The Impact of Female Education and Employment on Service Sector Value Added Growth: Evidence From Panel Data

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The world economy has experienced a considerable shift in structure from the late 1980s, with the service sector contributing approximately 62 percent to the overall economic output and 50 percent of the total employment share from 1991 to 2010. Given the importance of the service sector, we study the inter-relationship between female education attainment, female employment in the service sector, and the per capita value-added growth of the service sector. Our analysis uses data from 146 countries from 1991 – 2015. Using fixed effects panel estimations, we conclude that globally, an increase in female education significantly primary education attainment increases the growth of the service sector. In contrast, an increase in female employment in the service industry relative to male employment leads to decreased service sector growth. We suggest that the negative effects of female employment on growth are based primarily on discriminatory factors women face in the workplace. Our results are robust across all specifications and hold after correcting for possible endogeneity.

Keywords: service sector growth, female employment, economics of gender

INTRODUCTION

Globalization has brought countries closer, and information technology has brought them even closer. Services can easily cross borders with technological advancements to provide support. The service sector contributes substantially to the world economy, accounting for over 65% of the 2017 global GDP (The World Bank, 2019). Existing studies on the service sector show that women have entered the service sector workforce in more significant numbers over the past few decades than their male counterparts (Galor and Weil, 1996; Ngai and Petrongolo, 2017). These studies have primarily focused on the rationale for this gender shift in numbers employed in the sector, including the gender-skill structure of labor. However, little, if any, attention has focused on the intersection of female employment with service sector growth.

Economic growth and income inequality have been a subject of contention in empirical studies for several decades. The new growth theory models, first developed by Barro (1991), enabled researchers to identify the impact of income inequality on economic growth. Gendered perspectives have also been significantly considered in the economic growth narrative (e.g., Beneria, 1989; Moghadam, 1999; Seguino, 2000), with many studies emphasizing gender inequality in the form of less female employment on overall economic growth. Some research has dealt with the economies of a single country or geographic region

(e.g., Licumba, Dzator, and Zhang, 2015), while others focus on cross-country analyses (e.g., Mitra, Bang, and Biswas, 2014; Moorhouse, 2017). This paper aims to consider the effect of gender inequality in employment and education on the value-added growth of the service sector.

Unlike prior decades when the manufacturing sector was held crucial for growth in many countries, the service sector is now a significant factor in recent overall economic growth. As shown in Table A2 (see Appendix), the service sector value added is approximately 59.14 percent of the total GDP between 1970 and 2010. Disaggregating this into two separate periods strengthens our claim. The service sector contributed almost 51.19 percent to the overall GDP between 1970 and 1990, whereas from 1991 to 2010, the share of service sector output to GDP was significantly high at nearly 61.72 percent.

It is evident from the existing cross-country data that the service sector significantly contributes to overall economic growth. Figure 1 shows that agriculture value added has gradually fallen between 1991 to 2015, from an average value of 18.5% between 1991-1995 to 13.9% between 2011-2015. For industry and manufacturing value-added, we find a marginal decline from 1991 to 2015. Contrary to these trends, service sector value added has steadily increased for all countries and periods. The average service sector value added increased by approximately five percentage points between 1991 and 2015.

Given the importance of female education and employment and the role the service sector plays in overall economic growth, it seems essential to study the relationship between gender inequality in female social achievements and service sector value-added growth. Our main results suggest that increasing female employment in services leads to a decrease in the growth of services. The result holds across all specifications and is relatively constant. For example, a one percentage point increase in female employment relative to male employment reduces the value-added growth of the service sector by approximately 0.18 percentage points. Conversely, a one percentage point increase in the female-to-male ratio of primary education attainment increases service growth by 0.25 percentage points.

As discussed later in this paper, these results contradict the findings of existing studies that deal with overall economic growth and help us understand the implications of gender inequality at a sectoral level. In addition to the sectoral response to gender difference, we highlight four likely gender discriminatory practices typical of service sector jobs that perhaps lead to this contradiction. These are the gender wage gap, total time engaged in working, less access to capital, and less mobility to higher positions within an organization. Existing studies on gender inequality and growth have overlooked these discriminatory aspects, assuming female workers as a direct substitute for male workers by using women's labor force participation rate and economic activity rate as the leading employment variables to explain economic growth rates. We argue that this practice disregards women's discrimination in the workplace and society, especially in the service sector. Instead, we suggest using the actual employment of women within a sector to study the impact of women's employment on sectoral growth.

LITERATURE REVIEW

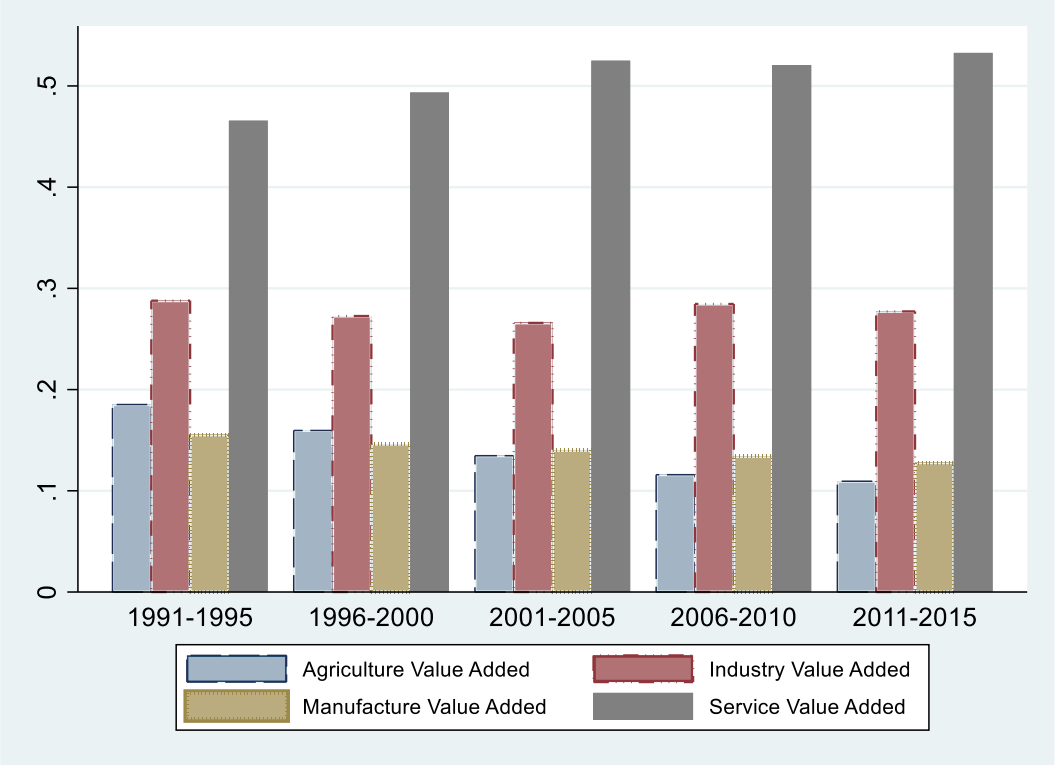
Much literature has found that gender inequality remains a significant factor in several economic determinants of developed and underdeveloped countries. For example, Becker and Lewis (1973) were among the first to study the effects women in the workforce had on a country's economy, noting that as a country's income increased, gender inequality decreased. However, they failed to indicate the size effect of the change. Others have issued theoretical arguments to explain gender inequality (e.g., Doepke and Tertilt, 2009; Fernandez-Mateo, 2009) but have not provided quantitative data on changes and economic impacts.

Early theorization of female employment and development suggests a U-shaped relationship between female employment and economic development (Boserup, 1970). The inference is that as significant economic development begins within an area and employment shifts from agricultural to factories, women are more likely to exit from the labor force. Later, with continued economic development, women are more likely to move back into the labor force, seeking employment in the service sector and other more culturally acceptable forms of employment. Ngai and Petrongolo (2017) report that the rise of services, driven by structural transformation and marketization of home production, raises women's relative wages and market hours, which, in turn, narrows the gender pay gap in the service sector.

Bobbit-Zeher (2011) indicates that cultural and structural contexts play an important role in gender stereotyping and discriminatory practices in the workplace. Consistent with Bobbit-Zeher's posit on structural context, several studies have examined the effect of schooling or education on gender inequality and economic growth for a variety of countries (e.g., Barro and Lee, 1993; 1994; Jacobs, 1996; Hill & King, 2010; Dollar & Gatti, 1999; Lorgelly & Owen, 1999; Tzannatos, 1999; Forbes, 2000; Klasen, 2002; Knowles, Lorgelly, and Owen 2002; Ghosh & Yamarik, 2004; Abu-Ghaida & Klasen, 2004; Winslow, 2010; Cooray & Potrafke, 2011). While methodologies and conclusions are mixed, and reasons for gender education inequality range from patriarchal pride to national or religious culture, all infer that gender education inequality impacts gender income inequality.

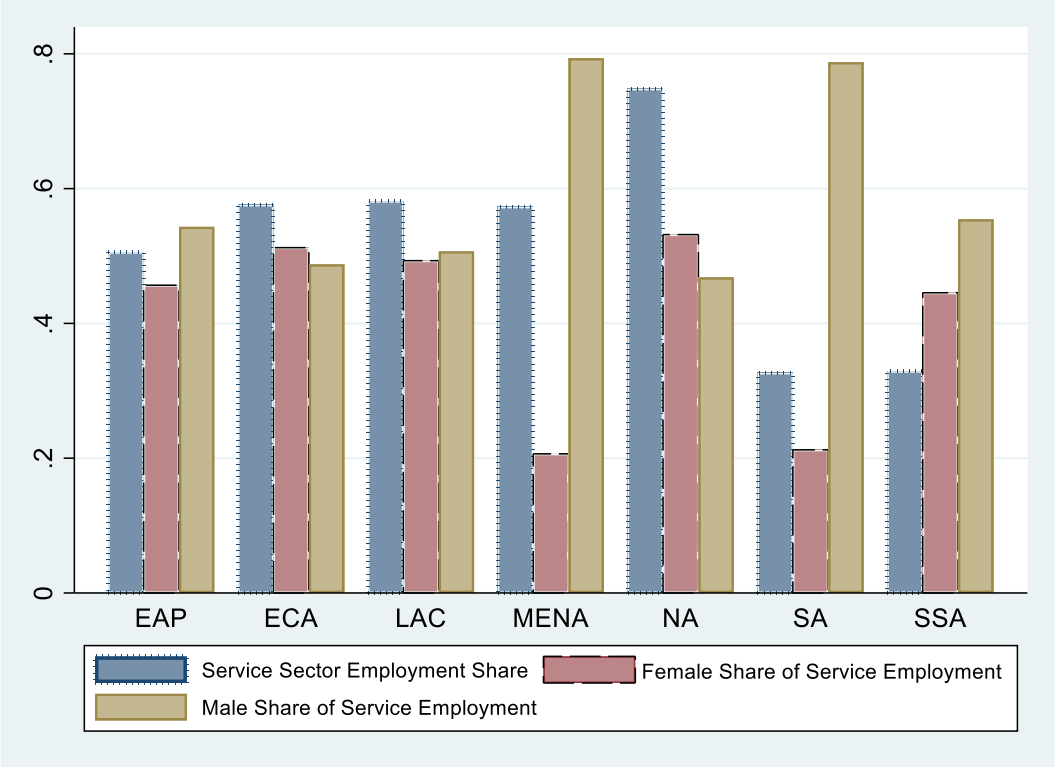
Klasen (2002) uncovers some interesting findings: (1) gender inequality in education affects the growth of both developing and industrial economies; (2) results when simultaneity is removed are similar to when possible in cross-section analysis; and (3) results are more robust when using the share of the population with some secondary education (as used in this study) as the education variable. Earlier findings concur. Dollar and Gatti (1999) determined that gender education inequality harms economic growth. They noted a significant positive coefficient on female secondary attainment and an insignificant negative one on male attainment, indicative of a more conducive environment for economic growth with increased female access to education. Fiala (1983) captures the service sector's size by its workforce percentage. Fiala suggests that expansion of the service sector is associated with greater inequality in the concentration of wealth, i.e., more wealth among the top 20% and top 5%. In contrast, a higher concentration of wealth in the lower strata of the population exhibits a negative relation with the service sector growth. Several studies support the conclusion that, in the past two decades, the service sector has contributed the most to overall economic growth (Gani & Clemes, 2010; Singh, 2010).

FIGURE 1
AVERAGE SECTORAL VALUE ADDED AS A SHARE OF GDP FROM 1991 TO 2015



Source: World Development Indicators 2019, The World Bank

FIGURE 2
AVERAGE SERVICE SECTOR TOTAL EMPLOYMENT SHARE FROM 1991 TO 2015 BY WORLD REGIONS



Source: World Development Indicators 2019, The World Bank
Note: World Regions are classified under WDI 2019 as East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and Caribbean (LAC), Middle East and North Africa (MENA), North America (NA), South Asia (SA), Sub Saharan Africa (SSA). The countries included in the analysis are restricted due to data unavailability. North America only consists of United States.

DATA AND METHODOLOGY

We use data from 146 countries[1] from 1991 to 2015. We measure service sector growth by five-year compound growth rate of service sector real value added per worker (*SVC_GTH*). Therefore, we have five non-overlapping periods[2] in our data for which growth is calculated. Similar strategies are adopted in all growth estimations to control for yearly serial correlation and to avoid data limitations; for example, see Forbes (2000) and Klasen and Lamanna (2009).

The service sector value-added variable is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It includes value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services Bank (The World Bank 2019). In our analysis, we prefer the *value added per worker* as opposed to *the total value added*. It enables us to identify the average individual effect of gender inequality in employment and education on sector output. Using total value added limits our analysis to draw conclusions on average individual effects.

Gender inequality in employment is measured as the ratio of total females employed in the service sector over total male employment in the service sector (*SVC_EMP_FM*). Following Klasen and Lamanna (2009), gender inequality in education is calculated by the ratio of average female years of schooling to average male years of schooling attained (*SCH_FM*). We also use additional measures of gender inequality

in education, female to male ratio of average years of primary schooling attained (*SCH_PRI_FM*), secondary schooling attained (*SCH_SEC_FM*), and tertiary schooling attained (*SCH_TER_FM*). Disaggregating the overall education variable into primary, secondary, and tertiary helps us to identify the education channel that impacts service growth the most.

We use income inequality as a control variable, and it is measured by the Gini coefficient (*GINI*), defined as the net income inequality in a country after redistribution (post-tax and post-transfer). We use additional control variables such as real GDP per capita (*GDP_PC*) calculated at constant US$ 2010, gross fixed capital formation as a share of GDP (*CAPITAL*), and employment to population ratio for people aged 15 years and above (*EMP_POP*).

Data on the growth of the service sector, employment in services, employment to population ratio, gross capital formation, and real GDP per capita have been obtained from the World Development Indicator Database of the World Bank (The World Bank 2019). The education variables have been obtained from Barro and Lee (2013) education dataset. Barro and Lee (2013) compiled and presented a comprehensive database that consists of age-group and gender-specific education attainment data for 146 countries from 1950 to 2010, with five-year intervals. Due to data limitations, we only consider the portion of the data from 1990 to 2010. Moreover, to fit our study period (1991 to 2015), we forward the timeline by one year. Therefore, the education attainment value for 1990 was considered as a proxy measure for educational attainment

in 1991; the value for 1995 is considered as a proxy for 1996, and similarly, 2010 data is used as a proxy for 2011. Per the data, education attainment does not show significant variation, even for a five-year period. As such, we argue that using such a method does not limit our analysis since education outcomes do not change significantly over one year.

We use the GINI coefficient from the Standardized World Income Inequality Database (SWIID) (2019). Table A3 (see Appendix) represents the variables' descriptions and sources. The SWIID database combines observations collected from a range of inequality measurement databases to maximize comparability across countries. It also accounts for the underlying uncertainty in the inequality estimates by using a Bayesian approach to standardize the data. In the paper, we use the estimated coefficients of the Gini index of net income inequality (post-tax post-transfer) calculated by Solt (2019). A potential drawback of the income inequality data is that there are numerous missing observations. We attempt to ameliorate this weakness by using the initial values of income inequality for each period, proxying for any missing values by the next available year. This is based on the assumption that the GINI coefficient does not change much within two consecutive years.

To study the relationship between service sector value added growth, and gender inequality in employment and education, we estimate the following equation:

$$SVC_{GTH_{it}} = \alpha_0 + \alpha_1 \ln SVC_{VA_{PW_{it}}} + \alpha_2\, CAPITAL_{it} + \alpha_3\, SVC_{EMP_{FM_{it}}} + \alpha_4\, GINI_{it} + \alpha_5\, SCH_{FM_{it}} + \phi_i + \gamma_t + e_{it} \quad (1)$$

Our methodology largely follows that of Klasen and Lamanna (2009). In equation (1), *SVC_GTHit* measures the five-year compound growth of service sector value added per worker for country *i* at period *t*. We consider the initial values of explanatory variables to capture the variation in service growth within countries over time. Equation (1) measures the direct effect of gender inequality on service growth. Analogous to economic growth regressions in Barro (1991), *SVC_VA_PW* measures the initial level of real service value added per worker. A negative sign indicates the existence of conditional convergence in the service sector. Convergence is not a focus of this paper; as such, we limit our discussion of it. The research question in this study focuses primarily on the coefficients of the *SVC_EMP_FM and SCH_FM*, which measure gender inequality in employment and gender inequality in education, respectively.

As discussed earlier in this paper, improving the employment and education outcomes of women in the economy should positively affect growth. If the coefficient α_3, is positive and significant, it can be hypothesized that employing more females vis-à-vis males in the service sector increases the value added per worker growth of services. If it is negative, the outcome is the opposite, and it may be indicative of discrimination against females in the service sector. That is, there may be unobserved discrimination against females that lead to less productivity and, thus, less growth in output per worker. In addition, the direct effect of gender inequality in education is captured by the coefficient, α_5. A statistically significant positive effect implies that higher education attainment of females increases the output of the service sector in the form of higher output per worker.

A positive coefficient of the *GINI* variable implies that income inequality promotes service sector growth. This result follows the efficiency wage theory, which suggests that a wage gap is maintained to increase worker productivity and morale (decrease shirking). A negative coefficient implies that income inequality is detrimental to service growth. We expect the coefficient to be positive, as found by Fiala (1983). The country-specific dummy variable (fixed effects), ϕi, controls for country-specific time-invariant unobserved heterogeneity. The variable, γt, represents period fixed effects and is used to control for macroeconomic shocks that may affect the growth in the service sector, such as sudden changes in the world trade environment, global shifts in prices, or global recessions. We estimate equation (1) using the panel fixed effect estimation technique[3].

TABLE 1
DESCRIPTIVE STATISTICS

Variables	N	Mean	SD	Min	Max
SVC_GTH	680	0.041	0.128	-0.888	0.738
SVC_VA_PW	681	24101.55	31401.7	657.166	227716.2
GINI	615	0.383	0.086	0.177	0.619
GINI_GTH	573	0.003	0.042	-0.245	0.301
SVC_EMP_FM	730	0.891	0.37	0.019	2.2
CAPITAL	656	0.221	0.07	0	0.68
SCH_FM	615	0.875	0.185	0.222	1.438
SCH_PRI_FM	615	0.888	0.174	0.217	1.426
SCH_SEC_FM	615	0.852	0.226	0.221	1.481
SCH_TER_FM	615	0.828	0.446	0.003	5.336
EMP_POP	730	0.569	0.112	0.29	0.889
GDP_PC	710	11477.39	16762.31	176.788	105264.8

RESULTS

Table (1) presents the descriptive statistics of our key variables. The mean value of the *SVC_GTH* variable, measured as five-year compound growth in the service sector value added per worker, is around 4.1%. The mean *GINI* coefficient is 38.34, which indicates that high-income inequality persists in the countries considered in our analysis. Female to male-employment share in services is approximately 0.89. It signifies that for every 100 males employed, 89 women are employed in the service sector. All education variables show lower education attainment for women relative to men.

Table (2) column (1) presents the fixed effects estimation results for equation (1). Columns (2) to (4) uses alternate measures of gender inequality in education[4]. The initial value of service sector value added per worker is negative and statistically significant across all specifications. This hints towards the presence of conditional convergence in service sector growth. Gross fixed capital formation is positive and

statistically significant. Similar to the existing literature, an increase in investment expenditure, proxied by capital formation, leads to higher growth rates. A 1% increase in *CAPITAL* increases growth by 0.002 percentage points. The coefficient on the *GINI* variable is significantly positive for the different specifications of equation (1). These results suggest that a 1-point increase in *GINI* index income inequality promotes service sector growth by 0.78 percentage points. The underlying intuition points to the conclusion that a wage gap (income inequality) between the service sector and the other sectors creates an environment where workers, irrespective of gender, have the incentive to put in more effort in the service sector. This effort then leads to higher growth in the service sector.

The average years of schooling for females are universally lower than that of males. An increase in female education attainment without changing the male education attainment unambiguously increases the productivity of the labor force, leading to higher growth, more so for the service sector workers. The weak statistically significant coefficient for *SCH_FM* suggests that lessening gender inequality in education promotes growth in the service sector.

In Table 2, columns (2) to (3), we disaggregate the education variable into primary, secondary, and tertiary education. This helps us to identify the specific improvements in levels of education that may bring about a positive impact on growth. Expectedly, primary education attainment has shown to be the most important indicator when considering policies to promote growth. Secondary and tertiary education attainment variables are statistically insignificant. It reveals the state of women's education in most countries, where they are deprived of basic primary education. A 1 percentage point increase in the female-to-male ratio of primary education attainment increases service growth by 0.25 percentage points which is twice the standard deviation of the growth variable for the entire sample.

TABLE 2
FIXED EFFECTS ESTIMATION RESULTS OF EQUATION (1)

	(1)	(2)	(3)	(4)
VARIABLES	FE	FE	FE	FE
SVC_VA_PW (log)	**-0.4806*** **	**-0.4808*** **	**-0.4818*** **	**-0.4826*** **
	(0.0513)	(0.0517)	(0.0512)	(0.0512)
CAPITAL	**0.2231** **	**0.2086***	**0.2418** **	**0.2488** **
	(0.1106)	(0.1128)	(0.1082)	(0.1061)
SVC_EMP_FM	**-0.1781***	**-0.1789***	**-0.1779***	**-0.1774***
	(0.1030)	(0.1018)	(0.1034)	(0.1026)
GINI	**0.7844** **	**0.8186** **	**0.7836** **	**0.7895** **
	(0.3684)	(0.3682)	(0.3649)	(0.3655)
SCH_FM	**0.1815***			
	(0.0994)			
SCH_PRI_FM		**0.2520** **		
		(0.1223)		
SCH_SEC_FM			0.0450	
			(0.0633)	
SCH_TER_FM				-0.0033
				(0.0207)
Constant	**4.2995*** **	**4.2262*** **	**4.4290*** **	**4.4737*** **
	(0.5382)	(0.5402)	(0.5394)	(0.5348)

Observations	489	489	489	489
R-squared	0.5753	0.5778	0.5724	0.5719
country FE	YES	YES	YES	YES
Period FE	YES	YES	YES	YES

Dependent Variable is five years compound growth rate of service value added per worker (constant 2010 US$). Standard errors are clustered at the country level and are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The dependent variable, service value added per worker growth, helps us to explore the effect of gender inequality at the individual level. Value added per worker depends directly on productivity. The productivity of female workers can be viewed as a function of observed and unobserved factors. The observed factors are human capital measured by levels of education and time attributed to work. Unobserved factors may include workplace inequality in the hiring of women into less important positions compared to a male with similar qualifications. Women are seen to have relatively lower levels of education compared to men, and due to social norms and household commitments, they often have less time attributed to work. All the above factors indicate a negative effect on the value added by women compared to men.

Our results suggest that increasing female employment in services (*EMP_SVC_FM*) without changing male employment leads to a decrease in the growth of value added per worker. The result holds across all specifications and is relatively constant. A 1% point increase in female employment relative to male employment reduces growth by approximately 0.19 percentage points. Thus, gender inequality in service sector employment appears to promote growth. The negative effect of female employment can be attributed to (i) the gender wage gap, (ii) total time engaged in work, (iii) less access to capital, and (iv) less mobility to higher positions within an organization.

Gender wage inequality exists, and Schwieren (2012) finds that women react similarly to men in terms of wages: lower wages lead to lower productivity, regardless of gender. Given a similar reaction to lower wages – in conjunction with knowledge that male counterparts are receiving higher wages for similar work – perhaps unobserved discrimination existing in the workplace limits the female workers' ability to contribute to their potential. As such, it is not discriminatory to suggest that increasing the share of service sector employment by women decreases growth.

Total time engaged in employment activities is higher for men than women. Also, women constitute the bulk of part-time employees relative to men. This is because of the social structure in most countries where women are also burdened with household activities. The Bureau of Labor Statistics (2014) shows that, on average, men work more hours than women for both full-time and part-time jobs. A similar trend is observed in the OECD countries, with a higher incidence of part-time work among women and men working longer hours than women (OECD Family Database 2018). We are unable to control for time preference in our analysis because of the unavailability of such data at the country level. Accounting for this limitation, we argue that our estimated coefficient of gender inequality in employment may be biased upwards. Controlling for time dedicated to work may reduce the coefficient of gender inequality. However, the unobserved inequality will still have a negative impact on the value added by women. Moreover, we can expect positive effects of female employment in the service sector by reducing these inequalities.

A major concern for limited female productivity is their restrictive access to capital. Studies have shown women with comparable human capital are less productive because the employer restricts their access to use capital, which is typically only provided to their male counterparts. Researchers (Loscocco & Robinson, 1991; Coleman, 2007; Sabarwal & Terrell, 2008) have found that female entrepreneurs are also constrained with financial capital and thus operate at a smaller scale. Studies (Steiger & Wardell, 1995) also find that the feminization of occupations leads to less investment in their skill upgradation, which subsequently has an effect on productivity. As expected, the end result of this discrimination against female workers and entrepreneurs is lowered firm output.

Finally, studies show how women are discriminated against within an organization by limited access to managerial positions. Women employees are concentrated into low-paying and less important positions, which contribute less to the overall firm output. This phenomenon, which is widely known to be a "sticky

floor," plagues the female workforce in most countries. Carrillo, Gandelman, and Robano (2014) find the existence of a "sticky floor" among female workers in Latin American countries. In a related study, Arulampalam, Booth, and Bryan (2007) show the presence of a "sticky floor" effect within EU countries.

The combination of all of these factors suggests that female workers are not a direct substitute for male workers in the labor market. Moreover, in the presence of gender discrimination, women are unable to realize their full potential and thus contribute less to total output.

TABLE 3
DIFFERENCE GMM ESTIMATION RESULTS OF EQUATION (1)

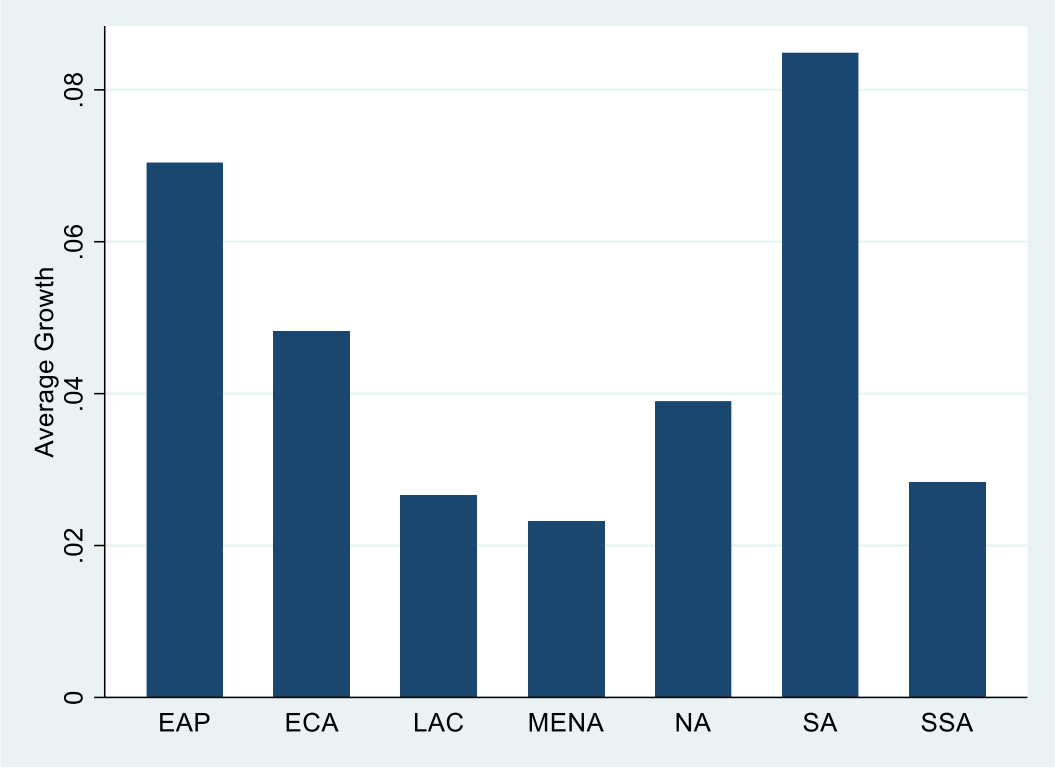
VARIABLES	(1) diff-GMM	(2) diff-GMM	(3) diff-GMM	(4) diff-GMM
SVC_VA_PW (log)	**-0.4246*** **	**-0.4291*** **	**-0.4178*** **	**-0.4126*** **
	(0.0926)	(0.0936)	(0.0937)	(0.0944)
CAPITAL	0.0329	0.0147	0.0598	0.0693
	(0.2138)	(0.2193)	(0.2154)	(0.2175)
SVC_EMP_FM	**-0.1883***	**-0.1889***	**-0.1888***	**-0.1883***
	(0.1060)	(0.1047)	(0.1064)	(0.1055)
GINI	**0.7419***	**0.7854***	**0.7323***	**0.7340***
	(0.3971)	(0.3973)	(0.3926)	(0.3913)
SCH_FM	**0.2123****			
	(0.0923)			
SCH_PRI_FM		**0.2884****		
		(0.1154)		
SCH_SEC_FM			0.0580	
			(0.0616)	
SCH_TER_FM				-0.0014
				(0.0205)
Observations	375	375	375	375
Number of ID	114	114	114	114
country FE	YES	YES	YES	YES
Period FE	YES	YES	YES	YES
AR (1)	-2.37	-2.34	-2.35	-2.32
(P-value)	(0.018)	(0.019)	(0.019)	(0.021)
AR (2)	0.83	0.78	0.89	0.92
(P-value)	(0.407)	(0.436)	(0.375)	(0.359)
Hansen J test	12.41	12.61	12.27	12.14
(P-value)	(0.134)	(0.126)	(0.139)	(0.145)
Number of Instruments	17	17	17	17

Dependent Variable is five years compound growth rate of service value added per worker (constant 2010 US$). Standard errors are clustered at the country level and are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Robustness Check

One issue arises in our estimation of the models specified in equation (1). Firstly, in equation (1), the initial value of service sector value added may be correlated with the error term and bias our results. To account for this endogeneity, we use one-step difference GMM estimations proposed by Arellano Bond (1991). Difference GMM estimations use lagged values of the *RHS* variables as internal instruments from the model. Table (4) report the GMM estimation results for equation (1). The overall result is qualitatively similar to the fixed effects models in Table (2), except for gross capital accumulation, which becomes insignificant. The magnitude of the gender inequality coefficient for education and employment has marginally increased. Therefore, we can conclude that our results are robust to alternate specifications as well as estimations.

FIGURE 3
AVERAGE COMPOUND GROWTH RATE OF SERVICE SECTOR VALUE ADDED PER WORKER BY WORLD REGIONS



Source: World Development Indicators 2019, The World Bank
Note: World Regions are classified under WDI 2019 as East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and Caribbean (LAC), Middle East and North Africa (MENA), North America (NA), South Asia (SA), Sub Saharan Africa (SSA). The countries included in the analysis are restricted due to data unavailability. North America only consists of United States.

Sub-Sample Analysis

The countries included in our sample are part of broad world regions. It is imperative that some regions have different service sector growth experiences than others. Figure 3 shows that service sector growth has been more pronounced in South Asia and East Asia, and the Pacific and has been the lowest in Middle Eastern and North African (MENA) countries. It is an expected outcome given that most Middle Eastern economies rely on oil and industries that are linked with the oil industries. In contrast, extensive growth in services has led to massive expansions over the past two decades in South Asian countries.

TABLE 4
SUMMARY STATISTICS FOR FEMALE EMPLOYMENT AND GROWTH IN SERVICE SECTOR VALUE ADDED

region	variable	N	Mean	SD	Min	Max
EAP	SVC_GTH	78	0.07	0.103	-0.215	0.35
	SVC_EMP_FM	85	0.863	0.204	0.471	1.236
ECA	SVC_GTH	197	0.048	0.14	-0.888	0.478
	SVC_EMP_FM	220	1.1	0.295	0.164	1.643
LAC	SVC_GTH	142	0.026	0.086	-0.273	0.245
	SVC_EMP_FM	145	1.00	0.267	0.603	2.2
MENA	SVC_GTH	49	0.023	0.104	-0.212	0.245
	SVC_EMP_FM	55	0.293	0.256	0.08	1.141
NA	SVC_GTH	3	0.038	0.026	0.021	0.069
	SVC_EMP_FM	5	1.135	0.015	1.11	1.151
SA	SVC_GTH	34	0.084	0.126	-0.293	0.232
	SVC_EMP_FM	35	0.289	0.163	0.019	0.614
SSA	SVC_GTH	177	0.028	0.151	-0.366	0.738
	SVC_EMP_FM	185	0.855	0.317	0.229	1.763

Note: EAP (East Asia and Pacific, ECA (Europe and Central Asia), LAC (Latin America and Caribbean), MENA (Middle East and North Africa), NA (North America), SA (South Asia), SSA (Sub Saharan Africa)

We find similar regional variation for the share of service employment as well as male and female employment in services, see Table 4. Despite having high growth rates in the service sector, South Asian countries have the fewest share of women employed in this sector, comparable to that of MENA countries. For Europe and North America, we find that the female share of service employment is higher than that of males. The other regions have a relatively equal distribution of male and female employers in services. We, therefore, explore these regional variations in growth and employment by estimation equation (1) for each region separately. The results are presented in tables 5(a) and 5(b). We combine the countries of the East Asia and Pacific region with the South Asia region, owing to fewer observations in South Asia. Also, we do not include North America in our analysis due to limited data.

TABLE 5A
REGION WISE FIXED EFFECTS ESTIMATION RESULTS OF EQUATION (1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	EAP & SA	EAP & SA	EAP & SA	EAP & SA	ECA	ECA	ECA	ECA	LAC	LAC
SVC_VA_PW (log)	**-0.4257*** **	**-0.4311*** **	**-0.4174*** **	**-0.4448*** **	**-0.5622*** **	**-0.5684*** **	**-0.5545*** **	**-0.5370*** **	**-0.3602*** **	**-0.3615*** **
	(0.0592)	(0.0596)	(0.0602)	(0.0702)	(0.0605)	(0.0612)	(0.0599)	(0.0641)	(0.0615)	(0.0662)
CAPITAL	0.0655	0.0767	0.063	0.1043	**0.6580*** **	**0.6156*** **	**0.6343*** **	**0.5889*** **	**0.5969** **	**0.6259*** **
	(0.2477)	(0.252)	(0.247)	(0.2399)	(0.1667)	(0.1635)	(0.1628)	(0.1706)	(0.2114)	(0.2171)
SVC_EMP_FM	**-0.3371** **	**-0.3354* **	**-0.3350** **	**-0.3193* **	**-0.3824*** **	**-0.3901*** **	**-0.3627*** **	**-0.4050*** **	0.1006	0.112
	(0.1598)	(0.1653)	(0.1519)	(0.1713)	(0.1228)	(0.1177)	(0.1213)	(0.1149)	(0.1194)	(0.1111)
GINI	**1.8324** **	**1.8414** **	**1.7516** **	**1.7756** **	**1.1415** **	**1.1416** **	**1.3106** **	**1.2300** **	-0.5759	-0.4869
	(0.6575)	(0.6551)	(0.6708)	(0.6814)	(0.5094)	(0.5584)	(0.5181)	(0.5293)	(0.7382)	(0.6868)
SCH_FM	0.2087				-0.0379				0.2476	
	(0.1785)				(0.2829)				(0.2919)	
SCH_PRI_FM		0.1977				**0.6022* **				0.1195
		(0.2197)				(0.3028)				(0.4012)
SCH_SEC_FM			**0.1962* **				-0.2733			
			(0.1081)				(0.1671)			
SCH_TER_FM				-0.0286				**-0.1651* **		
				(0.0441)				(0.0949)		
Constant	3.3869***	3.4364***	3.3551***	3.7644***	5.9111***	5.3706***	5.9793***	5.7781***	3.2124***	3.2939***
	(0.5439)	(0.5419)	(0.5878)	(0.6484)	(0.8438)	(0.7386)	(0.7703)	(0.7246)	(0.7025)	(0.8623)
Observations	91	91	91	91	171	171	171	171	100	100
R-squared	0.6488	0.6477	0.6522	0.644	0.7221	0.7305	0.73	0.732	0.5594	0.557
country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Period FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Dependent Variable is five years compound growth rate of service value added per worker (constant 2010 US$). Standard errors are clustered at the country level and are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1

TABLE 5B
REGION WISE FIXED EFFECTS ESTIMATION RESULTS OF EQUATION (1)

VARIABLES	(11) LAC	(12) LAC	(13) MENA	(14) MENA	(15) MENA	(16) MENA	(17) SSA	(18) SSA	(19) SSA	(20) SSA
SVC_VA_PW (log)	**-0.3653*** **	**-0.3669*** **	**-0.7034** **	**-0.7454** **	**-0.6196***	**-0.6634***	**-0.6565*** **	**-0.6569*** **	**-0.6550*** **	**-0.6672*** **
	(0.0628)	(0.0611)	(0.2583)	(0.2414)	(0.2649)	(0.2706)	(0.1155)	(0.1166)	(0.115)	(0.107)
CAPITAL	**0.6288*** **	**0.6868*** **	**-0.5515** **	**-0.4706** **	**-0.5702** **	**-0.5789** **	-0.1452	-0.1321	-0.1467	-0.1618
	(0.2158)	(0.2061)	(0.1781)	(0.1543)	(0.2007)	(0.2231)	(0.2413)	(0.2449)	(0.2417)	(0.2325)
SVC_EMP_FM	0.1077	0.1172	**-3.7361** **	**-3.3770** **	**-3.7643** **	**-3.6762** **	**0.5144***	**0.5097***	**0.5200***	**0.5312***
	(0.1177)	(0.1101)	(1.267)	(1.2224)	(1.3008)	(1.1599)	(0.2913)	(0.2933)	(0.2907)	(0.2837)
GINI	-0.5118	-0.4009	-0.4217	-0.4389	-0.7107	-0.4341	-0.2001	-0.2348	-0.1317	-0.209
	(0.6584)	(0.6811)	(0.9513)	(0.9746)	(0.9141)	(0.9713)	(0.7954)	(0.781)	(0.8076)	(0.7583)
SCH_FM			0.0952				0.0988			
			(0.3917)				(0.172)			
SCH_PRI_FM				0.4473				0.0302		
				(0.3896)				(0.2456)		
SCH_SEC_FM	0.0455				-0.2123				0.0822	
	(0.1604)				(0.2441)				(0.0844)	
SCH_TER_FM		-0.0189				-0.0528				**0.0728***
		(0.024)				(0.1943)				(0.0371)
Constant	3.4132***	3.4214***	8.3265**	8.3087**	7.8889*	8.0426**	5.2255***	5.2952***	5.1961***	5.3392***
	(0.6875)	(0.6844)	(3.1662)	(2.9738)	(3.1741)	(3.1037)	(1.0606)	(1.0673)	(1.0419)	(0.9566)
Observations	100	100	27	27	27	27	97	97	97	97
R-squared	0.5568	0.5603	0.7439	0.7549	0.747	0.744	0.6214	0.6203	0.6226	0.6362
country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Period FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Dependent Variable is five years compound growth rate of service value added per worker (constant 2010 US$). Standard errors are clustered at the country level and are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In Tables 5(a) and 5(b), we have four specifications presented for each region. In the four specifications, we use four different measures of gender inequality in education inequality: average total education, average primary education, average secondary education, and average tertiary education. We focus on five broad regions, East Asia and Pacific (EAP) and South Asia (SA); East Europe and Central Asia (ECA); Latin America and Caribbean (LAC); Middle East and North Africa (MENA); and Sub-Saharan Africa (SSA). For EAP and SA, ECA, and MENA, we find similar results as the overall model for gender inequality in employment. The magnitude of the coefficient is much higher than the overall sample. A 1 percentage point increase in female employment relative to males decreases service sector growth by approximately 0.3 percentage points in EAP, SA, and ECA regions. In MENA countries, an increase in female employment by one percentage point reduces growth by 3.7 percentage points. This effect in the MENA region is much higher than in all the other regions. Clearly, it directs toward the low human capital accumulation of women in these countries, along with low opportunity and discrimination. Interestingly, the Sub-Saharan Africa region shows a positive coefficient for gender inequality in the employment variable. In concert with our postulations, this effect may be due to African governments as well as regional and sub-regional organizations making significant commitments to and actions enabling gender equality and women's empowerment both before and throughout our sample period (*Gender Equality and Women's Empowerment in Africa 2019*).

CONCLUSION

This research culminates in findings that are contradictory to some earlier studies and to current speculation suggesting that increased female employment leads to overall economic growth. While disturbing in its implications, in our analysis of the data from 146 countries over the period from 1991 – 2015, we conclude that globally, an increase in female employment in the service industry relative to male employment leads to a decrease in service sector growth. We posit that the findings are based primarily on discriminatory factors. For instance, decreased education opportunities for females lead to more uneducated females entering the service sector workforce than uneducated male counterparts. Other gendered discriminatory practices such as (i) gender wage gap, (ii) total time engaged in work, (iii) less access to capital, and (iv) less access to managerial positions in the workforce may also contribute to lower productivity by females as opposed to their male counterparts.

We do not want these findings to discourage an increase in females entering the service sector, but we do believe our findings indicate that policymakers should not be concentrating on simply lessening the gender-employment gap in this industry. Efforts should focus on mitigating the aforementioned gendered discriminatory factors.

The availability of service sector wage data across gender and time preference data of women working in services can provide a better understanding as to why a decrease in gender inequality lowers the service sector output. We are unable to address these channels, and it is a possible limitation of our paper. Further research can be undertaken at a regional or national level to identify specific causes that lead to women contributing less in the service sector. It may also be that only certain industries in the service sector have a negative relationship between gender inequality and service growth, while other industries within the service sector have a positive relationship. Since the service sector contributes the most to the national GDP and overall economic growth, identifying these industries and the causes for lower women's contribution to service output can be used as an important policy tool for governments.

ENDNOTES

1. We consider all countries that have data for at least three periods for service sector growth. However, a few of the countries are dropped in the estimation due to data unavailability on a number of explanatory variables.
2. The five periods that we consider are period one from 1991-1995; period two from 1996-2000; period three from 2001-2005; period four from 2006-2010; and period five from 2011-2015.
3. The use of the Hausman Test favors fixed effects over the random effects model in our analysis.

4. A number of countries have missing observations for one or more explanatory variables. These observations are dropped during estimation, which reduces the total number of observations.

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APPENDIX

TABEL A1
LIST OF COUNTRIES

East Asia and Pacific (EAP)
Australia
Brunei
Cambodia
China
Fiji
Hong Kong
Indonesia
Japan
Malaysia
Mongolia
New Zealand
Philippines
Singapore
South Korea
Thailand
Timor-Leste
Vietnam

Middle East and North Africa (MENA)
Egypt
Iran
Israel
Jordan
Lebanon
Morocco
Oman
Saudi Arabia
Tunisia
West Bank and Gaza

Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Luxembourg
Macedonia
Moldova
Montenegro
Netherlands
Norway
Poland
Portugal
Romania
Russia
Serbia
Slovakia
Slovenia
Spain
Sweden

Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
St. Lucia
St. Vincent and the Grenadines
Suriname
Trinidad and Tobago
Uruguay
Venezuela

Sub Saharan Africa (SSA)
Benin
Botswana
Burkina Faso
Cameroon
Cape Verde
Central African Republic
Comoros
Congo, Dem. Rep.
Congo, Rep.
Ethiopia
Gabon
Gambia
Guinea
Guinea-Bissau

Yemen	Switzerland	Lesotho
	Tajikistan	Liberia
South Asia	Turkey	Madagascar
Bangladesh	Ukraine	Malawi
Bhutan	United Kingdom	Mali
India	Uzbekistan	Mauritania
Maldives		Mauritius
Nepal	*Latin America and Caribbean (LAC)*	Mozambique
Pakistan	Argentina	Namibia
Sri Lanka	Bahamas	Niger
	Barbados	Nigeria
North America (NA)	Belize	Rwanda
United States	Bolivia	Sao Tome and Principe
	Brazil	Senegal
Europe and Central Asia (EEA)	Chile	Sierra Leone
Albania	Colombia	South Africa
Austria	Costa Rica	Sudan
Azerbaijan	Cuba	Swaziland
Belarus	Dominican Republic	Tanzania
Belgium	Ecuador	Togo
Bulgaria	El Salvador	Uganda
Croatia	Guatemala	Zambia
Cyprus	Guyana	Zimbabwe

TABLE A2
AVERAGE SERVICE SECTOR VALUE ADDED AS A PERCENTAGE OF GDP.

	Period		
Country Group	**1971 – 2010**	**1971 – 1990**	**1991 – 2010**
All Countries	59.14	51.2	61.72
Low Income	43.73	39.08	48.38
Middle Income	52.61	47.89	56.16
High Income	66.07	59.27	69.3

Source: World Development Indicators 2019, World Bank

TABLE A3
VARIABLE NAMES, DEFINITIONS, AND DATA SOURCES

Variable Name	Definition	Data Source
SVC_GTH	Five years compound growth rate of service value added per worker (constant 2010 US$)	WDI 2019, The World Bank
SVC_VA_PW	Services, value added per worker (constant 2010 US$)	WDI 2019, The World Bank
GINI	Net income inequality measure, post-tax and post-transfer	SWIID Version 8, Solt (2019)
GINI_GTH	Five years compound growth rate of GINI	Calculated from SWIID Version 8, Solt (2019)
SVC_EMP_FM	Female to male employment ratio in the service sector	WDI 2019, The World Bank
CAPITAL	Gross fixed capital formation as a percentage of GDP	WDI 2019, The World Bank
SCH_FM	Female to male ratio of average years of schooling attained for ages 15 years and above	Barro and Lee (2013)
SCH_PRI_FM	Female to male ratio of average years primary of schooling attained for ages 15 years and above	Barro and Lee (2013)
SCH_SEC_FM	Female to male ratio of average years of secondary schooling attained for ages 15 years and above	Barro and Lee (2013)
SCH_TER_FM	Female to male ratio of average years of tertiary schooling attained for ages 15 years and above	Barro and Lee (2013)
EMP_POP	Employment to population ratio for for ages 15 years and above	WDI 2019, The World Bank
GDP_PC	Real per capita GDP (constant 2010 US$)	WDI 2019, The World Bank

Note: WDI is World Development Indicators and SWIID is Standardized World Income Inequality Database