



GDAŃSK UNIVERSITY OF TECHNOLOGY
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ARE WOMEN IMPORTANT FOR ECONOMIC DEVELOPMENT?

**AN EVIDENCE ON WOMEN'S PARTICIPATION IN LABOR
MARKET AND THEIR CONTRIBUTION TO ECONOMIC GROWTH
IN 83 WORLD COUNTRIES.**

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ARE WOMEN IMPORTANT FOR ECONOMIC DEVELOPMENT?

An evidence on women's participation in labor market and their contribution to economic growth in 83 world countries.

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Abstract

A kind of gender revolution is passing through various countries in various continents. By being offered free access to educational infrastructure, women become better educated, improve their skills and capabilities, gain possibilities to enter the labour market and use financial resources to start up their own businesses. All these bring women to play a role on the labour market and significantly contribute to overall socio-economic development. The women entrepreneurship unfolds various kinds of endowments concerning economic possibilities in wealth creation. The main scope of the paper is to identify and assess the role of gender equity and uniquely women entrepreneurship in the process of socio-economic development. Implying a set of variables, treated as proxies of gender equality and women entrepreneurship, we estimate their coherence with socio-economic development. In the empirical part, we use a cross-country panel data, for 83 economies, which are derived from World Development Indicators 2012 database International Monetary Fund World Economic Outlook Database April 2013. The time coverage is set for 1990-2011.

Keywords: *gender equity, women entrepreneurship, gender gap, economic development*

JEL Codes: J16, J24, O15

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1. Introduction

Both academics and practitioners would agree that female entrepreneurship plays a significant role within the context of socio-economic development (i.e. Allen *et al.*, 2007). Quite vast theoretical and empirical works conclude that women are of crucial importance to process of introducing innovations into markets, they create employment (including self-employment) contributing to overall wealth creation in all economies (i.e. Brush *et al.*, 2006). Also many studies provide evidence indicating the prominent character of female entrepreneurship with respect to poverty reduction (Yunus, 2007) and tend to emphasise its profound impact on local communities and surroundings (Court, 2012).

In recent years, it is widely observed that an increasing number of women are engaged in entrepreneurial activity. To support the above, i.e. in 2010, over 104 million of women in 59 countries (this accounts for 52% of the world's population and 84% of the global GDP), set up new businesses creating employment and different activities in labour markets (Kelly, Brush, Greene, and Litovsky, 2011). Summarizing the above the hypothesis on women's importance to economy stays unquestionable. Having in mind growing importance of the women's role in national economies, in the paper we aim to focus the potential role of female entrepreneurship – including female-male gender gap on labour market changes, confronting it with economic development.

2. Female entrepreneurship, gender equity and economic development – theoretical framework

The relationship between economic growth and women's economic empowerment is bidirectional. As stated in previous sections, women entrepreneurship is recognized as a factor which has unrecognized potential to contribute to economic growth and development. These can occur mainly by improving women's ability to access educational and healthcare systems, earning opportunities and socio-political rights. On one hand – economic growth and development as such can contribute to women's empowerment by driving down substantial inequalities between women and men, enhancing fight against discrimination; but on the other hand – women's active participation in labour market is a driving force for economic growth and accelerates development.

Recently several empirical analyses have been released which concern impact of women's entrepreneurship on socio-economic development. In the papers, the impact of female engagement in economic development process has been evaluated the lens of GDP per capita dynamics, total female employment of women productivity (Minniti, 2010; Fuller-Love, 2008; (Bahmani-Oskooee et al. 2012). Nonetheless, the most frequently applied measure appears to be employment and self-employment,

which is mainly assessed as the number of start-ups. Setting-up a new business, appears to be a crucial factors contributing to job creation, creating market activities, ensuring women to gain a stable source of earnings. On the other hand, job creation is critical from the point of few of social stability and security. Stable jobs, especially self-employment, create relatively better living, higher opportunities for further education and skills improvement. Growing demand for social and welfare benefits imposes an additional burden on public budgets, whereas a declining demand for commodities and services in the marketplace diminishes growth. On the contrary, substantial increase in the number of newly-established jobs results in reversed dynamics, and therefore we can observe an upward spiral (Mitchell, 2011). As an example we can cite the results of research conducted in the United States (a random sample of eight million women-owned businesses) by the Centre for Women's Business Research in 2009 revealed that their estimated economic impact amounted to 3 trillion dollars per year, which was reflected in establishment and/or retaining more than 23 million workplaces – 16% workplaces on the American labour market (Centre for Women's Business Research, 2009).

Taking into consideration the fact that women currently constitute nearly half of the workforce and more than half of college students, their lingering in the field of setting up high-growth companies has contributed to notable economic deficit. As a result, the nations offers fewer jobs and lower potential in emerging industries in comparison with the situation of women's entrepreneurship were equal to men's entrepreneurship (Mitchell, 2011). Although numerous research studies demonstrate an increase in the numbers of women entrepreneurs and women-owned businesses, findings continuously indicate predominant position of males when it comes to running business activities (Tsyganova, Shirokova, 2010). Normally, it is interpreted as a visible problem which should be efficiently handled for the benefit of women and in the interest of gender equity. As a matter of fact, it seems to be an economic issue which has an impact on all community as setting up new companies is beneficial and advantageous for everyone. Furthermore, it must be highlighted that returns will increase when more women contribute to the process by introducing their ideas and concepts into the market and establishing high-growth companies based on the aforementioned ideas and concepts.

In the face of such significant disproportion in percentage of women and men involved in entrepreneurship worldwide³ (Georgellis and Wall, 2005; Kim, 2007), understanding its causes and motivations becomes particularly important. There are various factors which can justify the divergence in the numbers of men and women setting up an enterprise. Acquiring resources, in particular funds essential for their new venture, constitutes one of the key hindrances for women (Orser *et al.*, 2006; Fuller-Love, 2008). In fact, women face a lot of difficulties in raising finance and, as a consequence,

³ For detailed numbers see next section of the paper.

only a small percentage of women manage to raise venture capital (Brush *et al*, 2002). The possibility to obtain venture capital is dependent on the industry in which an entrepreneur operates. Owing to the fact that women are most likely to choose the service industries (retail, education and healthcare), which are perceived as being less significant to economic and growth than high-technology and manufacturing, they do not attract venture capitalists to the same extent. The fact that fewer women engage in entrepreneurship based on technological innovations results, in turn, from large differences in education between men and women. Women are, in general, overrepresented in the humanities and underrepresented in science and technology-related fields (OECD Conference, 2004).

Except for the aforementioned differences, there are many others which we came across while studying the literature dedicated to this issue. Nevertheless, we shall emphasise a selected bundle of them. Some evidence supporting the idea that women, making financial decisions, are more risk averse than men (Fuller-Love, 2008) and additionally they have lower turnover expectations (Harding, 2007). Another studies prove that men and women differ in expectations concerning growth. Besides, men are more willing to grow their new venture in order to achieve financial success, whereas women recognise financial success as only one of many reasons to achieve growth (Brush, Cooper, 2012). According to the Global Entrepreneurship Monitor (Minniti *et al*, 2005), fewer women know other entrepreneurs and deem their skills as adequate to run a business in comparison with the men population. Apart from education and industry choice issues, aforementioned observations allow for proposing a hypothesis that men are more confident in their success and abilities than women. So developing confidence in female entrepreneurs is one of important aspect that should be emphasised.

Having analysed the differences between female and male entrepreneurship, it is also worth pinpointing the factors which constitute motivations to become entrepreneurs. The decision on launching one's own business is generally taken basing on the combination of numerous determinants. Ascher (2012), basing on research carried out by various authors within the last several years, recognises individual motivation, demography, economic and social environments, education, family networks and unemployment as the factors affecting female entrepreneurship, as well as being major determinants of differences between women and men, including the manner of perception. Among motivational factors, encompassing both women-specific factors and the ones characteristic of both genders, the author enumerates: the need for autonomy and flexibility, the need to generate income, the need for achievement, self-determination and personal growth, the need for change, frustration, boredom and dissatisfaction with the present job, previous unfriendly work environment, as well as hitting the 'glass ceiling' in the present job. All these factors discussed above constitute a significant barrier for equal access to labour market by female and male. The female-male gender gaps on labour markets, however

broadly observed, are not solely due to economic reasons. Lots of preconditions like i.e. religion, culture, educational system, become a huge barrier for women to enter labour market.

Despite all these, the empirical evidence on “women on labour market” and economic development is growing. In the last section, we concentrate on detecting some statistical relationships between women`s engagement on labour market, female-male gender gap in labour market participation *versus* gross domestic product (a proxy of economic development). Although we hypothesis on discovering important links between the two, we are fully aware that the quantitative analysis are highly limited. It does not let to uncover factors which above all determine possibilities for women to participate in labour market, and – in consequence – influence the magnitude of female-male gender gap in labour market.

3. Women and economic development – an empirical evidence for 83 world countries.

In the following section, we review the evidence on existing women`s deprivation from labour market, magnitude of female-male labour participation gap and secondly we emphasize the relationship between women empowerment and economic growth. For the analysis purposes we apply a cross-country balanced panel data for 83 – both developed and developing – economies. The time coverage is limited to the period 1990-2011⁴. All data are derived from World Development Indicators 2012 database and International Monetary Fund World Economic Outlook Database 2013 (April 2013).

In the paper we specify the following variables: Female Labour Participation Rate ($FemLabPart_{i,y}$), Male Labour Participation Rate ($MaleLabPart_{i,y}$), Female-Male Gender Gap ($F-MGenderGap_{i,y}$), Change in Female-Male Participation Rate ($ChangeGapF-M_{i,1990-2011}$), Gross Domestic Product PPP per capita ($GDPPPPpc_{i,y}$), Gross Domestic Product PPP per capita average annual exponential growth rate ($GDPPPPpcExpAnnGrowth_{1990-2011}$), where i – denotes country and y - year.

The variable ($F-MGenderGap_{i,y}$) (1) and ($ChangeGapF-M_{i,1990-2011}$) (2) estimates are the following:

$$(F-MGenderGap_{i,y}) = (MaleLabPart_{i,y}) - (FemLabPart_{i,y}) \quad (1),$$

and

$$(ChangeGapF-M_{i,1990-2011}) = (F-MGenderGap_{i,2011}) - (F-MGenderGap_{i,1990}) [\%pp] \quad (2).$$

Tables 1,2,3 and 4 (see below) summarize descriptive statistics, shedding light on the women relative to men inequality on labour market, both in 1990 and 2011.

⁴ In case of any missing values for selected variables, we have applied the data based on the time-trend estimates.

Table 1. Female Labour Participation⁵ (%). Summary statistics for 83 countries. Years 1990 and 2011.

	No. of obs.	Average (%)	Min.Value (%)	Max.Value (%)	Lower quintile (%)	Upper quintile (%)	Std. dev.
$(FemLabPart_{i,1990})$	83	46,2	8,9	77,69	36,2	55,9	13,9
$(FemLabPart_{i,2011})$	83	50,5	13,1	79,19	46,0	57,5	12,7
Change in Female Labour Participation Rate [[$(FemLabPart_{i,2011}) - (FemLabPart_{i,1990})$](%pp)	83	4,3 (↑)	(-22,59)	(+24,19)	-	-	-

Source: Authors` estimates based on data derived from World Development Indicators 2012.

In all 83 countries, the average women participation in labour market has slightly increased in 2011 ($FemLabPart_{i,2011} = 50,5\%$), in relation to 1990, which indicates improvements in relative empowerment of women on labour market when compared to men. In 1990, the most numerous group of countries – 42 countries, were economies where $FemLabPart_{i,1990} \in <40,0\% - 60,0\%>$, while in 2011, the group of countries with analogous $FemLabPart_{i,2011}$ values was relatively bigger – 57 countries achieved the given variable value. Greatest changes are observed in the group of countries where $FemLabPart_{i,1990,2011}$ ranged $<0,0\%-10,0\%>$, $<30,0\%-40,0\%>$ and $<50,0\%-60,0\%>$. In 1990 the number of countries where $FemLabPart_{i,1990} \in <0,0\%-10,0\%>$, which has decreased to zero in 2011. Again in 1990, the number of countries where $FemLabPart_{i,1990} \in <30,0\%-40,0\%>$, was 20 (share of total – 24%), which has decreased till 4 (share of total – 4,81%) in 2011. This is assigned as highly positive changes, as the 16 countries (out of total), has moved “forward”, climbing up the ladder in terms of women engagement in labour market. Finally, in 2011, the most numerous group – 33 economies (share of total – 39,75%) constituted countries where $FemLabPart_{i,2011} \in <50,0\%-60,0\%>$.

Table. 2. Female Labour Participation (%) *cont.* 83 countries. Years 1990 and 2011.

$(FemLabPart_{i,y})$	No. of obs.		Cumulative no.		Share of Total (%)		Cumulative share of Total (%)	
	Year1990	Year2011	Year1990	Year2011	Year1990	Year2011	Year1990	Year2011
$0,0 < x \leq 10,0$	2	0	2	0	2,4	0,0	2,4	0,0
$10,0 < x \leq 20,0$	2	3	4	3	2,4	3,61	4,81	3,61
$20,0 < x \leq 30,0$	3	5	7	8	3,61	6,02	8,43	9,63
$30,0 < x \leq 40,0$	20	4	27	12	24,0	4,81	32,53	14,45
$40,0 < x \leq 50,0$	21	24	48	36	25,30	28,91	57,83	43,37
$50,0 < x \leq 60,0$	21	33	69	69	25,30	39,75	83,13	83,13
$60,0 < x \leq 70,0$	11	10	80	79	13,25	12,04	96,38	95,18
$70,0 < x \leq 80,0$	3	4	83	83	3,61	4,81	100,0	100,0

Source: Authors` estimates based on data derived from World Development Indicators 2012.

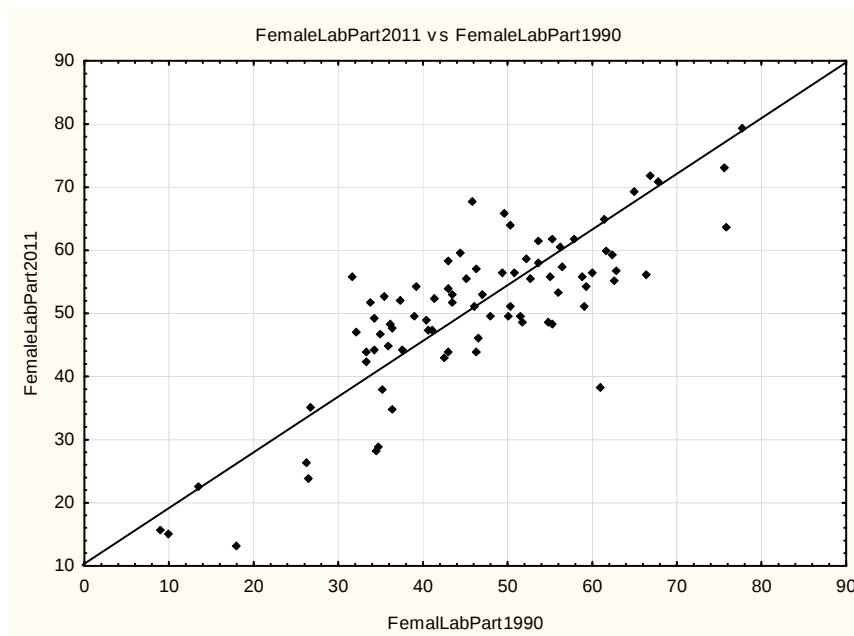
The Chart 1 (see below) shows the relationship in women empowerment – expressed as women participation in labour market, both in 1990 and 2011. The solid 45°C line is drawn arbitrary by the authors, to detect which countries have improved the female participation in labour market – in absolute terms – in the period of 21 years. All countries above the 45°C line, present economies where the variable $FemLabPart_{i,1990}$ in 1990 was lower than in 2011. According to estimates the number of such

⁵ According to World Bank definition: Labor participation rate is calculated as the % of female population ages 15+, which participates actively in the labor market.

economies is 57 (68% of total) and these economies are definitely improving women's situation and position at internal (national) labour market. At the same time, only one country – Morocco, achieved the score “0”, which implies no change in women's situation, and in 25 countries the women's situation has worsened (see counties below the 45°C line, where the $FemLabPart_{i,1990}$ in 1990 was lower than in 2011).

Additional conclusions on women's position in national labour market, can be derived from the analysis of female-male gender gap ($F-MGenderGap_{i,y}$), again in terms of labour market participation. The magnitude of gender gap⁶ reflects the specific relations between women and men in access, ability to participate and general empowerment in terms of national labour market. The greater gap, the more sever deprivation of women from free access to labour market and ability to earn to live. Such gaps (divides) and differences can occur due to multitude of factors i.e. culture, religion, and different access to education or healthcare system. The deprivation of women (girls) from basic education limits their future possibilities to operate successfully on labour market, to gain financial resources for setting up own business and so on. In many cases the barriers are hardly possible to overcome.

Chart 1. Women empowerment in terms of labour market participation. 83 countries. Years 1990 and 2011.



Source: Authors' elaboration.

⁶ Expressed in %pp.

Tables 3 and 4 (see below), explain the magnitude of Female-Male Gender Gaps in 1990 and 2011 ($F-MGenderGap_{i,1990}$; $(F-MGenderGap_{i,2011})$), and its changes in the given period ($ChangeGapF-M_{i,1990-2011}$), estimated by following the formula (2). As can be concluded from estimates (see following Tables 3 and 4), the F-M Gender Gap on average has slightly decreased which forecasts positive changes in national labour market women-men relations. Also in 2011 the highest score for the $(F-MGenderGap_{i,2011})$ was 60,6%, which was at 10,59%pp lower than in 1990 (both in 1990 and 2011, the country with the worst score of $(F-MGenderGap_{i,y})$ was Pakistan).

Table 3. Female-Male Gender Gap, Change in Female-Male Gender Gap (*acc. Labour Market Participation*). 83 countries. Years 1990 and 2011.

	No. of obs.	Average (%)	Min. Value (%)	Max. Value (%)	Lower quintile (%)	Upper quintile (%)	Std. dev.
$(F-MGenderGap_{i,1990})$	83	29,8	6,6	71,19	16,3	42,5	15,04
$(F-MGenderGap_{i,2011})$	83	22,15	6,6	60,6	12,0	31,19	13,58
$(ChangeGapF-M_{i,1990-2011})$	83	(-7,69) [%pp]	(-21,8) [%pp]	(4,7) [%pp]	-	-	-

Source: Authors' estimates based on data derived from World Development Indicators 2012.

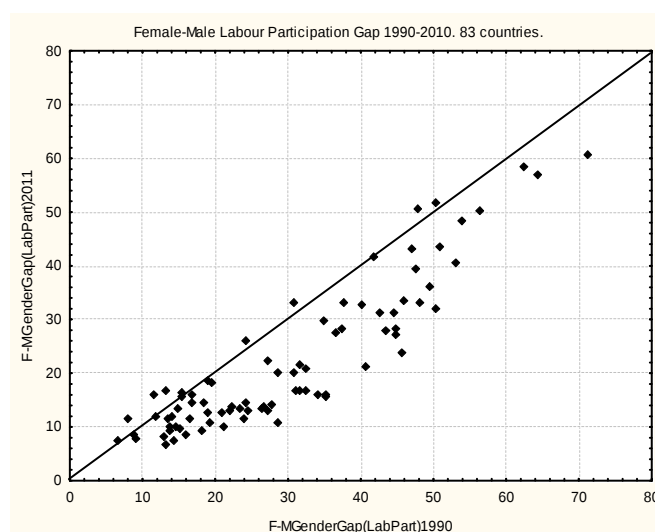
The Table 4 and Chart 2 indicate the magnitude of changes on the field. The progress is evident. On the Chart 2, again the 45°C line divides the countries' population into two groups: countries which made progress and diminished the Female-Male Gender Gap (countries below the indicated 45°C line, and the $(ChangeGapF-M_{i,1990-2011})$ score is negative), and countries where the relative situation of women to men on labour market has worsened (countries above the line). Happily the first group of countries is nothing less than 72 economies (86% of total), while the lagging behind group it is only 11 countries (these are: Thailand (+4,7%pp), Bulgaria, Slovak Republic, Egypt, Indonesia, Macedonia, India, Cambodia, Romania, Jamaica and Slovenia (+0,09%pp)). Table 5, summarizes best (5 countries) and worst (5 countries) performing countries in terms of changes in female-male gender gap on labour market.

Table 4. Change in Female-Male Gender Gap (*acc. Labour Market Participation*), *cont.* 83 countries. Years 1990 and 2011.

$(ChangeGapF-M_{i,1990-2011})$ [range, in %pp]	No. of obs.	Cumulative number	Share of total (%)	Cumulative share of total (%)
$-25,0 < x \leq (-20,0)$	1	1	1,2	1,2
$-20,0 < x \leq (-15,0)$	10	11	12,04	13,25
$-15,0 < x \leq (-10,0)$	18	29	21,68	34,93
$-10,0 < x \leq (-5,0)$	25	54	30,12	65,06
$-5,0 < x \leq 0,0$	18	72	21,68	86,74
$0,0 < x \leq 5,0$	11	83	13,25	100,00

Source: Authors` estimates based on data derived from World Development Indicators 2012.

Chart 2. Female-Male Labour Participation Gap. 83 countries. 1990 and 2011.



Source: Authors` elaboration.

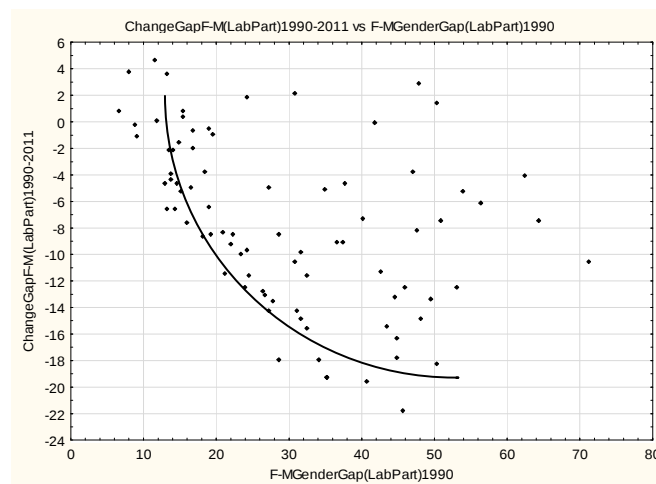
Table 5. Best and worst performing countries in terms of changes in Female-Male Labour Market Participation Gap ($ChangeGapF-M_{i,1990-2011}$). Changes in %pp. Period 1990-2011.

Worst performing countries		Best performing countries	
Country	$(ChangeGapF-M_{i,1990-2011})$ [%pp], [highest positive changes, (+)]	Country	$(ChangeGapF-M_{i,1990-2011})$ [%pp], [highest negative changes, (-)]
Thailand	4,7	Colombia	-21,8
Bulgaria	3,8	Brazil	-19,5
Slovak Republic	3,69	Spain	-19,29
Egypt	2,9	Ireland	-19,19
Indonesia	2,09	Malta	-18,19

Source: Authors` calculation.

Additionally, by drawing the scatter plot (see Chart 3) we have checked whether lower values of ($F-MGenderGap_{i,1990}$) in 1990, correlate strongly and positively with ($ChangeGapF-M_{i,1990-2011}$). If so, this would be a general, worldwide, tendency for better women empowerment and improvements of women to men ratios on labour markets. The picture on Chart 3 is clear, and quite evident relationship is revealed in the case. Applying the simple, one-independent variable model (GLM) – the $F-MGenderGap1990$ as regressor and $ChangeGapF-M1990-2011$ as dependent variable, we estimate the coefficient (-0,18) and the $p-value < 0,05$, which confirms the previous hypothesis and conclusions (for details see Appendix 2, at the end of the paper).

Chart 3. High initial $F-MGenderGap$ indicates higher $ChangeGapF-M$ in 1990-2011? 83 countries. Years 1990-2011.



Source: Authors' elaboration.

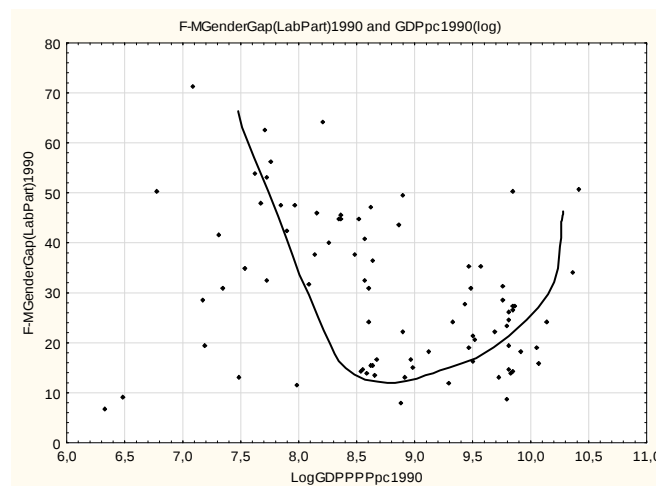
In the final section we present a simplistic attempt to estimate if changes in Female-Male Gender Gap correlate with Gross Domestic Product⁷. Economic growth can promote female participation in labour market by removing financial constraints, increasing opportunities to earn, or by providing infrastructure, access to educational and health care system. Providing basic infrastructure, like i.e. electricity and access to improved drinking water, is especially important in low and lower-middle-income countries. Significant improvements on the field, provide substantially new conditions for work and enable expanding different working activities. This structural change is of crucial importance for women. As can be concluded from raw data (see World Development Indicators 2012 statistics for female participation in labour market), in the last 2 decades the women empowerment on the field of labour market has increased. Also, provision of new kind of infrastructure, empowers women for

⁷ Gross Domestic Product *per capita* in Purchasing Power Parity per capita.

creating networks for more safe and effective work, mostly by expanding their opportunities of gaining new financial resources, as well as a new source of support, knowledge and information.

The following Charts 4 and 5, generalize the attempts by drawing the picture of the relationships from available data. In both cases, in 1990 and 2011, the kind of relationship is similar. The GDP PPP per capita and Female-Male Gender Gap, they correlate rather weakly and negatively (in 1990 the $r = (-0,31)$, and in 2011 – $r = (-0,47^8)$). However in both cases the relationship results to be statistically significant⁹, and graphically is approximated by the U-shaped curve. Regressing¹⁰ $GDPPPPp_{c_{iy}}$ on $F-MGenderGap_{iy}$ we obtain results which seem to confirm the hypothetical assumption on existing negative correlation between the two variables¹¹. Despite the fact, that the equation coefficient in both cases are low, but still negative and statistically significant.

Chart 4. Female-Male Gender Gap in Labour Market Participation and LogGDP PPP *per capita*. 83 countries. Year 2000.



Source: Authors` elaboration.

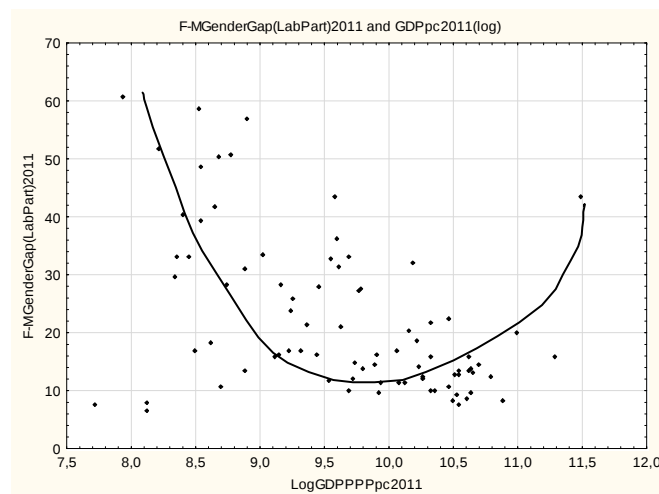
⁸ Authors` estimates.

⁹ For $\alpha=0,05$.

¹⁰ We apply the GLM (Gaussian identity) models with one regressor.

¹¹ For details, see Appendix 1.

Chart 5. Female-Male Gender Gap in Labour Market Participation and LogGDP PPP *per capita*. 83 countries. Year 2011.



Source: Authors` elaboration.

Conclusions

The main aim of the study was to uncover the quantitative links between female participation in labour market, female-male gender gap in labour market participation and economic development measured simply by gross domestic product (in PPP) *per capita*. Our panel covered 83 cross-country data, and the time span was set for 1990-2011. Our main findings are following: across the analyzed 83 economies, there exist huge differences in female labour participation – the $FemLabPart_{i,y}$ varies significantly between about 8% and 80%, but at a time in the period 2000-2011 the variable value increase in 57 countries; along with the previous significant and positive changes are reported in the value of female-male gender gap in labour market participation ($F-MGenderGap_{i,y}$) – in 72 countries (out of 83) the gap has fallen. Also we have found a negative relationship between the initial female-male gender gap ($F-MGenderGap_{i,2000}$) and ($ChangeGapF-M_{i,1990-2011}$) in the analyzed period, which implies the trend that in economies with initially higher female-male gender gap the changes are relatively high. These changes are accounted as highly positive from macroeconomic perspective, creating possibilities for growth enhacment. Secondly, we have identified the relationships between the variables $F-MGenderGap_{i,y}$ and $GDPPPPpc_{i,y}$. Both in 2000 and 2011, the statistical relationship between the two variables is reveals as the U-shaped curve. When regressing the $GDPPPPpc_{i,y}$ on $F-MGenderGap_{i,y}$ we find the statistical significance, and the regression coefficients are negative and low, in 1990 – $\beta = (-0,02)$, and in 2011 – $\beta = (-0,03)$.

The general conclusions on the quantitative analysis are quite evident, reporting on significant and positive changes. Female participation in labour market is growing which creates possibilities for growth and further development, higher stability and less inequality on labour market. Although the evidence is rather clear, we need to stress that the quantitative analysis is not sufficient to show the complexity of the problem. Aspects of relationships between women empowerment and economic development are mainly of qualitative kind. Also in the case we observe the two-way causality, when one influence the second. Detecting the strict direction of causality is not probable, while the changes go in both directions.

To sum up, the relationships between gender equality on labour market and economic growth is complex and the qualitative explanation of it is not sufficient. It omits a way array of conditions, difficult to capture, however of great importance. Probably, careful and detailed microeconomic analysis could provide more explanation to the issue, and the evidence could be more definite.

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Appendix 1.

```
. glm LogGDP1990 FMGap1990, family(gaussian) link(identity)
```

Iteration 0: log likelihood = -110.22087

Generalized linear models		No. of obs	=	83
Optimization	: ML	Residual df	=	81
Deviance	= 69.19220258	Scale parameter	=	.8542247
Pearson	= 69.19220258	(1/df) Deviance	=	.8542247
		(1/df) Pearson	=	.8542247

Variance function: $V(u) = 1$ [Gaussian]
Link function : $g(u) = u$ [Identity]

Log likelihood = -110.2208724 AIC = 2.704117
BIC = -288.7339

LogGDP1990	Coef.	OIM Std. Err.	z	P> z	[95% Conf. Interval]
FMGap1990	-.020208	.0067824	-2.98	0.003	-.0335013
_cons	9.3648	.22644	41.36	0.000	8.920986


```
. glm LogGDP2011 FMGap2011, family(gaussian) link(identity)
```

Iteration 0: log likelihood = -95.062249

Generalized linear models		No. of obs	=	83
Optimization	: ML	Residual df	=	81
Deviance	= 48.02012213	Scale parameter	=	.592841
Pearson	= 48.02012213	(1/df) Deviance	=	.592841
		(1/df) Pearson	=	.592841

Variance function: $V(u) = 1$ [Gaussian]
Link function : $g(u) = u$ [Identity]

Log likelihood = -95.0622486 AIC = 2.338849
BIC = -309.906

LogGDP2011	Coef.	OIM Std. Err.	z	P> z	[95% Conf. Interval]
FMGap2011	-.0307941	.0062603	-4.92	0.000	-.043064
_cons	10.32542	.1624259	63.57	0.000	10.00707

Source: authors` estimates.

Appendix 2.

```
. glm ChangeFMGap19902011 FMGap1990, family(gaussian) link(identity)
```

Iteration 0: log likelihood = -262.98806

Generalized linear models		No. of obs	=	83
Optimization	: ML	Residual df	=	81
Deviance	= 2746.34256	Scale parameter	=	33.90546
Pearson	= 2746.34256	(1/df) Deviance	=	33.90546
		(1/df) Pearson	=	33.90546

Variance function: $V(u) = 1$ [Gaussian]
Link function : $g(u) = u$ [Identity]

Log likelihood = -262.9880641 AIC = 6.385255
BIC = 2388.416

cha~19902011	Coef.	OIM Std. Err.	z	P> z	[95% Conf. Interval]
FMGap1990	-.1834738	.0427301	-4.29	0.000	-.2672232
_cons	-2.215205	1.426599	-1.55	0.120	-5.011287

Source: authors` estimates.

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