation in tertiary education and the labour force from their communist past, levels which decreased over 1995-2014. But they also started with the lowest levels of life satisfaction. As a consequence, post-communist countries have negative estimates for the two gender dimensions, while gender equality is positively correlated with SWB for the rest of the sample.

This study will contribute to the existing literature by shedding light on the influence of gender inequality on national well-being, filling a substantial gap in the feminist economic literature. To my knowledge, this will be the first research analysing in depth that relationship within a cross-country comparison. Furthermore, compared to prior research, this work

exploits more recent data, with a twenty-year period from 1995 to 2014. It also takes into account the multidimensionality of gender equality by using three different gender gaps, namely in education, employment and political outcomes. It also considers the interconnection between those three aspects, an element often omitted in similar research (Klasen, 2002; Seguino, 2000). Moreover, one cannot deny the constant need for better policies worldwide to reduce gender gaps, as demonstrated by the findings of Equal Measures 2030. The results of this study should provide better information on the extent to which societal welfare could be improved through policies targeting gender discrimination.

In the past few decades, policymakers have been advocating for the shift towards a focus on human development and well-being, instead of the conventional objective of economic growth at all costs. Moreover, numerous scholars have emphasized the need to stray from traditional but flawed economic performance measures, such as the growth rate of GDP per capita, to evaluate countries' welfare (Berik, Rodgers & Seguino, 2009; Moorhouse, 2017). The inability of GDP to capture important changes in welfare calls for more appropriate measures, also allowing for cross-national comparisons. Well-being has been a growing domain of research in the past few decades, especially in economics. It is an ambiguous concept: defining well-being is very difficult but measuring it remains even more challenging. Researchers have focused more on welfare's dimensions (e.g. happiness, life satisfaction, ability to fulfil goals) than on a clear definition (Conceição & Bandura, 2008). Nevertheless, well-being can be classified within two major categories. The first group, called objective measures, indirectly assesses individuals' well-being with observable dimensions – for example through economic and social variables – and make use of cardinal measures. The second category identifies subjective well-being, which aims at directly reflecting a person's feelings through ordinal measures. Concerning the definition of well-being, the online Oxford Dictionary (n.d.) simply describes the concept as "the state of being comfortable, healthy, or happy". A definition which seems to oversimplify the complexity behind this word. After reviewing numerous studies, Dodge, Daly, Huyton and Sanders (2012) proposed a more complete definition of well-being:

> …the balance point between an individual's resource pool and the challenges faced […] Stable well-being is when individuals have the psychological, social and physical resources they need to meet a particular psychological, social and/or physical challenge.

In economics, well-being was commonly measured by a unique objective dimension: income or GDP per capita. The relationship between income and welfare relied on the assumption that income increases consumption and consumption raises utility (Conceição &

Bandura, 2008). After several decades, the concept of well-being is now widely considered as multidimensional, with environmental, social and economic aspects. The new concept is more easily captured by indicators of objective well-being than it is for subjective measures. Even though they still suffer from shortcomings (Burchi & De Muro, 2016), various indices of human development, quality of life and welfare have been developed in the past few decades and do provide precious information.

Regarding gender equality, it is widely known that equality between women and men is beneficial for a nation. For instance, female education generates numerous positive externalities, such as lower child mortality and fertility levels, and better health and educational outcomes for the next generation (Hill & King, 1995). Furthermore, barriers to education and employment for women reduce the pool of talents in the labour market thus leading to lower productivity, as less qualified men are selected instead of more talented women. The loss in human capital results in slower economic growth (Klasen & Lamanna, 2009). Concerning political outcomes, greater presence of women in government seems to be linked to improvement of the quality of institutions, via the reduction of corruption and of the likelihood of civil wars, among others (Mitra, Bang & Biswas, 2015). Knowing the numerous benefits of gender equality on economic development, the next step is to analyse how gender discrimination could potentially shape national well-being. Understanding that relationship is important because it will provide the adequate background for policies tackling gender inequalities at regional, national, and international levels.

This paper is divided as follows. Section 2 presents the previous findings regarding the effects of gender gaps in education, employment and political outcomes, and attempts to link well-being and gender equality. Then, Section 3 explains the guiding frameworks through which gender equality can affect national welfare. This theoretical development results in eight hypotheses. Section 4 describes the five main variables, in addition to some important controls. Then, the methodology and econometrics issues are discussed in Section 5 and the next section reports the main results. Section 7 tests the robustness of the results. Finally, Section 8 sums up the findings, orientates future research and suggests policy recommendations.

2. Literature Review

As this study measures gender equality through three dimensions, this section reviews previous research about the societal impacts of gender equality in education, employment and political outcomes. The last subsection focuses more precisely on previous findings regarding objective and subjective well-beings and their relationship with gender equality.

2.1. Gender Equality in Education

According to the academic literature on women's education, benefits from closing the educational gender gap are well known. When it comes to schooling, most of the decisions are made by parents/caregivers. Education thus involves current expenditures (school fees, uniforms, books, etc.) and foregone opportunities (i.e. help from daughters for household chores, their bride price or child's labour), while its economic returns will only be reaped in the future. Returns to investment in education have been continuously higher for women than men since the 1950s (Psacharopoulos & Patrinos, 2018). Economic research has shown that women's education results in more positive externalities (Schultz, 2002) than men's schooling and thus, according to economic theory, it will indeed lead to underinvestment in girls' education.

Some studies have found a negative relationship between gender inequality and economic growth. Barro and Lee (1994) argue that female secondary education has a negative effect on growth, indicating that a larger gap between genders would be favourable to the economy, a result reiterated in Barro (1996). But the problematic interpretation of their coefficients led to new studies adopting more careful econometric techniques (Klasen & Lamanna, 2009; Knowles, Lorgelly & Owen, 2002). As a consequence, most of those investigating the societal effects of women's education reveal extremely positive outcomes, extending beyond returns to market activities. Indeed, an educated mother is expected to know the basis of nutrition and healthcare and thus exploit her knowledge and access to medical services, in order to ensure that her children fully reap the benefits of a healthy diet and modern medicine. In a study carried out in the Philippines, maternal schooling is found to positively affect the height of children through good nutrition, the major impact being on pre-schoolers (Barrera, 1990). In both Brazil and Ghana, mother's education has a bigger effect on daughters' height (Thomas, 1991). The investigation also shows that the smaller the gender disparities in education, the smaller the difference between the effects on sons and daughters, as demonstrated by Brazil where the gender gap is smaller.

Moreover, a more educated girl spends more time at school, which will delay both marriage and first pregnancy, subsequently reducing fertility. Thanks to this mechanism, more resources can be devoted to the education and health of each child. Hill and King (1995) find out that improving the education level of women can increase family health, child survival and investment in children's human capital. Nations with higher levels of primary and secondary school enrolments for girls are correlated with higher levels of GNP, and after accounting for cross-country differences in GNP, longer life expectancy, lower infant mortality and lower fertility rates. Accordingly, these last results also imply that gender disparity in educational attainment represents a substantial obstacle to national well-being. Numerous other studies confirm the detrimental impact of large gender gap in education on the economy, impacting the material well-being of individuals. Indeed, Klasen (2002) observes that gender inequality in education has a direct effect on economic growth by reducing the level of human capital and an indirect effect through the impact of inequality on investment and population growth. For example, gender gaps in schooling between East Asia and Sub-Sahara Africa can explain 0.44 percentage points of differences in annual per capita growth rates between the two regions. With a neoclassical growth model, Knowles et al. (2002) estimate the long-run effect of female and male education on output per worker with OLS regressions. Robust to 2SLS estimation, their results suggest that women's education has a significant positive impact on labour productivity, while the role of men's education remains unclear. On the other hand, it is important to specify that the relationship between the two variables can work in the other way: economic development can also reduce gender inequality. Duflo (2012) points out that economic growth can alleviate poverty and increase opportunity by providing more resources to households, and it can subsequently decrease the vulnerability of women in the educational, the labour market and political fields.

These findings suggest that educational gender gaps hinder human and economic development, while economic growth can contribute to the reduction of gender inequality, improving societal well-being. Notwithstanding, mentioning gender disparities in education without touching upon the gender gap in employment would be a mistake.

2.2. Gender Equality in Employment

Naturally, when girls and women are disadvantaged at school, their labour opportunities heavily suffer from it, reinforcing their economic vulnerability. Besides, if the access to the labour market is very limited for women, returns to education are seen as non-existent and

parents might choose not to send their daughters to school. The different mechanisms behind the impact of gender disparities in employment work as follows. If women are discriminated against on the labour market, it decreases the productivity of the workforce as more talented women are replaced by less skilled men (Klasen & Lamanna, 2009). It also reduces women's earnings and thus their bargaining power at home and investment in their children's health and education. Inversely, improved labour market opportunities for women increase the opportunity cost of childbearing, therefore reducing fertility levels and population growth (Mitra et al., 2015). However, research reveals mixed evidence when it comes to the effects of the employment gender gap.

First of all, with 20 semi-industrialized countries, Seguino (2000) observes that gender inequality, through low women's wages relative to men's, acts as a stimulus to growth in those exporting nations with female-dominated manufacturing industries. Although she mentions it is acting against women's well-being, the author finds that gender inequality boosts investment, through the mechanism of women's low wages on exports and technology imports. However, Seguino's inaccurate results arise from wage discrimination data: they are not internationally comparable (Schober & Winter-Ebmer, 2011). Once the problem is fixed, there is no evidence that a wider gender pay gap would stimulate growth in export-oriented semi-industrialized countries. All in all, wage discrimination is found to have a negative impact on economic growth.

Secondly, Klasen and Lamanna (2009) improve Klasen (2002) by including the employment gender gap into the analysis. The latter is defined by various gender gaps in the labour force participation. Just like in employment, gender gap in labour force participation can represent the inequality in economic outcomes. It captures several aspects, such as social norms prioritizing fertility over professional attainment, biased resource allocations and the restricted access to the formal labour market for women (Mitra et al., 2015). Covering 41 years of panel data, the study reveals that both gender gaps represent substantial constraints on economic growth and objective measures of well-being (i.e. fertility, under 5 mortality and life expectancy). Gender discrimination in employment heavily impacts Middle East-North Africa and South Asia (Klasen & Lamanna, 2009). By contrast, Baliamoune-Lutz and McGillivray (2007) find with Arellano-Bond estimations that the female share of the labour force is negatively correlated with income per capita. However, the study focuses solely on Sub-Saharan Africa (SSA) and Arab countries.

Thirdly, research suggests that improvement in women's bargaining power through employment results in increases in household savings, in the share of income invested in

education and health, and in familial investments in daughters (Duflo, 2012). Several studies in Latin America show that when women enter the labour market, their household bargaining power rises, especially with respect to fertility decisions (Blumberg, 1988; Weller, 1968). In Nepal, women working in market activities gained a great amount of power within the household, while women involved in domestic and subsistence sectors saw their bargaining power diminish relative to men (Acharya & Bennett, 1983). Besides, those women reported spending their income on household consumption goods and children's support, improving their family's well-being.

To sum up, the various conclusions depend on how the gender gap in the labour market is measured – pay gap, labour force participation, wages in formal employment, etc. – and on the composition of the sample (Moorhouse, 2017). Yet it can be inferred from those results that closing the gender gap in employment would improve national well-being, first by increasing the bargaining power of women at home and then by stimulating economic development.

2.3. Gender Equality in Politics

In politics, various elements keep on limiting the representation of women in national parliaments. Among others, Duflo (2012) mentions the existing electoral system in the country, the role and discipline of parties, and the absence of important female role models in politics. Another obstacle is the general idea that women are not as competent leaders as men, creating a bias in favour of male leaders, in both developed and developing nations. Beaman, Chattopadhyay, Duflo, Pande, and Topalova (2009) exploit the random variation in the exposure to female village council leaders in India, where one third of the leader seats is reserved for women. The experiment suggests that respondents maintain a preference for male leaders, even after an exposure to female leader. Nonetheless, the gender bias usually disappears after the second exposure and the presence of a female leader tends to enfeeble gender stereotypes in the domestic and public spheres.

First of all, research suggests that a greater representation of women in government raises the proportion of public expenditures allocated to health and education. In 16 Indian states studied between 1967 and 2001, the gender of politicians in urban districts was found to influence the educational attainments of their inhabitants (Clots-Figuerasa, 2012). If the effect applied to urban areas, no impact was observed in rural areas. A potential explanation for this contrast is that female politicians may invest more in education in urban areas, as returns and

demand for women's education are higher there. Rural areas might require other public investments first, with a higher priority for women's well-being (Duflo, 2012). Svaleryd (2009) investigates the influence of Swedish female political representatives on public spending. She concludes that a larger proportion of women on local councils raises the expenditures on childcare and education. In general, female legislators favour higher social public expenditures than male fellows, contributing to the nation's welfare (Abrams & Settle, 1999; Kenny & Lott, 1999).

A greater representation of women in politics can significantly reduce the gender bias present in public policy. This should remedy the various societal gender gaps and improve national well-being. Research suggests that the presence of women in politics can efficiently downsize the discrimination against girls and women found in patriarchal societies (Wolbrecht & Campbell, 2007). American female legislators are more liberal in their policy behaviour and prioritise feminist legislations on traditional concerns to women, such as health, education and well-being (Swers, 2001). For instance, female legislators in the US Congress exploit their positions to ensure that laws regarding violence against women and women's reproductive rights were included in the national agenda. Chattopadhyay and Duflo (2004) use the reservation of political seats for women in India and find that leaders favour investments in the public goods that are most valuable to their own gender, improving their welfare. In this way, a higher share of the budget is invested in roads and drinking water when the council leader is a woman, directly responding to women's top priorities in villages.

Lastly, a better representation of women in politics could greatly impact national well-being by improving domestic institutions. A study has revealed that compared to men, women elected at the head of village council provide more public goods and of better quality to the community, especially for delivering drinking water infrastructure (Duflo & Topalova, 2004). Additionally, the presence of more women in politics is associated with lower levels of corruption (Dollar, Fisman & Gatti, 2001). Iyer, Mani, Mishra and Topalova (2012) investigate the impact of women's political representation in India on crime reports. Evidence suggests that a greater presence of female politicians in local councils resulted in an increase in reported crimes against women over 1985-2007. It is important to note that the augmentation was due to higher reporting, and not to a higher incidence of crime. The mechanisms contributed to improving the quality of the judicial system because the number of arrests also rose significantly, creating a safer environment for women. Furthermore, Melander (2005a) finds that the percentage of women in parliament is correlated with lower numbers of human rights abuses, such as political imprisonments or torture. And a smaller

gender gap in parliament is found to reduce the likelihood of intrastate armed conflicts (Melander, 2005b). Consequently, a perfect gender parity in public office would be beneficial for countries on several societal aspects, such as education, health, safety and, of course, well-being.

2.4. Gender Equality and National Well-being

Even though the influence of gender inequality on national well-being has not been investigated in detail yet, this sub-section summarizes prior findings and hypothesize on the effects of gender equality. If life satisfaction is sometimes affected by inequality via complex channels, the impacts on the HDI – based on education, income and life expectancy – are more straightforward.

Tesch-Romer, Motel-Klingebiel & Tomasik (2008) find evidence that in societies exhibiting larger gender inequality, there are greater differences between women's and men's subjective well-being. Life satisfaction depends greatly on whether people can reach their goals. But without the adequate resources and opportunities (e.g. education and income), achieving personal objectives remains much harder. Women are thus more likely to report lower life satisfaction due to a lower achievement of goals and ambitions in more unequal societies. Under the same guiding framework, Diener, Diener and Diener (1995) conclude that societal equality significantly and positively influence SWB in 55 countries. The gender parity indicator is the relative percentage of age-eligible girls in secondary school and it is found to positively affect the average level of life satisfaction. However, result should be considered carefully because it takes into account only one aspect of gender equality, namely the educational gender gap. Interestingly, Meisenberg and Woodley (2015) also find a positive relationship between female education and well-being, while other indicators of gender equality barely impact life satisfaction. Additionally, they do not predict differences between women's and men's SWB. The authors show that different measures of gender equality can have different effects on well-being and thus advocate against the use of composite indices. Nevertheless, their results also indicate that high female labour force participation tends to reduce women's well-being relative to men, an effect echoing Tesch-Romer et al. (2008), Vieira Lima (as cited in Meisenberg & Woodley, 2015), and Stevenson and Wolfers (2009). This could be explained by the unequal division of labour within the household between genders, which often constrains women to part-time, lower paid jobs. Even if women experience fewer barriers in the labour market nowadays, they are still

expected to do most of the housework in patriarchal societies, increasing their everyday burden.

When it comes to objective well-being, it appears that research has barely looked into the influence of gender gaps on the HDI yet. Nonetheless, Eren, Çelik and Kubat (2014) test potential indicators of the HDI score with three regression models: binary logit, probit and Tobit analyses. The labour force participation ratio is significant in the three models. It can define gender equality in employment and is found to positively affect the development level. But the variable representing gender discrimination in political outcomes, i.e. the number of seats held by women in parliaments, is insignificant. It is important to note that the research of Eren et al. (2014) focuses on 84 countries with high and very high HDI scores only, while the present study covers countries from the four development categories. Even though it does not include the nations with the worst scores, the more inclusive analysis could yield very different results.

Though it exists very little literature about this relationship, the channels behind the effects of gender equality can be inferred from the aforementioned findings. According to Hill and King (1995), the reduction of the gender gap in educational attainment is a substantial determinant of subjective well-being, through its influence on life expectancy, fertility, and child and maternal mortalities. More precisely, child and maternal mortalities decrease while life expectancy increases, enhancing the HDI rate. Besides, mean years of schooling increase, which also improves the HDI score. Then, gender equality in education has been found to stimulate economic growth and labour productivity (Klasen, 2002; Klasen & Lamanna, 2009; Knowles et al., 2002). As the HDI depends on GNI per capita, economic growth will improve the material well-being of individuals. Similarly, gender equality on the labour market seems to positively influence economic outcomes (Klasen & Lamanna, 2009, Mitra et al., 2015; Schober & Winter-Ebmer, 2011) and human development (Acharya & Bennett, 1983; Banerjee & Duflo, 2011; Blumberg, 1988; Duflo, 2012; Weller, 1968). Together, these effects contribute to an increase of the HDI, through improvements in material well-being, education and life expectancy. Finally, a greater presence of women in politics has been shown to enhance domestic institutions (Dollar et al., 2001; Duflo & Topalova, 2004; Iyer et al., 2012) and encourage public investments in education and health, with a reduction of the gender bias in public policy (Abrams & Settle, 1999; Chattopadhyay & Duflo, 2004; Kenny & Lott, 1999; Swers, 2001). For these reasons, all indicators of the Human Development Index should increase.

3. Guiding Framework & Hypotheses

For life satisfaction, the guiding framework relies on the fact that gender inequality affects SWB if it alters people's ability to accomplish their objectives. Societal gender gaps are created when opportunity structures (e.g. labour market participation), action resources (e.g. education) and power structures (e.g. political representation) are unequally distributed between women and men (Tesch-Romer et al., 2008). These three dimensions, especially opportunities and resources, are necessary to reach goals and ambitions, which subsequently affect individual subjective well-being. If women have restricted access to action resources and societal opportunities to pursuit their objectives – as it is the case in more unequal societies –, they are more likely to report a lower life satisfaction on average. This should consequently reduce the mean level of SWB in the country. Inversely, a higher percentage of the population will be able to reach their objectives if the society favours gender equality, resulting in a higher average national SWB.

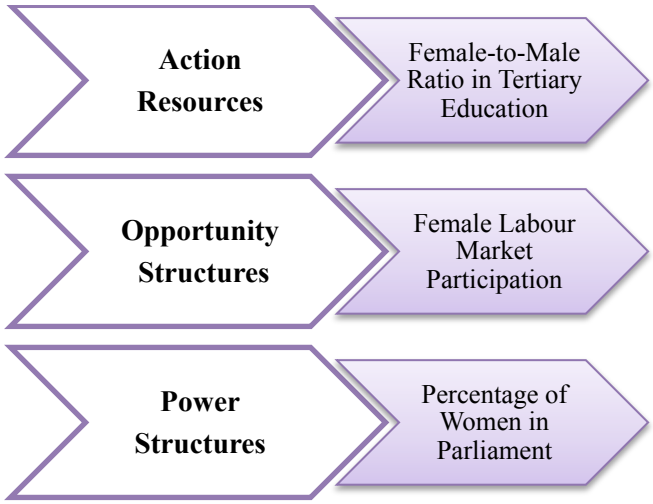


Figure 3.1. Guiding framework: visual representation of well-being's components

Moreover, when it comes to happiness and life satisfaction, the relativistic model could also be at work. It suggests that SWB depends on how one's resources compared to one's past level or the level of others, and not on one's absolute level of resources (Diener et al., 1995). According to the relativistic model, women would report lower life satisfaction because SWB also depends on the level of women's resources compared to men's standards, expected to be higher in less equal societies. If women report lower SWB, it will decrease the national mean. The gender parity index for enrolment in tertiary education, the ratio of female to male labour force participation rate and the percentage of women in parliaments are the

three macro-level indicators describing the extent to which women are deprived or excluded from action resources, opportunity structures and power structures, respectively. Women will report lower well-being if they are lacking the necessary resources to reach their objectives, i.e. if they encounter barriers to access tertiary education, the labour market and the political sphere, while men don't.

Even though they are based on different indicators and do not have the same scale, the Human Development Index and self-reported life satisfaction are simply two different approaches to measure the same concept: national welfare. Therefore, the guiding framework that applies to subjective well-being can also be easily linked to the objective well-being measure. More action resources for women – through a reduction of the educational gender gap – directly result in lower fertility and child mortality rates (Hill & King, 1995; Klasen & Lamanna, 2009). These two effects combined increase the life expectancy at birth. As a consequence, the HDI score also improves. Then, enhancing opportunity structures by raising women's participation in the labour market relative to men is expected to have a positive impact on economic growth (increasing the GNI per capita), and on the offspring's education (mean/expected years of schooling) and health (life expectancy) thanks to the increase of women's bargaining power. As a consequence, the three outcomes lead to a rise in objective well-being. Lastly, the power structures in our societies may reveal discrimination against women and this results in lower well-being. Reaching perfect parity in power structures is expected to improve the HDI score, through the augmentation of public investment in education and health, and less corruption.

Based on prior research and the guiding frameworks above, all explanatory variables are expected to have a positive impact on the two well-being measures. Consequently, eight hypotheses are defined as follows.

H1a: If the gender gap in tertiary education (as measured by the ratio of women to men enrolled in tertiary education) is reduced, then national life satisfaction increases.

H1b: If the gender gap in tertiary education narrows, then the HDI score of the country improves.

H2a: If the gender gap in employment (as proxied by female to male ratio in labour force participation) diminishes, then national life satisfaction raises.

H2b: If the gender gap in employment decreases, then it enhances the national HDI score.

H3a: If the gender gap in political outcomes (as measured by the percentage of women in parliament) narrows, then national life satisfaction increases.

H3b: If the gender gap in political outcomes is reduced, the HDI score of the country augments.

H4a: If the three dimensions of gender equality are combined, then they have a positive joint impact on national life satisfaction.

H4b: If the three dimensions of gender equality are combined, then they have a positive joint impact on the national HDI score.

The last two hypotheses seem obvious if each aspect already has a positive impact on well-being. It however remains important to test their combined effect. As explained in the next sections, the three aspects of gender equality are correlated with each other, both in terms of real-life channels and data, and correlation coefficients. Countries with greater gender parity in tertiary education usually have more women on the labour market and in politics. If the dimensions all have a significant impact on SWB and the HDI, including only one of them would automatically result in an omitted variable bias (OVB) (Mitra, et al., 2015; Moorhouse, 2017). Hypotheses *H4a* and *H4b* are thus tested to minimize potential OVB. The next section explains the five main variables and graphs scatter plots and trend curves to better understand those relationships.

4. Descriptive Statistics

4.1. Life Satisfaction

Although economists are now emphasizing human development over pure economic growth, measuring subjective well-being remains a real challenge. SWB highlights the self-reported evaluation of a person's life and consists of four dimensions: 1) pleasant emotions; 2) unpleasant emotions; 3) global life evaluation and 4) domain satisfaction (financial situation, health, marriage, etc.) (Conceição & Bandura, 2008). It is worth mentioning that happiness and life satisfaction are different concepts. Both components of SWB, life satisfaction captures a person's perceived distance from his/her aspirations while happiness is determined by positive and negative affects. Despite these dissimilarities, the two terms are often used interchangeably in academic research, particularly by economists. This study will focus on life satisfaction as a measure of SWB. Self-reported life satisfaction is provided by the different values studies across the globe, such as the World Values Survey (WVS, 2014). The latter is a worldwide questionnaire survey, which focuses primarily on political, cultural, gender and economic attitudes. In the WVS, the following question is asked: "All things

considered, how satisfied are you with your life as a whole these days?" Respondents select a number between 1 (= very dissatisfied) and 10 (=very satisfied) to indicate their level of subjective well-being. The national mean is then computed.

Numerous economists have used the life satisfaction component as an indicator of SWB (Tesch-Romer et al., 2008; Sacks, Stevenson & Wolfers, 2010). Indeed, it has several advantages but by being subjective, it also introduces some issues. First of all, subjective well-being is a multidimensional concept, just as objective well-being. Life satisfaction thus does not entirely capture the concept of well-being – there are things in life that remain more important, such as freedom, rights or justice (Conceição & Bandura, 2008). Secondly, life satisfaction surveys have been the target of criticisms: not suitable for cross-country comparisons due to cultural and language differences, psychological factors affecting responses, etc. However, tests have rejected or moderated most concerns. No-response rates are very low and life satisfaction questions tend to be answered very promptly. Besides, immigrants surveyed have been found to give scores more similar to the level of the local population than to their motherland (Economist Intelligence Unit, 2005).

Despite some limitations, life satisfaction surveys capture the influences of various aspects of well-being and thus complete existing indicators (Diener, Inglehart & Tay, 2013). The scale from 1 to 10 considers respondents' values and preferences, not to mention the outcomes of their choices. Those surveys provide a helpful extension in evaluating SWB in societies due to their relative inexpensiveness and their simple process. Furthermore, research suggests that national average life satisfaction mirrors quality of life differences across countries, providing evidence for the validity of life satisfaction scales. Among many others, GDP per capita, civil and political rights, and lower levels of corruption are strongly correlated with national mean levels of life satisfaction (Diener et al., 1995; Diener et al., 2013). Lastly, at the individual level, self-reported life satisfaction is sensitive to changes in life conditions, such as becoming unemployed (Lucas, Clark, Georgellis & Diener, 2004). However, this work uses national mean scores so variations should be limited to important countrywide changes, such as in the institutional quality for instance.

This study covers four five-year waves of the WVS (2014), namely 1995-1999, 2000-2004, 2005-2009 and 2010-2014. In addition, the sample was extended with several European countries by collecting data from the European Values Study (EVS, 2015). Due to different timespans, the 2nd wave in 1990 covers 1995-1998, the results in 1999 refer to 1999-2007 and the 2008 EVS wave deals with the last seven years of the WVS, 2008-2014. Waves of both

WVS and EVS do not always include the same countries and some of them had data for only 15, 16, 17 or 18 years instead of 20, whence the 1,161 observations.

Table 4.1. Descriptive Statistics of Main Variables

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
HDI	1,182	0.780	0.108	0.428	0.946
Life Satisfaction	1,161	6.659	1.101	3.73	8.51
Tertiary Education	937	1.231	0.262	0.54	2.03
Labour Participation	1,200	69.686	17.321	11.05	96.14
Women in Parliament	1,190	19.009	10.882	0	47.3
Log(GDPpc)	1,200	9.630	0.835	7.390	11.526
Institutions	960	0.574	0.915	-1.9	1.97
Postcommunist	1,200	0.3	0.458	0	1
Latitudes	1,200	41.875	12.943	4.6	64.15
CO2	1,200	1.823	1.224	0.09	6.89

4.2. Human Development Index

The indicator of objective well-being exploited in this thesis is the Human Development Index. It was created by economists for the UNDP, as GDP did not provide a realistic picture of human well-being (UNDP, 2018). It is a composite index based on three dimension indices: life expectancy, education and per capita income. The HDI is the geometric mean of these three normalized indices[2]. 189 countries are thus ranked according to their HDI score, varying between 0 and 1. In 2018, Norway ranked first with a score of 0.953 and Niger obtained the worst value, 0.354 (UNDP, 2019). Moreover, the HDI is divided into four categories: 1) the low development level, up to 0.550; 2) the medium level with scores between 0.550 and 0.699; 3) the high category for countries between 0.700 and 0.799; and 4) the very high development level, with values above 0.800 (Jahan, 2016). Naturally, the HDI is related to well-being through the dimensions it indicates (UNDP, 2018). A longer life expectancy at birth represents a long and healthy life. The education index indicates to which extent inhabitants are knowledgeable, as measured by mean years of schooling for adults aged

[2] Appendix C provides a detailed explanation to compute the HDI, with the example of Chile in 2011.

25 years and more, and expected years of schooling for children of school-entering age. Lastly, the GNI per capita (PPP $) reveals if people have a decent standard of living in the country.

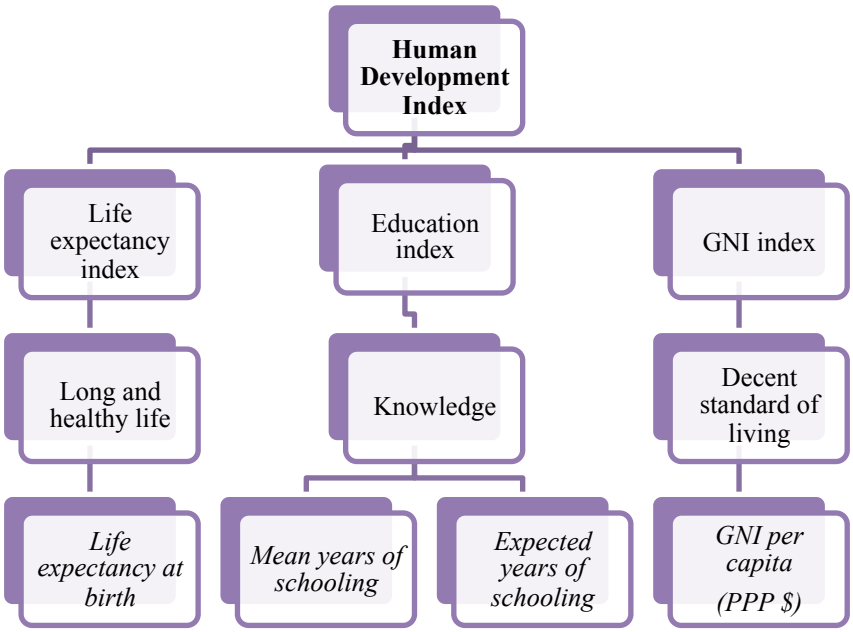


Figure 4.1. The Human Development Index: its indices, dimensions and indicators

The main advantages of using the HDI are that it captures the multidimensionality of welfare and allows for systematic and regular cross-country comparisons. Indeed, this index is based on easily measurable and comparable indicators. Those include both social and economic variables instead of the simplistic income-based approach – i.e. GDP per capita –, a substantial improvement for the different fields in economics. It also helps to easily keep track of country-level development trends over time and reflects ameliorations in living standards across the world. It is important to highlight that in 2010, a "new" HDI was implemented. Three of the four indicators were changed in order to answer criticisms (Al-Hilani, 2012). Before the GNI, the GDP per capita was used but it overlooked some aspects of economic activity such as housework, and was solely referring to a person's average income, an inadequate measure for their actual income. Then, mean years of schooling now replace the literacy rate because it entails a better discriminatory power. Furthermore, HDI underwent two major changes in its construction. It is now computed with a geometric mean and not the arithmetic one, to cancel perfect substitutability between the dimensions (Desai, 1991). And the logarithm of GNI per capita was introduced to account for diminishing returns to income.

Even though the HDI has been improved, it still suffers from shortcomings: 1) the index does not have a strong theoretical foundation nor a clear definition of well-being; 2) the

four indicators were chosen based on data availability and "conventional wisdom"; and 3) it does not distinguish "means" from "ends" of well-being (Burchi & De Muro, 2016). Additionally, the HDI tends to oversimplify an extremely complex reality (Conceição & Bandura, 2008) and it has also been criticized for neglecting the heterogeneity within a country in terms of human development. However, if we assume that this heterogeneity is low in comparison to the heterogeneity between countries, it should not be a problem in this study. Moreover, this index – like many others – suits the issues in developing nations, but fails to capture the more advanced steps of human capabilities in industrial countries (which represent the majority of the sample here). Measuring well-being with the HDI in high-income nations should thus focus on more complex outcome indicators (Anand & Sen, 1994), such as healthy life expectancy at birth or completion rate in secondary education. Nevertheless, Burchi and De Muro (2016) argue that the choice of components was based on data availability and made as to maximize the comparability between nations. And that is exactly for these reasons that the HDI can be used as a well-being index in this study, while keeping in mind that future research should focus on creating better well-being indicators, consisting of various dimensions like housing, health, safety, etc.

Data were collected from the UNDP database (2019) for 1995-2014. With a few missing variables, the number of observations reaches 1,182. The mean HDI score is around 0.780, which is also the result of Georgia in 2018, ranked 70th out of 189. As it can be seen in Table 4.1, the minimum score is 0.428 (Pakistan in 1995) but it remains above the worst score of 2018: Niger with 0.354. It can be inferred that the countries in this sample exhibited greater levels of well-being over time than the entire world sample did. This could later bias the estimates.

4.3. Gender Gap in Education

One of the first institutions where gender discrimination can be experienced is the education system. Most of the academic research focuses on primary and/or secondary education for world analysis(Hill & King, 1995; Klasen, 2002; Klasen & Lamanna, 2008). However, most of the countries in this study are classified as high-income countries (36 out of 60), where obligatory schooling laws can be enforced efficiently and public schools are in principle free. Discrimination against girls might not be clearly visible at the two lower levels of education, especially in this sample. Therefore, it seems more interesting to look at tertiary education where gender gaps are more likely to appear for various reasons.

First of all, studies become much more expensive at the tertiary level. Tuition fees can reach important amounts, without mentioning the necessary material like books and laptop computer. Colleges and universities being mainly located in big cities, the distance from home may require a new accommodation for the student. Consequently, tertiary education can become unaffordable for low-income families. If boys are favoured in the patriarchal society and thought to bring higher future returns, parents will be more willing to dedicate the education expenditures to their son(s) (Hill & King, 1995). Moreover, there is no law about compulsory education after completing secondary education – usually for teenagers above 17-18 years old (World Policy Analysis Centre, 2019). If girls are discriminated against in the country, they are more likely to be removed from the educational system to help at home for chores. Then, tertiary education is often associated with better career opportunities and earnings for citizens in more developed countries. A clear gap in this dimension of gender inequality would reveal worse outcomes for women on the labour market and the political scene as well. Lastly, using the gender gap in tertiary education instead of primary and/or secondary levels allows a greater number of observations.

Gender gap in education is measured by the gender parity index (GPI) for gross school enrolment in tertiary education, with data retrieved from the World Bank (2019). This is the ratio of women to men enrolled in tertiary education, at both private and public schools. A GPI below 1 indicates that girls are discriminated against, in terms of learning opportunities. With an index above 1, boys are more disadvantaged than girls. Table 4.1 indicates surprising statistics: the mean school enrolment is 1.231, meaning that women represent around 55 per cent of the students. At first sight, we could think that women are more advantaged than men in tertiary education. If women are generally more educated in OECD countries, the variable however does not distinguish between the different subjects and this does hinder gender gaps in the most profitable fields. Indeed, women are under-represented in the fields of science, technology, engineering and mathematics (STEM), and finance, but over-represented in health and welfare studies (OECD, 2017).

4.4. Gender Gap in Employment

The gender gap in education is intrinsically linked to gender inequalities in the labour market, as already explained in the literature review. Even though they are strongly correlated to each other, it remains important to investigate the two gender gaps separately as they do measure different concepts. They might not depend on each other if institutional factors are

determining either the access to education or to employment, such as a policy for universal education but which does not tackle barriers for women in the labour market. Then, some externalities of female education will differ from those of female employment. To measure gender inequality in the labour market, this research focuses on the labour force participation rates. As mentioned by Klasen and Lamanna (2009), data on gender gaps in labour force participation should be reasonable proxies for gender gaps in overall employment rates. The unemployment rates (the difference between the two) show very similar data for women and men (less than 1 percentage point) and data for formal-sector employment are not reliable.

In this study, the gender gap in employment is measured by the ratio of female to male labour force participation rate, expressed as a percentage. The labour force participation rate describes the proportion of the population that is 15 years old and older, and economically active. These statistics are modelled ILO estimates, thus resulting in no missing data (i.e. 1,200 observations). They are based on labor force surveys, censuses, and establishment censuses and surveys, in order to maximize their cross-country comparability. Data are retrieved from the World Bank (2019).

4.5. Gender Gap in Politics

The increasing presence of women in national parliaments has been found to reduce the gender bias in public policy design. As explained above, a greater percentage of women in governments seems to improve numerous institutional variables in societies, which are directly and indirectly related to well-being.

To capture the voice of women in the design and implementation of policies, the Inter-Parliamentary Union (IPU) (2019) provides data on the percentage of women in national parliaments for each year. For the 1,190 observations, on average, only 19 per cent of the parliament members were women. Jordan was the only country of the sample with absolutely no female members between 1997 and 2000. The summary statistics in Table 4.1 also reveal a sad truth: none of the country had reached perfect parity in parliament by 2014. Fortunately, there was a positive trend, with more women entering national parliaments over time.

4.6. Graphs

4.6.1. Subjective well-being & gender gaps

Graphs 1.A, 1.B and 1.C represent the relationship between life satisfaction, or subjective well-being, and the different gender gaps. Each graph is composed of two distinct graphs. The

first one is a scatter plot of the relationship (the dark blue dots), while the orange line shows the quadratic trend between the two variables, with the fitted values. It calculates the prediction for the dependent variable from a linear regression of well-being (in this case) on the explanatory variable and the squared of that same variable, to plot the resulting curve. In Graph 1.A, the fitted values of the quadratic trend draw a concave parabola. Interestingly, the maximum indicates that perfect gender equality in tertiary education, that is a ratio equal to 1, would not maximize well-being, while some discrimination against men would do so. This outcome could be due to the fact that women's education results in more positive externalities than men's education (Schultz, 2002), and thus leading to better subjective well-being levels, up to a certain extent. In order to compute the coordinates of the maximum, the first derivative of the following quadratic function is taken:

$$LifeSatisfaction = \gamma_1 GGEducation + \gamma_2 (GGEducation)^2$$

Solving for *GGEducation* indicates that subjective well-being is maximized when the ratio of female-to-male in tertiary education is equal to 1.123, and not 1. Then, Graph 1.B displays a relation in the form of concave parabolas, meaning that increasing the participation of women in the labour market improves the national self-reported life satisfaction but only up to a participation of around 63 per cent of that of men. After that maximum, the positive effect diminishes, with most of the observations. This particularity will be analysed in Section 7.2. Regarding the number of women in parliaments (Graph 1.C), it is a constantly increasing curve, depicting a positive relationship with subjective well-being, as expected. However, the maximum in this sample does not reach the 50 per cent and it is thus impossible to know if once women become a clear majority in parliaments, the positive trend could be reversed.

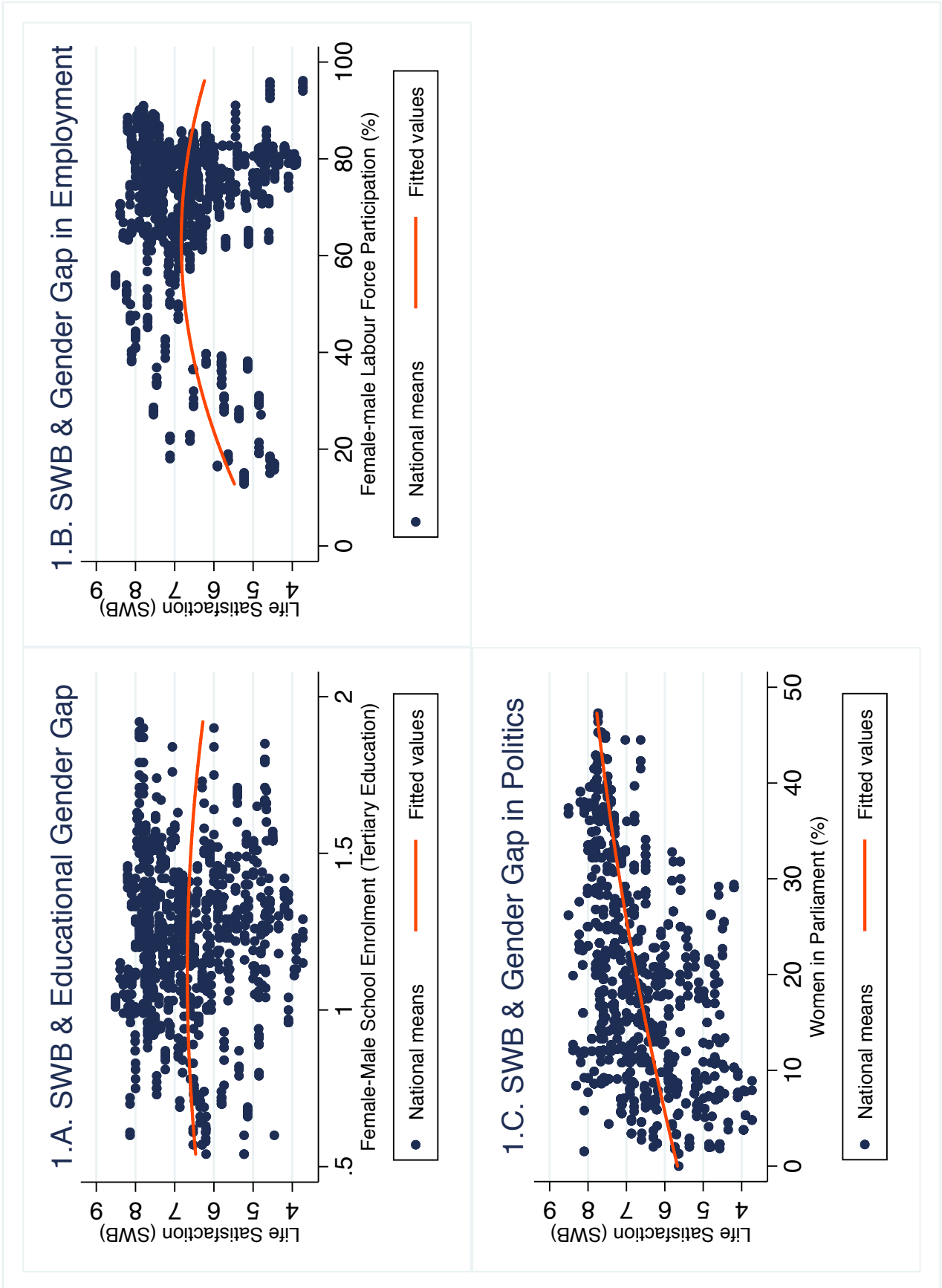
4.6.2. HDI & gender gaps

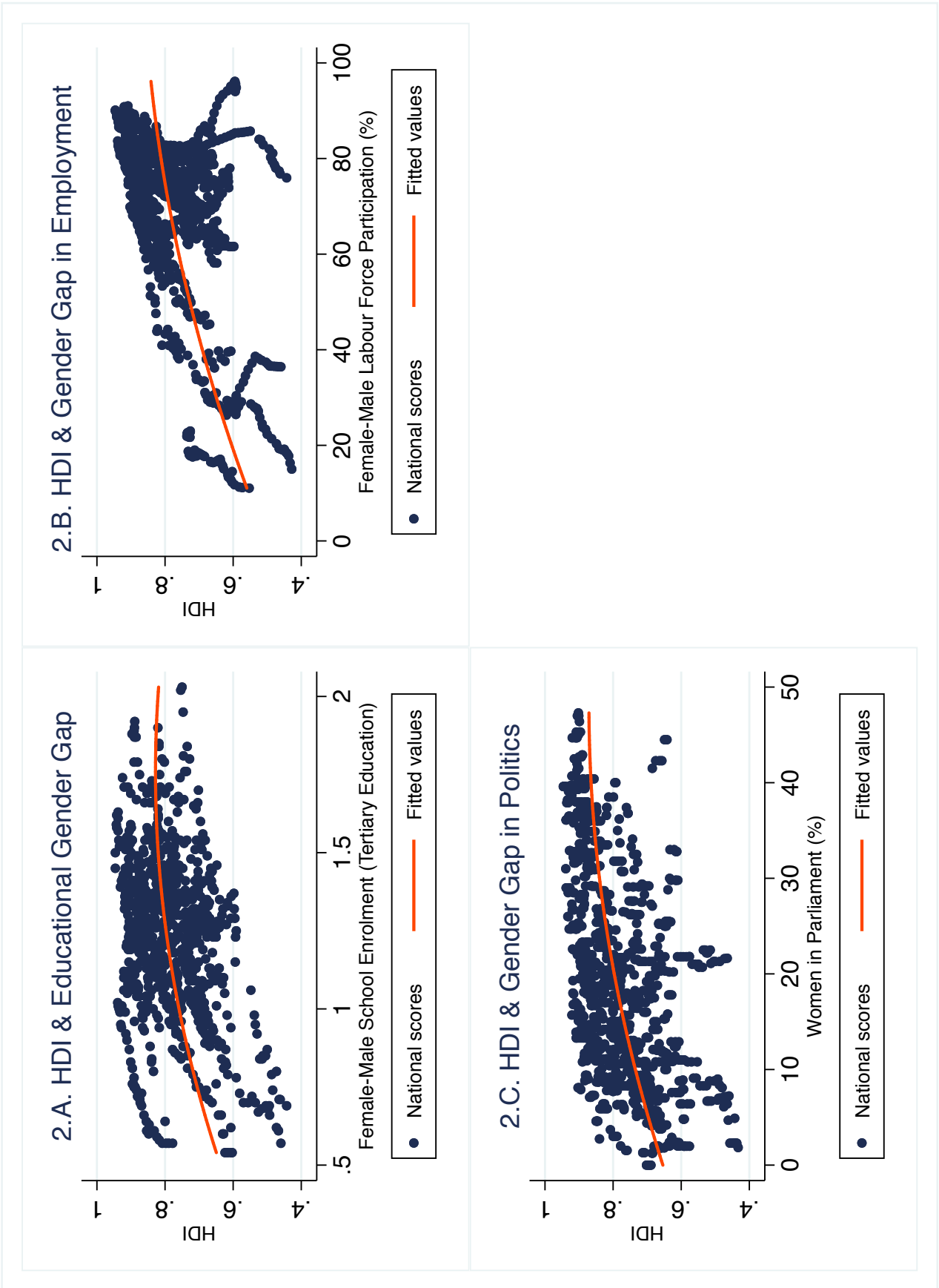
When it comes to objective well-being, we can observe on Graph 2.A a clearly positive trend from both the scatter plot and quadratic fitted values. However, the curve displays a parabola again, but with a maximum even higher than for SWB, above a ratio of 1.5. The same hypothesis as for SWB can be advanced here: given its numerous positive externalities on health, economic growth and education, women's schoolings will lead to major improvements in the HDI score. To know the exact value at which the HDI rate is maximized, the following equation is derived: $HDI = \gamma_1 GGEducation + \gamma_2 (GGEducation)^2$.

After solving for *GGEducation,* the obtained result of 1.756 means that human development is maximized when women represent around 64 per cent of students enrolled in tertiary

education. Then, the scatter plot of Graph 2.B has a singular shape, with some observations that seems to create trends, somehow independent from the general mass. However, it must be reminded that the data on labour force participation are ILO estimates, whence some very clear sequences. The orange curve clearly defines a constantly increasing trend between human development and women's participation, relative to men, on the labour market: countries with lower gender gaps in the labour force experience higher national well-being.

There are a few outliers which deserve a deeper examination. On the left side, we find four countries with the lowest labour participations for women relative to men: Iraq, Jordan, Pakistan and India (which follows a negative trend). On the right side, there is Nigeria which increases both variables over time but starts with a very low HDI and high labour participation ratio, which is a common feature of Sub-Saharan African countries (Baliamoune-Lutz & McGillivray, 2007). Then, China and Moldova are the last two outliers which have a negative trend. When looking closer at the per country evolution of HDI and gender gap in employment, I find that nations in transition have all experienced improvements in their HDI scores but for ten out of the eighteen countries, this was achieved at the cost of a reduction in women's labour force participation. As it will be explained in Section 6, post-communist countries were switching to a market economy after 1991, which helped human development. The high female labour participation rate was a direct outcome of the communist regime, which advocated for gender equality in the work sphere. But the economic transition is said to have encouraged the return to traditional, segmented gender roles in Eastern Europe (Down Metcalfe & Afanassieva, 2005). This is why some nations in transition display a negative trend in Graph 2.B. Then, the case of China is peculiar because the country is still considered as communist but data indicate some sort of transition towards the post-communist scheme: a small reduction in the labour participation ratio combined with an increase in its HDI score over time. In addition to India, two other non-post-communist nations displayed negative trends: Argentina and South Africa. Understanding why they follow a negative tendency requires future research. However, the other 47 nations follow the expected positive trend between women's labour participation and human development. Lastly, from Graph 2.C, it can be unambiguously inferred that there exists a positive link between the HDI and gender parity in political outcomes, but it is marginally decreasing. In other words, countries with a better representation of women in parliament show a higher index of national well-being.


1.A. SWB & Educational Gender Gap
Life Satisfaction (SWB)
4
5
6
7
8
9
.5
1
1.5
2
Female-Male School Enrolment (Tertiary Education)
National means
Fitted values
1.B. SWB & Gender Gap in Employment
Life Satisfaction (SWB)
4
5
6
7
8
9
0
20
40
60
80
100
Female-male Labour Force Participation (%)
National means
Fitted values
1.C. SWB & Gender Gap in Politics
Life Satisfaction (SWB)
4
5
6
7
8
9
0
10
20
30
40
50
Women in Parliament (%)
National means
Fitted values


2.A. HDI & Educational Gender Gap
HDI
.4
.6
.8
1
.5
1
1.5
2
Female-Male School Enrolment (Tertiary Education)
National scores
Fitted values
2.B. HDI & Gender Gap in Employment
HDI
.4
.6
.8
1
0
20
40
60
80
100
Female-Male Labour Force Participation (%)
National scores
Fitted values
2.C. HDI & Gender Gap in Politics
HDI
.4
.6
.8
1
0
10
20
30
40
50
Women in Parliament (%)
National scores
Fitted values

4.7. Controls

4.7.1. Life Satisfaction

Identifying the determinants of subjective well-being at the macro level remains challenging due to the mixed and often contradictory evidence from the literature. However, three variables have been selected according to the academic literature and the Bayesian Information Criterion (BIC). This index is used to determine the best regression among the alternative models (Schwarz, 1978). The model with the lowest BIC score is preferred.

GDP. Several researchers have mentioned *GDP per capita* as being a robust indicator of life satisfaction (Diener et al, 1995; Meisenberg & Woodley, 2015). A higher GDP per capita is associated with a greater material well-being and thus positively impacts the subjective one, because it is likely to influence one's ability to reach personal goals. Here, material well-being is represented by the GDP per capita measured in purchasing-power adjusted international dollars. Data come from the World Bank (2019). To deal with the skewed data, the variable is transformed into the natural logarithm.

Post-Communism. Individuals residing in post-communist nations usually experience a transition period during which social and economic disorders reign. Moreover, communism may have left deep changes in societal norms and attitudes. Those societal changes have negatively affected self-reported life satisfaction (Bjørnskov, Dreher & Fischer, 2008; Sanfey & Teksov, 2007). Here, a dummy variable is created and equals 1 for post-communist countries, 0 for the others[3]. Data on nations in transition are found on the Freedom House website (2018).

Institutional Quality. Numerous studies have emphasized the role of institutions in influencing the national levels of SWB (Bjørnskov et al., 2008; Diener et al, 1995; Meisenberg & Woodley, 2015; Sanfey & Teksov, 2007). The quality of national institutions determines to which extent individuals could encounter barriers on their way to reach their goals. However, different authors mention different dimensions: good economic governance, political stability, or absence of corruption. To account for all aspects, an index of institutional quality is computed as the average of the six following institutional dimensions: Control of Corruption, Government Effectiveness, Political Stability, Regulatory Quality, Rule of Law, and Voice and Accountability (World Bank, 2019). The index runs from -2.5 to 2.5 (perfect quality of institutions). A higher level of institutional quality is expected to have a

[3] China is a particular case, as it is still a communist nation. Yet, it remains in the "non-post-communist" category, taking the value of 0.

positive effect on self-reported life satisfaction. It must be noted that data on institutional quality were not available for the following four years: 1995, 1997, 1999 and 2001.

4.7.2. Human Development Index

Three variables related to the HDI and gender equality have been selected in order to build the best model in this situation. Once again, I used the BIC strategy to identify the most appropriate controls.

Institutional Quality. Human development and institutions are intrinsically related. Better institutions protect individuals' rights and ensure law enforcement, also when it comes to gender equality. They boost economic development, condition the behaviour of the government (Özcan & Bjørnskov, 2011) and encourage government expenditures in health and education. All these elements will thus improve the three indices of the HDI. This variable is the same as for life satisfaction, with an index ranging from -2.5 to 2.5.

Latitudes. Latitudes are included to capture the bio-geographical determinants of human development (Özcan & Bjørnskov, 2011). The distance from the equator indicates numerous factors shaping the natural living conditions of human societies, such as climate. The further we move from the equator, the higher the HDI score becomes and vice versa (Kummu & Varis, 2011). The latitude for each country represents the geographical coordinates of its capital and the absolute values of southwards latitudes were taken. Data are collected from the World Cities Database (SimpleMaps, 2019).

CO^2 *emissions.* Using GDP per capita as an indicator of economic development leads to a very high correlation with the HDI. To solve this issue, the variable "per capita CO^2 emissions" (in metrics tons) establishes itself as a good substitute, and it has already been linked to human development (Klugman, 2011). Data come from the Carbon Dioxide Information Analysis Centre (CDIAD, 2019).

5. Methodology

This study covers an unbalanced panel dataset of 60 countries over a period of 20 years, namely 1995-2014, thus resulting in 1,200 observations. The estimation strategy first regresses the two well-being measures on each gender gap separately to identify their individual impact. It then groups the three dimensions within two regressions, one for HDI and a second one for life satisfaction, to estimate the overall impact of gender equality on

well-being. The econometric method used in this study is the linear Ordinary Least Squares (OLS) method. The OLS estimates are obtained by minimizing the sum of the squared residuals (Wooldridge, 2015). This econometric method seems to be the best option here given that the analyses consist of multiple linear regression models for a cross-country analysis. Regressions are first run without any fixed effects. In Section 7, year and/or country fixed effects are included in the baseline models to reduce the likelihood of omitted variable bias. The following equations refer to the eight hypotheses developed earlier.

H1a: $LifeSatisfaction_{it} = \alpha + \beta_1 GGEducation_{it} + \beta_2 \mathbf{X}_{it} + \epsilon_{it}$ (1)

H1b: $HDI_{it} = \alpha + \beta_3 GGEducation_{it} + \beta_4 \mathbf{H}_{it} + \epsilon_{it}$ (2)

H2a: $LifeSatisfaction_{it} = \alpha + \beta_5 GGLabour_{it} + \beta_6 \mathbf{X}_{it} + \epsilon_{it}$ (3)

H2b: $HDI_{it} = \alpha + \beta_7 GGLabour_{it} + \beta_8 \mathbf{H}_{it} + \epsilon_{it}$ (4)

H3a: $LifeSatisfaction_{it} = \alpha + \beta_9 GGPolitics_{it} + \beta_{10} \mathbf{X}_{it} + \epsilon_{it}$ (5)

H3b: $HDI_{it} = \alpha + \beta_{11} GGPolitics_{it} + \beta_{12} \mathbf{H}_{it} + \epsilon_{it}$ (6)

H4a: $LifeSatisfaction_{it} = \alpha + \beta_{13} GGEducation_{it} + \beta_{14} GGLabour_{it} + \beta_{15} GGPolitics_{it} + \beta_{16} \mathbf{X}_{it} + \epsilon_{it}$ (7)

H4b: $HDI_{it} = \alpha + \beta_{17} GGEducation_{it} + \beta_{18} GGLabour_{it} + \beta_{19} GGPolitics_{it} + \beta_{20} \mathbf{H}_{it} + \epsilon_{it}$ (8)

Each variable is measured for country *i* in year *t*. The **X** in equations (1), (3), (5) and (7) represents the control variables used for life satisfaction. Similarly, the **H** in the other four equations indicates the controls for the HDI. α describes a constant and ϵ_{it}, the error term.

5.1. Econometric Concerns

One major issue encountered in econometric analyses is the potential presence of reverse causality. In this case, gender inequality is expected to have an impact on well-being measures. But do HDI and life satisfaction also affect gender inequality? There are a few indirect channels through which variations in welfare can actually lead to changes in gender equality. The most obvious one is economic development. As mentioned by Duflo (2012), economic growth can indeed reduce gender inequalities by allocating more resources to households. Those additional resources directly improve the material well-being of family's members and can be translated into a better access to action resources, opportunity and power structures for everyone. There is thus a link between economic growth and improvements in

life satisfaction and human development. But these exact same changes also help alleviate poverty and decrease the vulnerability of women when it comes to education, employment and politics. Thus, economic development, which is related to both objective and subjective well-beings, results in a reduction of gender inequalities. Another potential indirect channel of reverse causality can operate through policies. For example, a country with a low HDI score might decide to tackle its low education level by implementing compulsory schooling, and thereby reducing the gender gap in education. In this case, a low level of objective well-being can indirectly narrow the educational gender gap. Consequently, reverse causality cannot be rejected.

Many previous studies have focused on solely one dimension of gender equality, such as education (Hill & King, 1995; Klasen, 2002) or employment (Seguino, 2000; Schober & Winter-Ebmer, 2011). However, it rejects the multidimensional nature of gender equality and leads to an omitted variable bias, as other aspects are excluded from the regression. One solution to capture some of the omitted variables is to include fixed effects. New regressions with year and/or country fixed effects will be displayed in Section 7.1 as part of the robustness checks. Nevertheless, including all gender gaps as separate variables in the model ignores the multicollinearity present between them (Mitra et al., 2015; Moorhouse, 2017). Indeed, another problem in this type of studies is the strong correlation between gender gaps in education and in employment (Klasen & Lamanna, 2009). Therefore, to fully capture gender inequality, using an index such as the UN's Gender Index sounds like a better option. But by aggregating all aspects in one measure, it is impossible to isolate the respective impact of each dimension on the dependent variable and measurement errors are likely to arise. To analyse some of the concerns, I created a Pearson correlation matrix (Table 5.1). The matrix shows three results above 0.5, which deserve some attention. Given the link between the education and employment, a correlation of 0.5291 seems rather high but not problematic. Then, the correlation between life satisfaction and the HDI reaches 0.5290 and this is explained by the fact that they measure the same concept and have several determinants in common, such as material well-being (Economist Intelligence Unit, 2005). Lastly, the HDI and labour participation exhibit a correlation of 0.5215. As research suggests, a greater female participation on the labour market is linked to greater bargaining power for women, who allocate more households' resources to children's education and health, ultimately boosting human development. A surprising result from the matrix is that one score is negative, extremely low and not significant at the 10% level: the correlation between life satisfaction and the gender gap in tertiary education. Looking closer at the data, it can be seen that

numerous post-communist countries are included in the sample. Several studies have mentioned a particularity in those nations' scores for life satisfaction: they all tend to report lower SWB. However, they also have, on average, higher rates of labour force participation and enrolment in tertiary education for women, relative to men (Tables A.1 and A.2 in appendix A). The combination of these elements may explain the negative correlation between the variables.

Table 5.1. Pearson Correlation Matrix of Main Variables

	Life satisfaction	**HDI**	Tertiary Education	Labour Participation	Women in Parliament
Life satisfaction	1.000				
HDI	0.5290	1.000			
Tertiary Education	-0.0198	0.3615	1.000		
Labour Participation	0.1018	0.5215	0.5291	1.000	
Women in Parliament	0.4514	0.4964	0.3314	0.4332	1.000

6. Results

The OLS estimations of the subjective well-being equations are presented in Table 6.1. Column (1) shows the regression of life satisfaction on the three controls variables. They are all significant at the 1% level and have the expected sign. Countries with institutions of good quality, higher levels of GDP per capita and without a communist past are more likely to enjoy a higher level of life satisfaction. All else constant, average life satisfaction score is 1.137 point lower in a nation in transition than in non-post-communist countries. Post-communism seems to impose a substantial penalty on SWB. Between regressions (1) and (2), there is an important drop in the number of observations. This is due to the numerous missing data for the explanatory variable of gender parity in education. In the second regression, *Institutions* becomes insignificant. The measure of educational gender gap shows that when the ratio in tertiary education changes from 0.8 to 0.9, the average life satisfaction would increase by 0.042. Regarding the labour market, a 10 percentage point increase in the women's labour force participation relative to men augments the average self-reported life

satisfaction by 0.06 point. The coefficient is again significant and positive, and the institutional quality recovers its significance as well. Column (4) presents the hypothesis *H3a* and estimates suggest that a better representation of women in power structures has a positive and significant effect on SWB. Ceteris paribus, of the number of seats held by women in the parliament rises from 30 to 40 per cent, the average life satisfaction would increase by 0.1 point. Those results support the first three hypotheses *H1a, H2a* and *H3a*. Individually, each of the three dimensions of gender equality exerts a positive and significant effect on the national mean level of life satisfaction.

Table 6.1. OLS Regressions of Life Satisfaction on Gender Gaps

	(1)	(2) *H1a*	(3) *H2a*	(4) *H3a*	(5) *H4a*
Institutions	0.214***	0.089	0.155***	0.190***	0.095*
	(0.054)	(0.055)	(0.049)	(0.055)	(0.056)
Log(GDPpc)	0.410***	0.482***	0.401***	0.370***	0.448***
	(0.052)	(0.054)	(0.050)	(0.052)	(0.056)
Postcommunist	-1.137***	-1.287***	-1.231***	-1.115***	-1.195***
	(0.057)	(0.063)	(0.058)	(0.058)	(0.076)
GGEducation		0.419***			0.332***
		(0.102)			(0.109)
GGLabour			0.006***		-0.004
			(0.002)		(0.003)
GGPolitics				0.010***	0.010***
				(0.002)	(0.003)
Observations	934	748	934	929	745
R^2	0.606	0.623	0.612	0.613	0.628

Notes: The dependent variable is the national mean level of self-reported life satisfaction. Estimation method is linear OLS. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

The last regression tests the combined impact of the three explanatory variables. Surprisingly, the coefficient for women's labour force participation becomes negative and insignificant. This change could be explained by the rather high correlation between the gender gaps in education and employment. When *GGPolitics* is excluded from the last regression, the presence of tertiary education also cancels the influence of *GGLabour* (Table A.7, column (1)). To interpret the combined effect, perfect gender equality in the three dimensions

(*GGEducation* = 1, *GGLabour* = 100 and *GGPolitics* = 50) would account for 0.432 point[4] of the average national life satisfaction, all else constant. Therefore, the next step is to analyse the joint significance of the three aspects of gender equality. I performed a Wald test in order to know if the parameters of interest are simultaneously equal to zero. The test reveals that the three dimensions of gender equality are jointly significant with an F-test of 10.14 (Prob > F = 0.00). Even if one of the coefficients remains insignificant, they do have a significant and positive combined effect on subjective well-being, supporting the hypothesis *H4a*.

Due to the particular effect of post-communism on SWB, the sample has been divided according to this characteristic, instead of using the dummy as a control variable, in Table 6.2. As a reminder, post-communist nations were found to have less discrimination against women in tertiary education and in labour market, but a much lower mean life satisfaction score than other countries (see Tables A.1 and A.2[5]). The regression based on *H4a* is run twice: column (1) represents the non-post-communist nations and column (2) the post-communist ones. The first regression indicates that the three aspects of gender equality remain significant (at least at the 10% level) and positive. Perfect gender equality in tertiary education, labour participation and parliaments would account for 1.456 points of the overall life satisfaction score in non-post-communist countries. The F-statistic of 20.60 from the Wald test gives evidence that the three parameters of interest are jointly significant. Nonetheless, it should be mentioned that *Log(GDPpc)* loses its significance and this model does not seem to be a very good fit for the sub-sample, with an R^2 of solely 0.329. Inversely, the model appears to be more suitable to post-communist nations (18 in total). The two control variables are significant. Concerning the three variables of interest, *GGEducation* and *GGLabour* become negative and only *GGEducation* and *GGPolitics* stay significant. Yet, they still have a significant combined effect on well-being. According to the estimates, perfect gender equality in nations in transition would have a surprising negative impact on life satisfaction and account for a reduction of 1.433 in the national mean level. How to explain this? Most of the post-communist nations in this sample have very high percentages of women in tertiary education and on the labour market. This could be directly linked to their communist and economic social legacy, which advocated for women's equality within the workplace (Down Metcalfe & Afanassieva, 2005). Gender equality in politics and the work sphere was a central tenet in the communist regimes. Consequently, women's employment in politics, science and engineering was strongly supported by the state, as well as their education. However, the

[4] $(0.332 \times 1) + (-0.004 \times 100) + (0.010 \times 50) = 0.432$

[5] Tables with an A preceding the number can be found in appendix A.

economic and political transition towards a capitalist regime is claimed to have encouraged the return of traditional gender identity and gendered power relations in Central and Eastern Europe. In this case, women are disproportionately affected in post-communist countries. If the post-communist social and economic disorder is combined with the loss of power and opportunity for women, it could result in a negative impact of gender equality on SWB if women's participation in the labour force and education only changes slowly.

Table 6.2. Post-communist VS Non-post-communist

	(1) Post-communist = 0	(2) Post-communist = 1
Institutions	0.112*	0.223***
	(0.059)	(0.080)
Log(GDPpc)	0.113	0.896***
	(0.071)	(0.087)
GGEducation	0.646***	-0.883***
	(0.132)	(0.247)
GGLabour	0.0046*	-0.011
	(0.002)	(0.007)
GGPolitics	0.007**	0.011*
	(0.003)	(0.006)
Observations	468	277
R^2	0.329	0.529
F (Wald test)	20.60	6.83

Notes: The dependent variable is the national mean level of self-reported life satisfaction. The sub-sample in column (1) consists of 42 non-post-communist countries, and in column (2), of 18 post-communist nations. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. Estimation method is linear OLS. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Knowing that gender equality has a positive and significant impact on SWB, it would be interesting to investigate whether this effect also applies to objective well-being. The OLS estimations of the HDI equations are displayed in Table 6.3. Column (1) presents the three controls explained above. They all have a positive influence on the Human Development Index and are significant at the 1% level. Countries with good institutional quality, further from the equator and with high per capita emissions of carbon dioxide are more likely to enjoy a higher level of human development. Additionally, the estimates of each control keep more or less similar magnitudes throughout the different regressions, except for *Latitudes* which loses its significance in the last regression. The next column reports the results for

testing hypothesis *H1b.* The variable of interest indicates that an increase in the education ratio from 0.8 to 1 would improve the HDI score by 0.0106 point, ceteris paribus. When a country reaches perfect gender parity in tertiary education, it would account for 0.053 of the total HDI score. In column (3), all coefficients are positive and highly significant. The estimate for women's labour force participation relative to men can be interpreted as follows. If the gender gap in the labour force is reduced by 10 percentage points, through in increase in women's participation, then the HDI score would rise by 0.007, all else constant. Similarly, the estimates for *H3b* suggest that it cannot be rejected, due to the positive sign and the significance at the 1% level. The HDI rate would enhance by 0.009 point if the number of seats held by women in national parliaments increases by 10 percentage points, all else equal.

Table 6.3. OLS Regressions of **HDI** on Gender Gaps

	(1)	(2)	(3)	(4)	(5)
		H1b	*H2b*	*H3b*	*H4b*
Institutions	0.08***	0.072***	0.075***	0.076***	0.067***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.056)
Latitudes	0.001***	0.001***	0.001***	0.001***	0.0003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.0002)
CO2	0.014***	0.020***	0.014***	0.014***	0.019***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
GGEducation		0.053***			0.034***
		(0.010)			(0.009)
GGLabour			0.0007***		0.0006***
			(0.000)		(0.0002)
GGPolitics				0.0009***	0.0009***
				(0.000)	(0.0002)
Observations	952	761	952	949	758
R^2	0.762	0.778	0.772	0.767	0.792

Notes: The dependent variable is the Human Development Index. Estimation method is linear OLS. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Lastly, regressing the HDI on all gender dimensions reveals positive and very significant results, except for *Latitudes*. The three estimates of interest imply that if there were perfect gender equality in tertiary education, labour participation and parliaments, this would account for 0.139 point of the total HDI rate. Moreover, the Wald test yields an F-statistic of 26.73, meaning that the three dimensions are not simultaneously equal to zero but jointly significant for determining the HDI of a country. Individually, the three variables are economically

significant; the size of each effect is meaningfully large. And collectively, they remain economically significant. To sum up, the four hypotheses about the individual and collective effects of gender equality dimensions on the HDI rate are all supported by the estimates in Table 6.2. Each parameter of interest has a positive and significant coefficient in the regressions.

7. Robustness Analyses

In order to assess the robustness of the results obtained in the previous section, various fixed effects are included into the regressions. Then variations in the sample and control variables are performed and results are interpreted.

7.1. Fixed Effects

In this study, the panel dataset covers 60 countries over 20 years. The 1,200 observations are thus divided per country per year. Based on those characteristics, an alternative method to measure the impact of gender inequalities on well-being is obtained by including time and/or country fixed effects into the main specification. Fixed effects models allow to control for omitted variables in panel data when these ones are expected to be correlated with the explanatory variables, the three dimensions of gender equality. In general, those OLS models include two types of fixed effects: for countries and for time period. Year fixed effects control for macro trends or shocks that affect the sample as a whole (Nunn & Qian, 2011). Over the period studied, macroeconomic shocks occurred, the most important being the 2007-2009 financial crisis followed by a worldwide recession in the late 2000s. For example, a subsequent increase in unemployment could have decreased the national mean level of life satisfaction, as individual SWB is sensitive to the fact of becoming unemployed (Lucas et al., 2004). Time fixed effects can also control for the development of the Internet, natural disasters, epidemics and wars that might have affected all nations similarly. Any systematic measurement error varying by country will be captured by the year fixed effects. It should be noted that country fixed effects cannot be included in the SWB analyses. Post-communism is a very strong determinant of self-reported life satisfaction and it is country-specific and time-invariant over 1995-2014. Country fixed effects would simply cancel the particular effect of transition on self-reported life satisfaction. Besides that, one of the conditions for using them is that the dependent variable must vary enough within country. Data show that it is not the

case for life satisfaction. Consequently, only year fixed effects are added to the main specification of SWB. The new specification for life satisfaction is described by equation (9):

$$LifeSatisfaction_{it} = \alpha + \beta_{21}GG_{it} + \beta_{22}Institutions_{it} + \beta_{23}Log(GDPpc)_{it} + \beta_{24}PostCommunist_{it} + \eta_t + \epsilon_{it} \quad (9)$$

This equation thus results in four regressions, one for each gender gap (represented by GG_{it}) and a fourth one including the three of them. The new term here, η_t , indicates the linear year fixed effects.

Table 7.1. Year-fixed-effect OLS Regressions of Life Satisfaction on Gender Gaps

	(1)	(2)	(3)	(4)	(5)
Institutions	0.325***	0.160***	0.268***	0.290***	0.151***
	(0.025)	(0.032)	(0.019)	(0.033)	(0.027)
Log(GDPpc)	0.249***	0.362***	0.250***	0.238***	0.351***
	(0.049)	(0.052)	(0.052)	(0.054)	(0.051)
Postcommunist	-1.156***	-1.307***	-1.237***	-1.137***	-1.219***
	(0.082)	(0.065)	(0.095)	(0.082)	(0.099)
GGEducation		0.410***			0.347***
		(0.081)			(0.077)
GGLabour			0.005***		-0.004
			(0.001)		(0.003)
GGPolitics				0.008***	0.009***
				(0.002)	(0.003)
Observations	934	748	934	929	745
R^2	0.601	0.621	0.608	0.609	0.626

Notes: The dependent variable is the national mean level of self-reported life satisfaction. Estimation method is linear OLS, with linear year fixed effects. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. This table includes the overall R^2. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Table 7.1 summarizes the estimates when regressing subjective well-being on the three dimensions of gender equality. The first column indicates that as expected, countries with good institutions, a high GDP per capita and that are not post-communist tend to have a greater level of self-reported life satisfaction. Regarding the next regressions, it can be seen that all estimates have the expected sign and are statistically significant at the 1% level. The only exception is *GGLabour*, which becomes negative and insignificant when the three gender gaps are simultaneously included. But this change had already been observed in Table 6.1 without the fixed effects. When comparing the two tables, the estimates for the variables of interest remain of similar magnitudes and barely vary. The combined effect of gender gaps

can be interpreted as follows: if a country reaches perfect equality in action resources, opportunity and power structures, this would account for 0.397 point of the national level of life satisfaction. Without the fixed effects, perfect gender equality explained 0.432 point of SWB. The new result might echo the supposition made above: worldwide shocks, which were not controlled for in Table 6.1, have influenced self-reported life satisfaction. As a consequence, gender equality has a smaller impact now. Concerning the joint significance of the gender gaps, the Wald test reveals an F-statistic of 16.66. It can be concluded that they have a significant combined effect on SWB, even if one of the coefficients remains insignificant. All in all, the results for SWB are clearly robust to the addition of year fixed effects.

For the Human Development Index, three different fixed-effect models can be tested: with year fixed effects, country fixed effects and both of them. As a reminder, one of the conditions for using them is that there must be enough variation within country for the variables of interest. If countries change little across time, standards errors may become too large to tolerate. From the dataset, an interesting detail can be noticed. In general, richer countries appear to have experienced more variations in the female labour force participation and the percentage of women in parliament, while less developed nations have larger changes in their HDI and tertiary education ratio. Including country fixed effects into the main specification can partially solve for the problem of comparability between those different country's characteristics, arising in cross-country studies (Klasen & Lamanna, 2009). In this case, human development can depend on many time-invariant factors, specific to a particular country. Firstly, there are the bio-geographic determinants of a nation, such as its distance from the equator, which determines its climate, whether it is landlocked, etc. (Sachs, Mellinger & Gallup, 2001). The climate of a country may also determine the productivity of its workers or furthermore, its poverty level due to the "disease burden" (Acemoglu, Johnson & Robinson, 2005). All these factors could influence the HDI, and gender equality. Besides, culture is often evoked as an important determinant of human development through religious beliefs, legal systems, and various cultural heritages from the colonizing power (North, Summerhill & Weingast, 2000, as cited in Acemoglu et al., 2005). In this study, the simple OLS method is likely to be biased if the various dimensions of gender equality are determined by the same factors that influence human development. If control variables are already accounting for some factors, there always remains the problem of omitted variables. Fortunately, this issue can be partly solved with fixed effects. As this sample consists of static

panel data, adding country fixed effects will control for all time-invariant characteristics that differ between countries – assuming they do not change, or very slowly, over the 20-year period (Nunn & Qian, 2011). In economic literature, institutions are often named as a variable which can be captured by fixed effects due to its invariance over time (Feyrer, 2009; Nunn & Qian, 2011). But values for the national institutional quality index do vary over the sample period and excluding the control variable from the main specification could lead to a substantial OVB. The three fixed-effects models will be tested according to the following specifications:

$$HDI_{it} = \alpha + \beta_{25} GGs_{it} + \beta_{26} Institutions_{it} + \beta_{27} Latitudes_{it} + \beta_{28} CO^2{}_{it} + \eta_t + \epsilon_{it} \quad (10)$$

$$HDI_{it} = \alpha + \beta_{29} GGs_{it} + \beta_{30} Institutions_{it} + \beta_{31} CO^2{}_{it} + \delta_i + \epsilon_{it} \quad (11)$$

$$HDI_{it} = \alpha + \beta_{32} GGs_{it} + \beta_{33} Institutions_{it} + \beta_{34} CO^2{}_{it} + \delta_i + \eta_t + \epsilon_{it} \quad (12)$$

These equations will examine the combined effect of the gender gaps, defined by GGs_{it}, on the HDI. The terms η_t and δ_i represent the linear year and country fixed effects, respectively. Due to its time-invariance, the control *Latitudes* is removed from regressions (11) and (12).

The fixed-effect OLS estimations of the HDI are displayed in Table 7.2. This table solely shows estimations when the three gender gaps are included in the regression; individual effects can be found in Tables A.8-A.10. Column (1) reproduces the results without fixed effects. The next column includes the year fixed effects. The coefficients all have the expected signs, but there are a few changes. *GGEducation* is 30% smaller, and *GGPolitics* loses all of its significance. However, running a Wald test results in an F-statistic of 35.03, meaning that the three gender gaps are still jointly significant. If there were perfect gender parity in tertiary education, labour participation and parliaments, it would account for 0.089 of the HDI score, against 0.139 without year fixed effects. Regressing equation (11) with country fixed effects results in substantial variations in the parameters of interest. In comparison to column (1), the gender gaps have all trebled in magnitude. These surprising results indicate that gender equality would explain 0.442 of the total HDI rate! Compared to the initial outcome of 0.139, the effect is enormous, also given that the index only ranges between 0 and 1. The numbers imply that the returns to gender equality would be incredibly high in terms of welfare, and thus potentially outweigh the costs to achieve it. It also means that the three dimensions are economically significant. The Wald test yields an F-statistic of 105.28, signifying that the three gender equality dimensions are strongly jointly significant. However, such a change hints at the possibility that country fixed effects might not be the most appropriate for the present model.

Table 7.2. Fixed-effect OLS Regressions of HDI on Gender Gaps

	(1)	(2)	(3)	(4)
Institutions	0.067***	0.072***	0.037***	0.015***
	(0.056)	(0.001)	(0.013)	(0.0056)
Latitudes	0.0003	0.0005***		
	(0.0002)	(0.0001)		
CO2	0.019***	0.020***	0.004	0.018***
	(0.002)	(0.002)	(0.008)	(0.005)
GGEducation	0.034***	0.024***	0.092***	0.020***
	(0.009)	(0.007)	(0.020)	(0.006)
GGLabour	0.0006***	0.0006***	0.002***	-0.0007**
	(0.0002)	(0.0001)	(0.0007)	(0.0003)
GGPolitics	0.0009***	0.0001	0.003***	0.0002
	(0.0002)	(0.0001)	(0.000)	(0.0003)
Year FE		**X**		**X**
Country FE			**X**	**X**
Observations	758	758	758	758
R^2	0.792	0.785	0.620	0.482
Wald test	26.73	35.03	105.28	4.00

Notes: The dependent variable is the Human Development Index. Estimation method is linear OLS, with various linear fixed effects. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. This table only includes the overall R^2. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

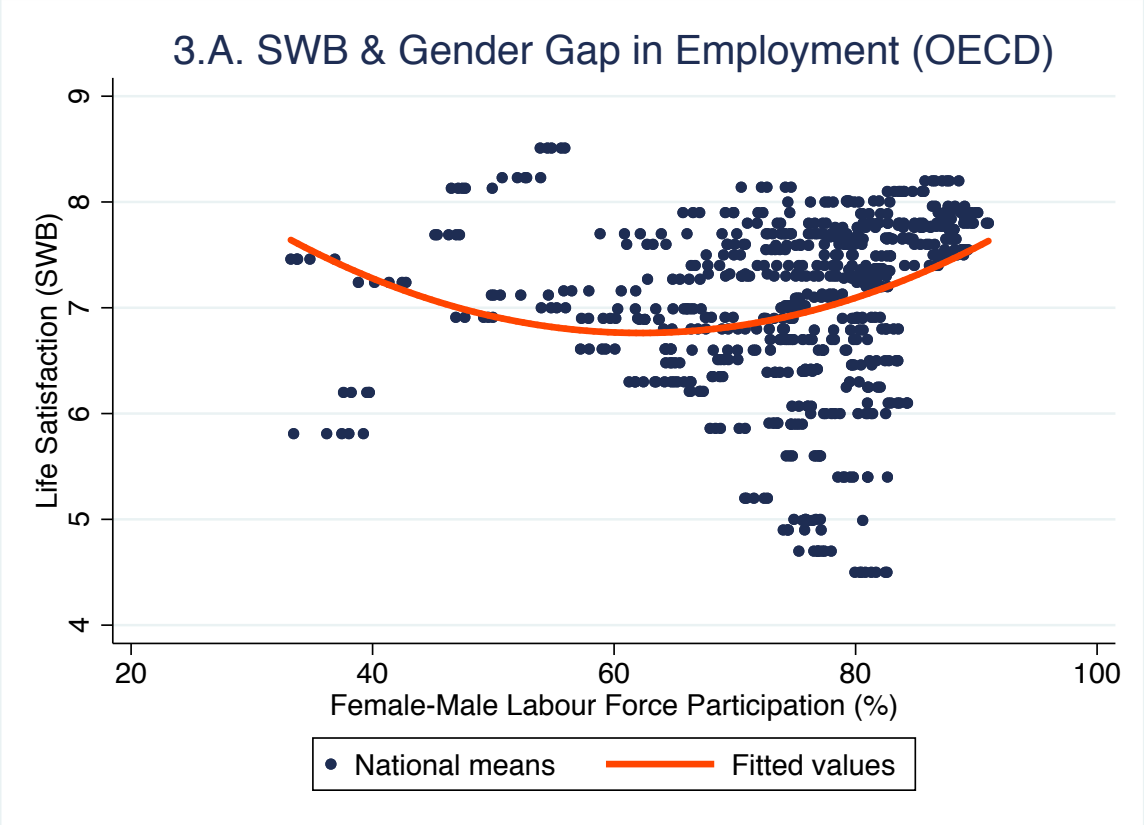
To go one step further, column (4) displays the OLS estimations when both year and country fixed effects are included into the main specification. Similarly to column (2), *GGPolitics* loses its significance. If both *GGEducation* and *GGLabour* remain significant at the 5% level, the former is almost cut in half while the latter becomes negative: the more women enter the labour force, the lower the HDI is. This negative effect outweighs the two other gender gaps when there is perfect equality in the three dimensions: the absence of gender discrimination would result in a decrease of 0.04 point in the total HDI score. According to the Wald test, the dimensions are only jointly significant at the 5% level, with an F-statistic of 4.00. Looking at the R^2 reveals that the inclusion of country fixed effects always decreases the goodness-of-fit of the model, plummeting to 0.482 when combined to year fixed effects. It can be concluded that the results for objective well-being are robust to the addition of year fixed effects, except for *GGPolitics*. Once country fixed effects are included, there is too much variation in the parameters of interest and their collective impact. The model with year fixed effects appears to be the most suitable to the data, due to its

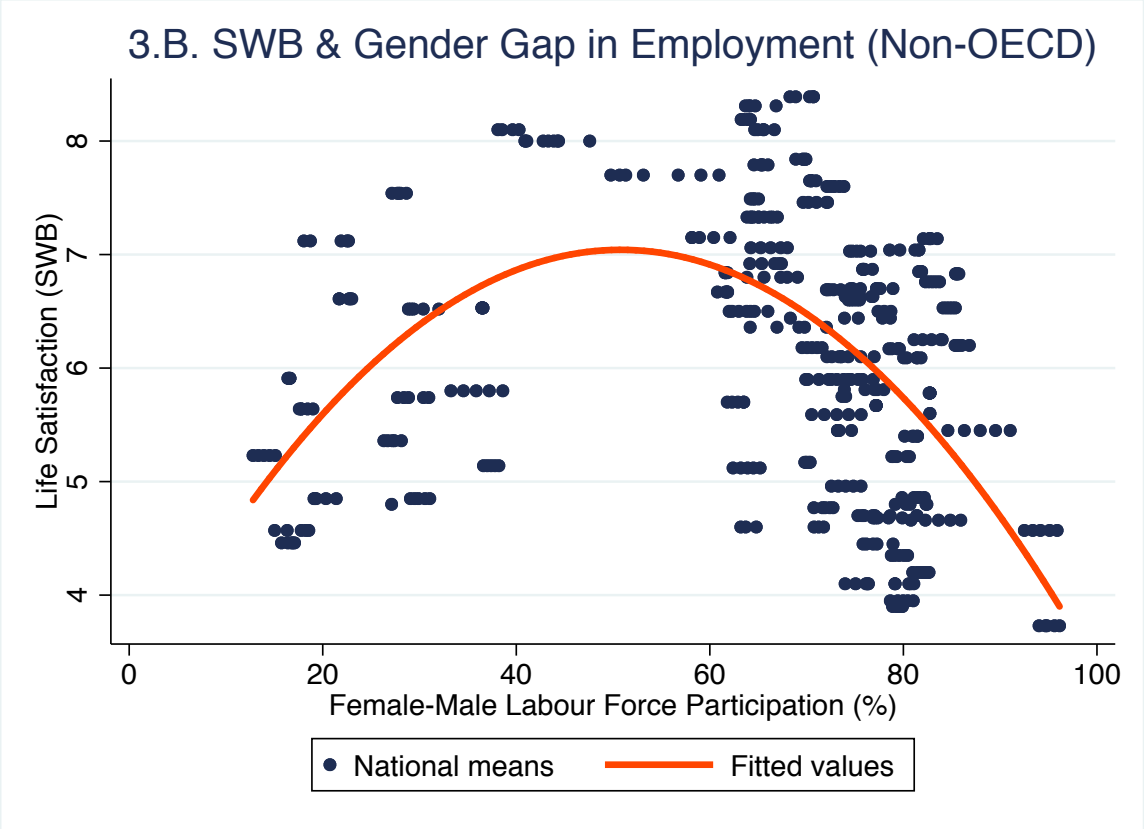
similarities with the results of the main OLS specification, its goodness-of-fit, the joint significance of the three dimensions and their realistic collective effect on the HDI.

Comparing results for the two measures of welfare, it appears that gender equality – at least in the dimensions used in this study – is more beneficial to human development than to life satisfaction. Although both effects are significant and positive, perfect gender equality in the three societal aspects would account for 9 or 14 per cent of a perfect HDI score of 1, but only for approximately 4 per cent of a maximum life satisfaction of 10.

7.2. OECD & Non-OECD

After a deeper analysis of the dataset, I found that OECD and non-OECD countries have different trends in their relationship between life satisfaction and gender gap in employment, as shown by Graphs 3.A and 3.B. The OECD graph reveals that there would be a negative relationship between the two variables, while non-OECD nations follow a positive trend.





Running the different regressions by separating OECD from non-OECD countries should shed light on the two patterns. Tables 7.3 and 7.4 display the OLS estimates. Columns (1) and (2) show the results for the individual effect of *GGLabour* on life satisfaction, first without and then with year fixed effects. The last two columns follow the same logic but focus on the collective impact of gender equality dimensions. For the OECD nations, the negative trend observed on the graph is confirmed by the negative and statistically significant coefficients obtained in Table 7.3. A decrease of 10 percentage points in the gender gap in the labour force participation would reduce the national SWB score by 0.16-0.17 point, all else equal. But when we consider the three gender gaps, the negative effect is even stronger, with insignificant *GGEducation*. Perfect gender equality would be detrimental for an OECD country, decreasing SWB by 4 points if the gender gap in employment is closed. However, this negative trend has already been observed. Stevenson and Wolfers (2009) find that in industrialized countries, women's SWB has declined relative to men, while indicators of objective welfare suggest clear improvements for women in the family and work spheres. This paradox is quite difficult to explain but some reasons can be proposed. Combining the market work to the emotional and physical burden of home production, still primarily borne

by women, could be a potential explication. Besides, if women now compare their lives to men, they may judge that these ones come up short and report lower life satisfaction. Some socioeconomic changes may have left women worse off: decreased social cohesion, increased anxiety and neuroticism, and increased household risk (Stevenson & Wolfers, 2009). If non-OECD countries have not entirely experienced those changes yet, it could explain why Table 7.3 only displays positive and significant estimates for *GGLabour*, a positive tendency observed in Graph 3.B. Ceteris paribus, the absence of a gender gap in the labour force would result in a 1.3 to 1.5 point increase in the national life satisfaction score. Nevertheless, the two other gender equality dimensions become insignificant for the non-OECD subsample. Knowing that the two subsamples have conflicting trends when it comes to the employment gender gap, this particularity might explain why the estimates for *GGLabour* are insignificant when analysing the collective impact for the entire sample.

Table 7.3. OLS Regressions of Life Satisfaction on Gender Gaps: OECD Countries

	(1)	(2)	(3)	(4)
Institutions	0.470***	0.545***	0.555***	0.477***
	(0.101)	(0.040)	(0.092)	(0.073)
Log(GDPpc)	0.536***	0.459***	0.636***	0.766***
	(0.067)	(0.051)	(0.075)	(0.072)
Postcommunist	-0.680***	-0.683***	-0.342***	-0.307***
	(0.102)	(0.068)	(0.087)	(0.064)
GGEducation			0.010	0.055
			(0.120)	(0.101)
GGLabour	-0.016***	-0.017***	-0.039***	-0.040***
	(0.003)	(0.002)	(0.004)	(0.005)
GGPolitics			0.028***	0.029***
			(0.003)	(0.002)
Year F.E.		**X**		**X**
Observations	556	556	454	454
R^2	0.549	0.548	0.626	0.623

Notes: The dependent variable is the national mean level of self-reported life satisfaction. Estimation method is linear OLS. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Table 7.4. OLS Regressions of Life Satisfaction on Gender Gaps: Non-OECD Countries

	(1)	(2)	(3)	(4)
Institutions	0.357***	0.416***	0.336***	0.349***
	(0.072)	(0.041)	(0.095)	(0.043)
Log(GDPpc)	0.605***	0.415***	0.605***	0.450***
	(0.059)	(0.068)	(0.078)	(0.094)
Postcommunist	-1.752***	-1.728***	-1.904***	-1.916***
	(0.079)	(0.117)	(0.101)	(0.141)
GGEducation			0.279	0.355
			(0.206)	(0.209)
GGLabour	0.015***	0.015***	0.014***	0.013***
	(0.002)	(0.002)	(0.003)	(0.003)
GGPolitics			0.005	0.003
			(0.006)	(0.004)
Year F.E.		**X**		**X**
Observations	378	378	291	291
R^2	0.632	0.625	0.670	0.664

Notes: The dependent variable is the national mean level of self-reported life satisfaction. Estimation method is linear OLS. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

7.3. Variations in Controls

Different measures of health have been found to affect national levels of life satisfaction, such as life expectancy at birth, fertility rates or infant mortality (Bjørnskov et al, 2008; Diener et al., 1995; Economist Intelligence Unit, 2005). Research suggests that health(care) improves subjective well-being. Two of the aforementioned indicators, namely life expectancy at birth and infant mortality, are tested in the present study. The infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year. Data for both variables were collected from the World Bank (2019). In addition to health indicators, various measures of institutional quality have been used in the academic literature and were found to influence national well-being. Regarding self-reported life satisfaction, the absence of corruption is positively related to SWB (Meisenberg & Woodley, 2014). If *Institutions* is replaced by an indicator of the level of corruption, the different parameters of interest should not vary a lot. Data for control of corruption are retrieved from the World Bank (2019). The variable ranges from -2.5 to 2.5, and it estimates the extent to which public power is used for

the elites' private gains. A country with a score above zero means that it is perceived as better at controlling corruption than a nation with a negative score.

Table 7.5. OLS Regressions of Life Satisfaction: Variations in Control Variables

	(1)	(2)	(3)	(4)	(5)	(6)
Institutions	0.086	0.144***	0.105*	0.152***		
	(0.057)	(0.026)	(0.058)	(0.028)		
Log(GDPpc)	0.421***	0.332***	0.504***	0.412***	0.460***	0.369***
	(0.064)	(0.053)	(0.061)	(0.053)	(0.048)	(0.046)
Postcommunist	-1.190***	-1.216***	-1.158***	-1.185***	-1.155***	-1.159***
	(0.076)	(0.098)	(0.085)	(0.107)	(0.083)	(0.081)
LifeExpectancy	0.007	0.005				
	(0.009)	(0.005)				
InfantMortality			0.005	0.004**		
			(0.004)	(0.0015)		
Corruption					0.091**	0.145***
					(0.045)	(0.041)
GGEducation	0.327***	0.343***	0.357***	0.372***	0.303***	0.301***
	(0.110)	(0.078)	(0.110)	(0.079)	(0.110)	(0.083)
GGLabour	-0.0035	-0.004	-0.003	-0.0034	-0.0036	-0.0036
	(0.003)	(0.003)	(0.0026)	(0.003)	(0.0026)	(0.003)
GGPolitics	0.010***	0.009***	0.010***	0.009***	0.009**	0.007*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.0035)	(0.0035)
Year FE		**X**		**X**		**X**
Observations	745	745	745	745	745	745
R^2	0.628	0.626	0.629	0.628	0.628	0.626
F (Wald test)	9.95	16.33	10.36	16.88	6.65	5.52

Notes: The dependent variable is the national level of self-reported life satisfaction. Estimation method is linear OLS, without (odd column numbers) and with linear year fixed effects (even column numbers). GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. This table includes the overall R^2. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Table 7.5 displays the different variations of the OLS estimations of equations (7) and (9). To have a better understanding of the robustness, changes in controls have been performed with both the linear and year-fixed-effect OLS regression methods. Columns (1)-(4) add health variables into the main specifications without (odd column numbers) and with year fixed effects (even column numbers). After the inclusion of *Life Expectancy*, the estimates of interest barely change and the health variable remains entirely insignificant in both types of OLS regressions. Columns (3) and (4) incorporate the other measure of health, *Infant Mortality*. This one is significant at the 5% level under fixed effects but not when they

are removed. In both cases, the coefficient of the educational gender dimension slightly increases. *GGLabour* is now smaller but still negative and insignificant. *GGPolitics* keeps its estimates of 0.010 and 0.009 constant. Therefore, it can be said that results for SWB are robust to the inclusion of health indicators. In the last two columns, the index for corruption control replaces *Institutions*. This change results in similar alterations of the estimates: a decrease in magnitude for the three gender gaps, especially for *GGPolitics* which is now less significant than in the baseline models. Consequently, the Wald test yields smaller F-statistics of 6.65 and 5.52, making the joint significance weaker than with *Institutions*. Reaching perfect gender equality in the three dimensions would only account for 0.393 point of the national level of life satisfaction, against 0.432 when using *Institutions*. With fixed effects, it would explain 0.291 point of the national SWB, against 0.397 before. Results with time fixed effects are thus somehow more sensitive to a change in the variable measuring institutional quality than those not controlling for time trends.

With regards to human development, Table A.5 shows that the quality of national institutions is highly correlated with the HDI rate (0.8499). Therefore, it is natural to ask whether the results in Table 6.3 are being confounded by the eventuality that the two variables could measure the same thing. Finding an alternative control but correlated to human development to a lower extent could make the results more robust. To address this concern, I follow Özcan and Bjørnskov (2011) by replacing the institutions index by one of its dimensions, namely a measure of democracy. Democracy, by conditioning the behaviour of governments, has a positive impact on the various indicators of the HDI. If a measure of democracy substitutes for institutional quality, estimates should remain statistically significant and similar to those obtained in Table 6.3. Democracy is measured by an index ranging from -10 to 10. Scores between -10 and -6 indicate an autocracy; between -5 and 5, an anocracy[6]; and from 6 to 10, a democracy. Data were collected from Our World in Data (Roser, 2019), which obtained the dataset from the Center for Systemic Peace. This new measure is still positively correlated to the HDI but to a lower extent, with a Pearson's coefficient *r* of 0.5305 (Table A.6). Besides democracy, the protection of human rights can be interpreted as an alternative measure for institutional quality. The protection and respect of human rights are supposed to facilitate one's ability to achieve personal goals and lead to greater levels of well-being. It can also be directly related to gender equality, by indicating to which extent women

[6] An anocracy is defined as a partial democracy: it exhibits characteristics from both democratic and autocratic regimes (Vreeland, 2008).

are protected in case of any violation of their rights. The variable *HumanRights* measures the degree to which governments respect and protect human rights. Data come from Fariss (2019), but the index was rescaled to obtain standardized values between -2.5 and 2.5 (perfect score). Furthermore, in their study, Özcan and Bjørnskov (2011) use the longitudes in their main specification and latitudes as an alternative control. To exploit the same idea, the robustness analysis replaces the latitude of the capital by the longitude.

Table 7.6. OLS Regressions of HDI: Variations in Control Variables

	(1)	(2)	(3)	(4)	(5)	(6)
Institutions					0.067***	0.072***
					(0.003)	(0.002)
Democracy	0.005**	0.006***				
	(0.0005)	(0.0003)				
Human Rights			0.003	0.003**		
			(0.003)	(0.001)		
Latitudes	0.001***	0.0015***	0.0009***	0.001***		
	(0.0002)	(0.0001)	(0.0003)	(0.0002)		
Longitudes					-0.000**	-0.0001***
					(0.000)	(0.000)
CO2	0.037***	0.038***	0.042***	0.043***	0.020***	0.022***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
GGEducation	0.020*	0.009	0.039***	0.032***	0.035***	0.026***
	(0.011)	(0.009)	(0.011)	(0.010)	(0.009)	(0.008)
GGLabour	0.0005*	0.0005*	0.0007***	0.0007***	0.0007***	0.0007***
	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)
GGPolitics	0.002***	0.002***	0.002***	0.002***	0.0009***	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)
Year FE		**X**		**X**		**X**
Observations	880	880	919	919	758	758
R^2	0.662	0.657	0.614	0.611	0.793	0.786
F (Wald Test)	69.08	190.85	93.88	530.05	41.99	68.01

Notes: The dependent variable is the Human Development Index. Estimation method is linear OLS, without (odd column numbers) and with linear year fixed effects (even column numbers). GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Table 7.6 shows the different variations of the OLS estimations of equations (8) and (10). In columns (1) and (2), *Institutions* is replaced by *Democracy*. The estimate of *Democracy* is positive, as expected, and significant in both cases. Compared to Table 6.3,

GGPolitics doubles in size, from 0.0009 to 0.002, while the two other gender gaps lose in magnitude and significance. Moreover, the test for joint significance (F = 69.08) of the three gender dimensions suggests that the parameters of interest are not simultaneously equal to zero. More precisely, perfect gender equality in action resources, and opportunity and power structures accounts for 0.17 point of the HDI score, while it explained only 0.139 before. With year fixed effects, *GGEducation* entirely loses its significance, while *GGPolitics* is now 20 times bigger and significant. This still results in a greater part of human development explained by gender equality – 0.159 against 0.089 before. Democracy and institutions are intrinsically linked in a positive way, but they do not measure exactly the same thing. Therefore, it seems normal that the magnitudes of the parameters of interest change but due to the large modifications in statistical significance, results are sensitive to replacing *Institutions* by *Democracy*. Such variations confirm the supposition that *HDI* and *Institutions* might measure the same thing, whence the lack of significance of *GGPolitics* under time fixed effects. This speculation is reinforced by the results obtained with *HumanRights* control. Indeed, using *HumanRights* leads to very similar results between the models without and with fixed effects. In column (3), although the estimates for the educational and labour equality dimensions are similar to those obtained with *Institutions*, that of *GGPolitics* doubles again. In column (4), the same parameter is now 20 times bigger, from 0.0001 to 0.002, and is significant at the 1% level. Interestingly, perfect gender equality would now explain 0.202 point of the total HDI score, but only 0.089 with *Institutions*. The variations in estimates' magnitudes are too important to conclude that results with fixed effects are robust. However, results without fixed effects are more resistant to the same change, maybe because *Human Rights* was insignificant. Finally, columns (5) and (6) show the OLS estimates with *Longitudes*. The parameters of interest keep their magnitude, even if *GGEducation* and *GGLabour* both slightly increase with and without year fixed effects. It means that when there is perfect gender equality in action resources, opportunity and power structures, it would account for 0.150 point of the HDI without fixed effects and for 0.101 with fixed effects. They are all significant at the 1% level, with the exception of *GGPolitics*, insignificant under fixed effects. Using *Longitudes* even enhances the goodness-of-fit of the model and the joint significance of the three gender gaps (from 26.73 to 41.99 and from 35.03 to 68.01). Results for the HDI are thus strongly robust to this change in the bio-geographic determinant.

8. Conclusion

This thesis investigates the consequences of gender equality on national well-being, filling a gap in the feminist economic literature. In order to capture its multidimensionality, gender equality was represented by three dimensions related to well-being's components: education as action resources, employment as opportunity structures and political representation as power structures. Each of those aspects was measured respectively by the gender parity index for school enrolment in tertiary education, the ratio of female to male labour force participation rate and the percentage of women in parliaments. To capture the subjective and objective categories, the concept of well-being was divided in two measures: the national mean level of self-reported life satisfaction and the Human Development Index.

I constructed a panel data, covering 60 countries from 1995 to 2014. According to the academic literature, the three dimensions were expected to, individually and collectively, positively influence well-being scores. Linear OLS regressions confirmed the hypotheses. Perfect gender equality in action resources, opportunity and power structures would explain 0.432 and 0.139 of the total life satisfaction mean and HDI score, respectively. Taking the example of Belgium in 2014, out of its SWB score of 7.4, 0.501 point could be explained by its values in gender equality dimensions and as for HDI, 0.128 point out of 0.909. Gender equality thus accounted for 6.78 per cent of the Belgian SWB and 14.1 per cent of the objective one. In light of this example, it can be seen that the three variables are economically significant because the welfare of a nation can greatly benefit from reductions in gender inequality within the educational, employment and political fields. But education distinguishes itself from the two other gender gaps by its constant significance, while the latter resulted in more nuanced results, or even insignificant. To test the robustness of the results, I added fixed effects to the main specifications. Year fixed effects were found to be the most suitable for both objective and subjective well-beings. Although the baseline and new models led very similar results for life satisfaction, including time fixed effects for HDI regressions weakened the estimates of educational and political gender gaps. The first one loses in size and the second in terms of statistical significance. Results for life satisfaction were robust to the addition of new health controls, while HDI results were very sensitive to variations in the institutional variable. This was primarily due to the high correlation between HDI and the control *Institutions,* undermining the effect of greater female representation in politics. Besides, OECD members are worse off in terms of national subjective well-being when the female labour force participation rises relative to men. Research suggests that it is

due to the decline in women's SWB in the industrialized world. Potential reasons include the burden of house production still borne by women, the comparison with men's achievements according to social norms, etc.

Despite the in-depth analysis, a few flaws and concerns remain. However, future research could address some of them. As it is always the case for countrywide analyses, there exists a selection bias in the sample because richer and more developed countries are more likely to collect reliable data on a regular basis and make them available for research. Poorer countries often lack the financial funds and structural resources to carry out such important data collections, and will be consequently omitted from research samples. Accordingly, this sample is heavily weighted toward European states, the only countries consistently surveyed during the period studied, while the WVS included different countries in the various waves. Nevertheless, as the WVS are including more and more nations over the years, I would encourage future research to extend the sample in order to have a more balanced panel data in which developed countries are not overrepresented. Besides, including three gender gaps in the analysis reduced the risk of OVB and measurement errors (Moorhouse, 2017). On the other hand, gender equality cannot be entirely defined by those three dimensions. Future research could replicate this analysis but with more and/or different gender gaps. Moreover, the concern about reverse causality of well-being on gender gaps remain. Economic growth and policies can be indirect channels through which variations in national welfare can lead to changes in gender parity in education, employment and politics.

Decomposing the sample in post- and non-post-communist nations highlighted the fact that nations in transition have lower gender gaps due to their communist legacy (Down Metcalfe & Afanassieva, 2005) but also lower levels of life satisfaction due to the uncertainty of economic and political transition. All in all, gender equality would lead to a large reduction of 1.433 point in SWB in post-communist. Results should thus be considered carefully because in this case, the negative effect found is mainly provoked by other factors, such as the social and economic disorder going hand in hand with post-communist transition. Therefore, future research could focus on the particular case of nations in transition within the same guiding framework but with a new model, in order to better isolate the role of gender equality in those countries. Additionally, future research should concentrate on creating better well-being indicators, taking into account various dimensions like housing, health, safety, etc. Naturally, these same indicators should also involve some measure of gender equality.

Reverse causality could be an important caveat but if we assume that the three dimensions of gender equality do have an impact on well-being, I can formulate a few policy

recommendations. Public policies should address each of the gender gaps, even though one of them, when entirely closed, could lead to more substantial outcomes for either subjective or objective well-being. Based on the results obtained for life satisfaction, it is the gender parity in politics which may lead to the largest gains in welfare. If women constitute exactly 50 per cent of the parliament, it would explain from 0.45 to 0.5 point of the total SWB score[7]. The aforementioned studies have demonstrated the positive outcomes of encouraging women's representation in politics. However, none of the countries in the sample had achieved gender parity in their parliament by 2014. To solve this problem, the simplest option would eventually be to establish a quota of "50% women – 50% men" for political parties with penalties if the rule is not respected. Under this regulation, female electors will be given a voice in the design and implementation of public policies. Furthermore, female members of parliament can incarnate role models for young girls (Wolbrecht & Campbell, 2007). Prior research suggests that women in governments often propose and support laws or policies targeting discrimination against girls and women, paving the way to societal gender equality.

Estimates for HDI regressions imply that having more women in the labour force would result in the largest improvement in welfare. Indeed, perfect gender parity in the labour market (i.e. the same number of women and men in the labour force) would account for 0.06 point of the HDI rate. Although it will be extremely costly to ensure that women represent precisely half of the total labour force, governments can target barriers to female employment. For instance, public policies could focus on the pay gap between genders, implementing tax penalties for employers who do not respect equality of salaries.

It is important to note that countries in this sample are predominantly developed European states. Those countries also exhibit lower levels of gender inequality in different fields, compared to poorer nations. This difference is particularly marked in the enrolment ratio of female to male in tertiary education. Data show that the majority of the sample had a GPI ratio above 1, meaning that more women than men are enrolled at that education level. Although numbers could hint at discriminations against men, women are actually underrepresented in STEM and finance, the most profitable fields (OECD, 2017). To attract more girls in those study fields, public policies should start by hiring more female teachers for scientific subjects and then run a national campaign with scientific women, acting as role models. With regards to developing countries, the gender gap which can be tackled in the fastest and most effective way would be the political one. By simply implementing a

[7] When considering solely the baseline and the year-fixed-effect OLS regressions.

regulation about quotas in political parties, those nations can ensure that women and men are equally represented in politics, triggering an unprecedented metamorphosis. Addressing the gender gaps in tertiary education and employment might be more costly and complex for countries lacking administrative resources to ensure that the equality laws are respected.

Finally, policies should tackle the restricted access for women to the three components of well-being, namely action resources, opportunity structures and power structures. I can only reiterate the need for any additional research investigating the impact of gender equality on society. Nowadays, 80 per cent of girls and women around the world still live in nations that are barely passing or even failing on gender equality (Equal Measures 2030, 2019). Besides revealing gender inequalities to those who often overlook them, feminist economic research should thus aim at encouraging concrete public policies by showing how everybody can benefit from alleviating gender discriminations across the world.

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Appendix A: Additional Tables

Table A.1. Summary Statistics of Post-communist Countries

Post-communist countries	**Obs.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Life Satisfaction	360	5.580	0.922	3.73	7.35
Tertiary Education	344	1.345	0.183	0.92	1.9
Labour Participation	360	77.136	5.852	61.8	96.14
Women in Parliaments	356	15.166	7.147	3.3	35.6

Table A.2. Summary Statistics of Non-post-communist Countries

Not post-communist countries	**Obs.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Life Satisfaction	801	7.144	0.785	4.46	8.51
Tertiary Education	593	1.165	0.278	0.54	2.03
Labour Participation	840	66.497	19.498	11.05	91
Women in Parliaments	834	20.650	11.758	0	47.3

Table A.3. Pearson Correlation Matrix for Life Satisfaction (=**LS**) (Baseline Model)

	LS	GGEducation	GGLabour	GGPolitics	Log(GDPpc)	Postcommunist	Institutions
LS	1.000						
GGEducation	-0.0198	1.000					
GGLabour	0.1018	0.5291	1.000				
GGPolitics	0.4514	0.3314	0.4332	1.000			
Log(GDPpc)	0.6235	0.2373	0.3538	0.5287	1.000		
Postcommunist	-0.6573	0.3316	0.2813	-0.2308	-0.2922	1.000	
Institutions	0.5771	0.2803	0.4657	0.4607	0.8170	-0.2703	1.000

Table A.4. Pearson Correlation Matrix for Life Satisfaction (=**LS**) (Alternative Controls)

	LS	GGEducation	GGLabour	GGPolitics	LifeExp.	InfantMort.	Corruption
LS	1.000						
GGEducation	-0.0198	1.000					
GGLabour	0.1018	0.5291	1.000				
GGPolitics	0.4514	0.3314	0.4332	1.000			
LifeExpectancy	0.5056	0.2221	0.2631	0.3776	1.000		
InfantMortality	-0.2791	-0.4225	-0.4394	-0.3287	-0.8473	1.000	
Corruption	0.6424	0.2749	0.4159	0.5537	-0.5641	-0.2703	1.000

Table A.5. Pearson Correlation Matrix for HDI (Baseline Model)

	HDI	GGEducation	GGLabour	GGPolitics	Institutions	Latitudes	CO2
HDI	1.000						
GGEducation	0.3615	1.000					
GGLabour	0.5215	0.5291	1.000				
GGPolitics	0.4964	0.3314	0.4332	1.000			
Institutions	0.8499	0.2803	0.4657	0.4607	1.000		
Latitudes	0.5519	0.4334	0.4463	0.3849	0.5254	1.000	
CO2	0.6421	0.1085	0.3347	0.2769	0.6121	0.4613	1.000

Table A.6. Pearson Correlation Matrix for HDI (Alternative Controls)

	HDI	GGEducation	GGLabour	GGPolitics	Democracy	HumanRights	Longitudes
HDI	1.000						
GGEducation	0.3615	1.000					
GGLabour	0.5215	0.5291	1.000				
GGPolitics	0.4964	0.3314	0.4332	1.000			
Democracy	0.5305	0.2381	0.3992	0.3059	1.000		
Human Rights	0.4173	0.3191	0.4289	0.3224	0.3522	1.000	
Longitudes	-0.0808	-0.2100	-0.0815	-0.0639	0.1693	-0.0691	1.000

Table A.7. Regressions of Life Satisfaction on Various Combinations of Gender Gaps

	(1)	(2)	(3)
Institutions	0.093*	0.075	0.158***
	(0.055)	(0.055)	(0.050)
Log(GDPpc)	0.485***	0.445***	0.373***
	(0.056)	(0.055)	(0.050)
Postcommunist	-1.280***	-1.246***	-1.178***
	(0.066)	(0.066)	(0.062)
GGEducation	0.430***	0.296***	
	(0.105)	(0.111)	
GGLabour	-0.0006		0.0038*
	(0.002)		(0.002)
GGPolitics		0.008***	0.0079***
		(0.003)	(0.003)
Observations	748	745	929
R^2	0.623	0.626	0.615

Notes: The dependent variable is the national mean level of self-reported life satisfaction. Estimation method is linear OLS. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Table A.8. OLS Regressions of HDI With Year Fixed Effects

	(1)	(2)	(3)	(4)
Institutions	0.079***	0.074***	0.076***	0.079***
	(0.001)	(0.001)	(0.001)	(0.001)
Latitudes	0.001***	0.0007***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
CO2	0.015***	0.021***	0.015***	0.015***
	(0.001)	(0.002)	(0.001)	(0.001)
GGEducation		0.037***		
		(0.007)		
GGLabour			0.0005***	
			(0.000)	
GGPolitics				0.000
				(0.000)
Observations	952	761	952	949
R^2	0.762	0.776	0.771	0.761

Notes: The dependent variable is the Human Development Index. Estimation method is OLS, with linear year fixed effects. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Table A.9. OLS Regressions of HDI With Country Fixed Effects

	(1)	(2)	(3)	(4)
Institutions	0.027	0.022	0.043**	0.029**
	(0.023)	(0.022)	(0.019)	(0.014)
CO2	-0.002	-0.014	0.009	0.009
	(0.014)	(0.010)	(0.013)	(0.012)
GGEducation		0.150***		
		(0.025)		
GGLabour			0.005***	
			(0.001)	
GGPolitics				0.004***
				(0.000)
Observations	952	761	952	949
R^2	0.703	0.232	0.560	0.573

Notes: The dependent variable is the Human Development Index. Estimation method is OLS, with linear country fixed effects. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Table A.10. OLS Regressions of HDI With Year and Country Fixed Effects

	(1)	(2)	(3)	(4)
Institutions	0.017***	0.019***	0.013**	0.016***
	(0.006)	(0.006)	(0.006)	(0.005)
CO2	0.019***	0.018***	0.018***	0.019***
	(0.005)	(0.005)	(0.005)	(0.003)
GGEducation		0.020***		
		(0.007)		
GGLabour			-0.0009***	
			(0.0003)	
GGPolitics				0.0000
				(0.0003)
Observations	952	761	952	949
R^2	0.611	0.654	0.353	0.608

Notes: The dependent variable is the Human Development Index. Estimation method is OLS, with year and country fixed effects. GGEducation is measured by the ratio of female-to-male enrolled in tertiary education (GPI), GGLabour by the female-to-male labour force participation rate (%) and GGPolitics by the percentage of women in national parliaments. Robust standard errors are shown in parentheses. Statistical significance: *** = at the 1% level; ** = at the 5% level; and * = at the 10 % level.

Table A.11. Variables: Definitions and Sources

Variable Name	*Definition*	*Sources*
Life Satisfaction	National mean of self-reported life satisfaction. Obtained from the answers to "All things considered, how satisfied are you with your life as a whole these days?" Answers from 1 (= completely dissatisfied) to 10 (=completely satisfied)	World Values Survey (2014) & European Values Survey (2015)
HDI	Average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living	United Nations Development Programme (2019)
School enrolment, tertiary (gross), gender parity index (GPI)	Ratio of women to men enrolled at tertiary level in public and private schools	World Bank (2019)
Ratio of female-to-male labour force participation rate (%)	Female labor force participation rate* divided by male labor force participation rate and multiplying by 100 (*Labor force participation rate is the proportion of the population ages 15 and older that is economically active)	World Bank (2019)
Women in parliaments	Percentage of women in parliaments	Inter-Parliamentary Union (2019)
GDP per capita (log)	GDP per capita, PPP (international $)	World Bank (2019)

Post-communist	Dummy equal to 1 if post-communist nation; 0 otherwise	Freedom House (2018)
Institutional Quality	Created index ranging from -2.5 to 2.5. It is the arithmetic mean from the six following determinants of governance: • *Control of Corruption* • *Government Effectiveness* • *Political Stability* • *Regulatory Quality* • *Rule of Law* • *Voice and Accountability*	World Bank (2019)
Latitudes	Distance in degrees from the equator, in absolute values	Simple Maps (2019)
Per capita CO^2 emissions	CO^2 emissions per capita, in metric tons	Carbon Dioxide Information Analysis Centre (2019)
Life Expectancy	Life expectancy at birth	World Bank (2019)
Infant Mortality	Number of infants dying before reaching one year of age, per 1,000 live births in a given year	World Bank (2019)
Control of Corruption	Perceptions of the extent to which public power is exercised for private gain, as well as "capture" of the state by elites and private interests. In units of a standard normal distribution, i.e. ranging from -2.5 to 2.5.	World Bank (2019)
Democracy	Index for political regime, ranging from -10 to 10. From -10 to -6 = autocracy; from -5 to 5 = anocracy; from 6 to 10 = democracy.	Roser (2019)
Human Rights	Degree to which governments respect and protect human rights, on a scale from -2.5 to 2.5.	Fariss (2019)
Longitudes	Distance in degrees from the Greenwich Meridian	Simple Maps (2019)

Appendix B: List of Countries

East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	MENA	North America	South Asia	Sub-Saharan Africa
1. Australia	1. Albania*	1. Argentina	1. Egypt	1. Canada	1. India	1. Nigeria
2. China	2. Austria*	2. Brazil	2. Iraq	2. USA	2. Pakistan	2. South Africa
3. Japan	3. Belgium	3. Chile	3. Jordan			
4. New Zealand	4. Belarus*	4. Colombia	4. Malta			
5. Philippines	5. Bulgaria*	5. Mexico				
6. South Korea	6. Croatia	6. Peru				
	7. Czech Republic*	7. Uruguay				
	8. Denmark					
	9. Estonia*					
	10. Finland					
	11. France					
	12. Georgia*					
	13. Germany					
	14. Greece					
	15. Hungary*					
	16. Iceland					
	17. Ireland					
	18. Italy					
	19. Latvia*					
	20. Lithuania*					
	21. Luxembourg					
	22. Macedonia*					
	23. Moldova*					
	24. Netherlands					
	25. Norway					
	26. Poland*					
	27. Portugal					
	28. Romania*					
	29. Russia*					
	30. Slovakia*					
	31. Slovenia*					
	32. Spain					
	33. Sweden					
	34. Switzerland					
	35. Turkey					
	36. Ukraine*					
	37. UK					

Note: Countries followed by an asterisk (*) are post-communist nations. MENA stands for Middle East and North Africa. This classification follows the World Bank database (2019).

Appendix C: Computing the HDI

The Human Development Index is computed in two steps (Klugman, 2011).

Step 1: Creating the dimension indices

The indicators must be transformed into values between 0 and 1. To do so, minimum and maximum values, also called goalposts, are set. The minimum values can be considered as subsistence values, fixed at 20 years for life expectancy, at 0 for both education elements and at $100 for GNI per capita. Concerning the maximums, they are determined based on the highest observed values in the time series. For example, for the year 2014, the time series covered 1980-2014. Due to concavity, the actual minimum and maximum values of income are transformed into natural logarithms.

After defining the maximum and minimum values, the indicators are computed as follows:

$$Dimension\ index = \frac{actual\ value - minimum\ value}{maximum\ value - minimum\ value}$$

For education, the equation is applied to each subcomponent and then, with the two results obtained, a geometric mean is calculated. Finally, the same equation is reapplied to the geometric mean, with a minimum of 0 and the highest geometric mean of the two indices for the same time period as the maximum.

Step 2: Aggregating the sub-indices to yield the HDI

The HDI is the geometric mean of the three indices:

$$(I_{Life}{}^{\frac{1}{3}} \cdot I_{Education}{}^{\frac{1}{3}} \cdot I_{Income}{}^{\frac{1}{3}})$$

Goalposts for the HDI for 2011

Dimension	*Observed Maximum*	*Minimum*
Life expectancy	83.4 (Japan, 2011)	20
Mean years of schooling	13.1 (Czech Republic, 2005)	0
Expected years of schooling	18 (Capped at)	0
Combined education index	0.978 (New Zealand, 2010)	0
Per capita GNI (PPP$)	107,721 (Quatar, 2011)	100

(Adapted from Klugman (2011), using the times series of 1980-2011)

***Example**: Chile in 2011*

Based on UNDP data (2019), the Chilean values for the four indicators in 2011 are:

- Life expectancy at birth = 78.6
- Mean years of schooling = 9.8
- Expected years of schooling = 15.3
- GNI per capita (2011 PPP$) = 19,187

Life expectancy index = $\frac{78.6-20}{83.4-20} = 0.924$

Mean years of schooling index = $\frac{9.8-0}{13.1-0} = 0.748$

Expected years of schooling index = $\frac{15.3-0}{18-0} = 0.85$

Education index = $\frac{\sqrt{0.748 \times 0.85}-0}{0.978-0} = 0.815$

Income index = $\frac{\ln(19{,}187)-\ln(100)}{\ln(107{,}721)-\ln(100)} = 0.752$

Human Development Index = $\sqrt[3]{0.924 \times 0.815 \times 0.753} = 0.828$