Rev Econ Household (2021) 19:291–306
https://doi.org/10.1007/s11150-020-09512-z

Gender differentiated economic responses to crises in developing countries: insights for COVID-19 recovery policies

Sandeep Mohapatra[1]

Received: 27 July 2020 / Accepted: 28 September 2020 / Published online: 15 October 2020

Abstract
COVID-19 has wide-ranging and long-term implications for individual and household outcomes. Policymakers expect that the economic impact of COVID-19, channeled through labor markets, will disproportionately fall on women and girls, relative to men and boys. Surprisingly, little evidence exists for informing gender-sensitive COVID-19 recovery policies. This study examines the existence of gender-differentiated dynamic responses of labor market and other household welfare outcomes to GDP contractions using historical country level panel data for South/South-East Asia and West Africa. The econometric results reveal large gender differences in economic outcomes post crisis and provide insights for designing gender-sensitive COVID-19 recovery policies.

Keywords COVID-19 · Women · Labor market · Dynamic impact

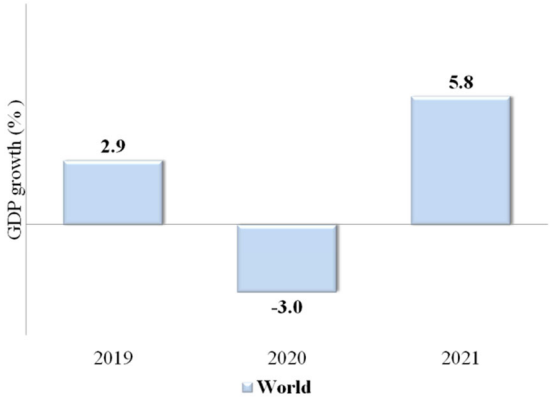
JEL Classification 01, 053, 055

1 Introduction

Typically, an economic downturn or recession is caused by *one* of these three types of shocks: a demand shock (e.g., 9/11 event); a supply shock (e.g., 1990s oil price boom); or a financial market shock (e.g., 2008 crisis). COVID-19 brings all three shocks simultaneously (Triggs and Karas 2020): aggregate demand has shrunk as lockdown measures such as social distancing and business closures interrupt most forms of economic activity; supply disruptions have emerged due to travel restrictions and border closures particularly in the Asia Pacific region where global value chains

✉ Sandeep Mohapatra
sandeep.mohapatra@ualberta.ca

[1] Department of REES, University of Alberta, Alberta, Canada



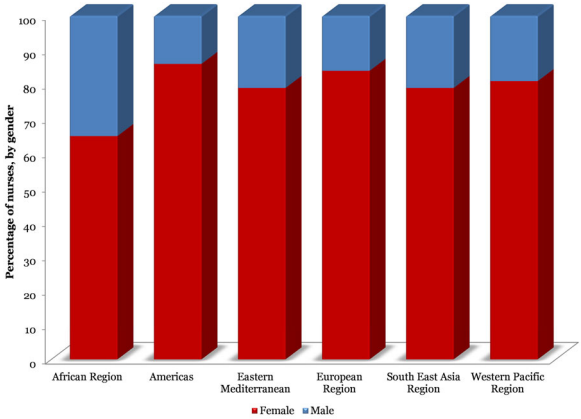
Source: World Economic Outlook Database, IMF 2020

Fig. 1 Global economic growth projections

are most concentrated (Abiad 2018); stock market volatility has increased in many countries along with macro- and micro- level liquidity crunches in financial markets.

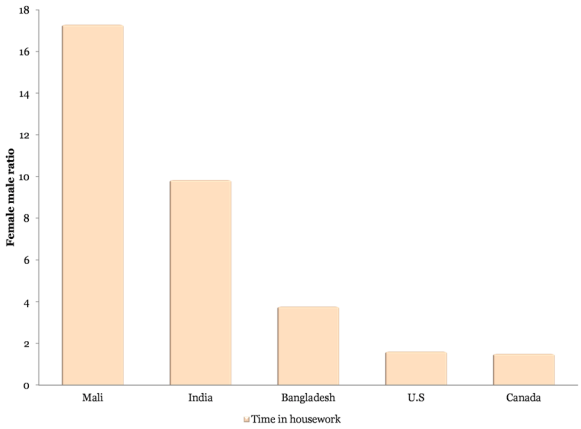
The economic-growth implications of these shocks are unprecedented. According to projections by the IMF, the global economy will contract by 3% in 2020 due to domestic demand and supply shocks and the rapid decline in the movement of goods, labor and capital. Recovery (Fig. 1) in 2021 is based on the assumption that COVID-19 will fade away in the second half of 2020 and government policies will restore economic conditions to pre-crisis levels. Most countries individually are also projected to face GDP contractions in 2020 (e.g., U.S: −5.1%; Canada: −6.2%) with the engines of global growth, China and India, facing dramatic slowdowns (IMF 2020; OECD 2020a). The effects of the economic growth contractions are predicted to spill across product and factor markets including the entire food supply chain with significant long term effects on employment, income and poverty status of households (Triggs and Karas 2020). Arguably, the strongest impacts of COVID-19 will be felt in developing economies which are characterized by low health-care capacities, poor governance and management of adverse economic shocks, small fiscal multipliers, and weak transmission of monetary policies (Loayza and Pennings 2020).

A consensus in policy circles is that the negative economic impact of COVID-19 will disproportionately fall on women and girls, because of the types of jobs they predominate, women's care-giving roles within households, and pre-existing gender inequalities in various social and economic spheres (e.g., World Bank 2020a; IFPRI 2020). For instance, women are more exposed than men to frontline occupations. In both developed and developing countries, the majority of nurses are women (Fig. 2, Boniol et al. 2019). In India, the primary interface with respect to information, data collection and care for COVID-19 is led by a team of almost a million workers exclusively made up of women. Women are also expected to be more affected within their households by school closures and sick-care burdens due to the greater share of time they spend on unpaid household work (Fig. 3). Given the gendered time use patterns, Covid-19 is more likely to reduce women's employed hours or force their exit from labor market compared to men.



Source: Data from Boniol et al. 2019

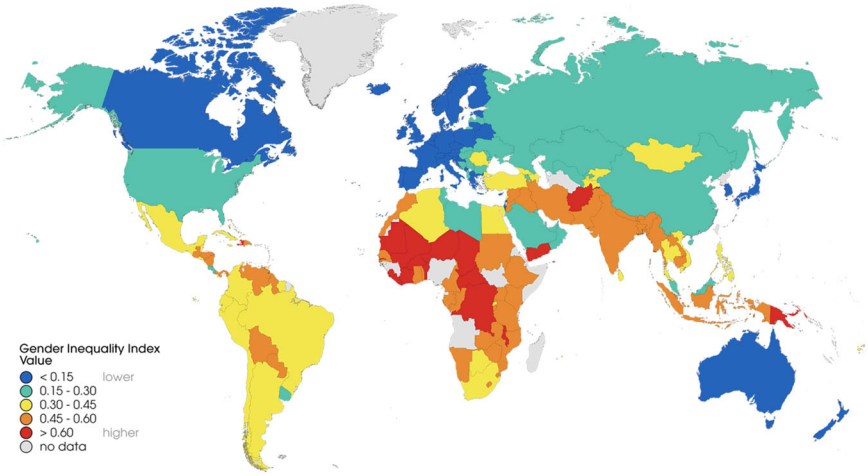
Fig. 2 Frontline occupation, by gender



Source: Our World in Data, World Bank database

Fig. 3 Household work, by gender

Pre-existing gender inequalities in education, health, labor markets, and household decision-making (Fig. 4) also make it likely that females will be less able to compete for limited resources during a crisis. For instance, intra-household allocations can favor boys' access, to limited internet and computers, over girls in online classes that have arisen in the wake of COVID-19 (World Bank 2020a). Industry-specific COVID-19 impacts are expected to exacerbate the existing gender gaps since women's employment predominates in many of the industries, such as retail, most immediately affected by COVID-19. Treating women as a separate group for analyzing COVID-19 impacts is, therefore, necessary since the greater exposure to the pandemic not only increases women's vulnerability but also casts them as agents of change during recovery.



Source: Henning 2019; Human Development Report 2019

Fig. 4 Gender inequality index in health, education, political representation and labor markets

However, there is surprisingly little evidence that can be used for informing gender-sensitive COVID-19 recovery policies. Public health scholars worry that gender norms that influence women's differential vulnerability to disease outbreaks, including COVID-19, are not receiving sufficient attention (Bali et al. 2020; Wenham et al. 2020). While the lack of econometric evidence on the recent pandemic is due to insufficient data points on COVID-19 impacts, scholars also point to the failure in learning about gender differences in economic responses during a crises from historical data (Smith 2019). According to Davies and Bennett (2016), "…few publications have addressed gender issues relating to disease outbreaks. [O]n both Ebola and Zika outbreaks, [...] less than 1% of published research discussed gender issues." The thin literature on this topic is largely descriptive and fails to take advantage of the available gender differentiated data to econometrically identify stylized patterns of economic behavior that occur over time during and after a crisis.[1] As lockdowns begin to be lifted in countries around the world, there is an urgent need to build the evidence base for informing recovery policies.

Estimating COVID-19 impacts, however, is challenging because of the lack of data on post COVID-19 economic outcomes. In this paper, we estimate the potential impact of COVID-19 by examining historical data for evidence of gender differentiated labor market responses to contractions in per capita GDP. That is, we use GDP contractions, which are the main channel of economic impact of COVID-19 as a proxy for a one-time lockdown shock. The estimates can be thought of as lower-bounds on what to expect in the future regarding the existence of differential impacts of COVID-19 on women given that the impacts of the current shock is biased against women, as discussed above. We focus on labor markets to uncover gender

[1] An exception is Bandiera et al.'s (2018) impact evaluation study of Ebola in Sierra Leone which found that girls suffered a 16% permanent drop in school enrollment, post crisis.

differentiated impacts because of the centrality of labor markets, including self- and informal employment, in propagating potential COVID-19 impacts. For both men and women, employment status is highly correlated with households that are considered food secure; the employed are significantly more likely to live in a food secure household compared with those who were unemployed or out of the labor force (OECD 2020b).

Using two separate country-level panel datasets from two developing regions, South (south and south-east) Asia and West Africa, we ask: (a) What is the response of labor market outcomes (e.g., employment) of females and males to past contractions in GDP? (b) Are the adverse effects persistent or is there recovery over time as the crisis subsides? (c) Are there systematic patterns of gender differences in labor market response and recovery paths over time, holding constant country-specific factors such as institutions, endowments, culture and customs that determine labor market participation? (d) How do non-gendered household outcomes that are indirectly important to women during the current crisis, such as access to safe sanitation services and household consumption expenditures, affected by a GDP contraction? Our objective is to answer the above four questions by estimating the dynamic response of the relevant economic variable to a GDP contraction, over a 10 year horizon, using rigorous time series and panel econometrics methods.

Current statistical approaches to estimating COVID-19 impacts combine epidemiological models with economic models to understand the trade-off between lockdown measures (to save lives) and economics effects (on livelihoods). Tracking feedbacks between the two, however, requires a compromise. Typically, the epidemiological model is rich in specification while the economic component is restrictive with strong assumptions about how exactly the economic effects will propagate (Buera et al. 2020). We take a different approach whereby the epidemiological shock is an approximation (a GDP contraction) while the economic responses are rich and propagation mechanisms are left unrestricted. That is, the economic responses we estimate are based on actual aggregate behavior and, thereby, conditioned on all past policies, market inefficiencies, and gender inequalities at time of shock and recovery. Our results based on historical data can be used to complement projection models currently used in the literature to help design effective containment measures, and medium and long term recovery policies that target vulnerable subpopulations for effective public service delivery.

Our empirical approach is to specify a series of panel autoregressive models corresponding to each of the outcome variables mentioned under our objectives (employment by gender, household consumption and access to sanitation services) for South Asia and West Africa. The autoregressions, which are reduced form representations of underlying structural economic relationships, allow estimation of dynamic impacts while controlling for unobserved country-level time invariant determinants, such as customs and culture, through the use of fixed effects estimators. The coefficients of the autoregressions are estimated using generalized method of moment instrumental variable methods (see, e.g., Arellano and Bond 1991) and allow us to capture both the immediate effect of a GDP contraction as well as delayed effects that manifest over time. We simulate the empirical response paths of each economic outcome to GDP contractions and its confidence interval band by calculating impulse response functions (IRFs) based on a Monte Carlo approach.

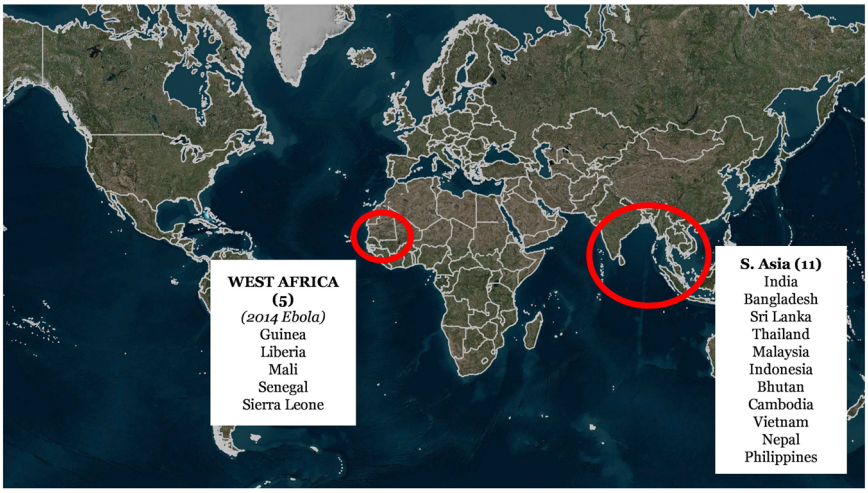


Fig. 5 Countries in each region (S. Asia and W. Africa) included in study sample.

The rest of the paper is organized as follows. Section 2 provides context with a description of the data and hypotheses. Section 3 presents our empirical framework for addressing the objectives with a discussion of estimation and specification issues. Section 4 presents the results, and the final section concludes.

2 Data and hypotheses

Historical time series data from developing countries is sparse, specifically with respect to gender disaggregated variables. We exploit the limited data available from the World Development Indicators, World Bank dataset. We construct country-level panels from 1991–2019 from two regions South and South East Asia and West Africa (Fig. 5). As described earlier, we use GDP per capita contractions as a proxy for the economic shock of COVID-19 for the South Asia sample. For the West Africa sample, we consider GDP contractions after the most recent Ebola outbreak in 2014 to more closely approximate a pandemic driven GDP shock. Countries in our West Africa sample were severely affected by the Ebola outbreak and suffered immense health and economic costs that worsened over time due to declines in investment, production, and consumption throughout the region, coupled with falling international commodity prices (World Bank et al. 2015).[2]

Our outcome variables comprise of male and female employment-population ratios (*employment*), proportions of the population with access to safe sanitation services (*sanitation*), and household real per capita consumption expenditures (*consumption*). The employment-population ratio is defined as the proportion of a

[2] There is no clearly defined epidemiological event (such as the SARS outbreak) for South Asia with sufficient across country pre- and post-event observations.

country's working-age population that is employed. An employed individual is older than 15, performing any work for wage or profit, including unpaid family work. Due to the breadth of this variable, which includes both wage work and self-employment as well a section of informal unpaid workers, it served as the major indicator for monitoring the United Nations Millennium Development Goals regarding extreme poverty and hunger ("achieving full and productive employment and decent work for all, including women and young people").

The *employment* variable captures both workers' movements out of employment into unemployment, as well as movements out of the labor market and allows us to explore several alternative hypotheses. For instance, women's employment may increase following a shock as more women enter the labor market as a coping strategy to make up for lost household income (the "added worker effect"). Increases in female labor force participation were documented in the Philippines (Lim 2000) and Indonesia (Smith et al. 2002) during the East Asian crisis of 1997 as male unemployment increased. The increase was primarily among women from low income households and among those who were older and those with low levels of education (Cerutti 2000; Aslanbeigui and Summerfield 2000; Lee and Cho 2005). Alternatively women's employment may decrease as women leave the labor market and stop looking for work in the wake of a crisis due to care responsibilities in their households or due to a lack of jobs (the "discouraged worker" effect). In South Korea, large numbers of women (more than men) exited the labor force during the 1997 financial crisis although 5 years after the recession, women's employment rates had recovered to pre-crisis levels (Kim and Voos 2007).

Both the added worker effect and the discouraged worker effect may operate simultaneously within different sections of the labor force (Sabarwal et al. 2011). The net aggregated effects of these employment responses on the labor market have distinct policy implications for the welfare of women, and for the poverty status and human capital accumulation within their households. We are particularly interested in the time evolution of these phenomena, following a crisis. It is plausible that there is no gender difference in *employment* immediately, but there is a gender difference in the persistence of the negative growth shock over time.

We also consider two outcome variables that are not differentiated by gender. First, given the direct links of consumption to household welfare, poverty status and children's human capital we examine how household per capita consumption expenditures behaves after a GDP contraction. Second, we consider if people's access to *sanitation* weakens with the onset of a crisis. The COVID-19 pandemic underscores the role of sanitation services in disease prevention. Progress on the specific indicator for *sanitation* that we consider is currently being used to monitor SDG Goal 6 on clean water and recognized by the U.N as "fundamental to fighting the virus and preserving the health and well-being of millions. COVID-19 will not be stopped without access to safe water for people living in vulnerability."

Jointly, the behavior of these set of outcomes over time to GDP shocks will inform COVID-19 recovery policies on (a) the existence and nature of gender differences to expect in labor market responses within two major developing regions of the world and (b) the behavior of two key variables during crisis which indirectly have enormous implications for women, their children and their households during the pandemic.

3 Model

We build on the empirical framework of Cerra and Saxena (2008) who estimate the impacts of crises on economic growth (also see Romer and Romer 1989). We specify separate panel autoregressive models for each outcome variable, in each of the two regions, S. Asia and W. Africa

$$Y_{it} = b(L)Y_{it-1} + c(L)Contraction_{i,t} + \lambda_i + \varepsilon_{it}, \quad (1)$$

where Y_{it} is the dependent variable (e.g., women's employment) in logs, observed for country i at time t; $b(L)$ is a pth order polynomial in the lag operator L which governs system dynamics; $c(L)$ is a qth order polynomial in the lag operator L which captures GDP contraction impacts on the outcome, Y_{it}, in the same period and up to q future periods following the shock; *Contraction* is an indicator variable which takes a value one for years in which there was a negative growth in GDP per capita in the South Asia sample (and for years after the Ebola outbreak in 2014 in which there was a negative growth in GDP per capita in the West Africa sample). Finally, ε_{it} is an i.i.d vector of white noise error terms. Country specific unobserved heterogeneity in the dependent variables is modeled using λ_i.

To address our objectives, we estimate the response paths over time of each outcome variable, Y_{it}, to GDP contractions by computing impulse response functions (IRFs). IRFs track the time evolution of conditional forecasts of the dependent variable. Conditional on the country-specific unobserved heterogeneity, λ_i, the response path of an outcome over the period $t+s$, following a GDP contraction, c_t, is calculated by plotting $\frac{\partial E(Y_{t,t+s})}{\partial c_t}$ against $s = 0...S$. In our context, IRFs provide direct graphical answers to the questions posed under our objectives, for instance, the IRF computed using estimates from Eq. (1) specified with women's employment as the outcome variable would simulate the effect of a GDP contraction on future expected values of the women's employment, holding other changes constant.

3.1 Estimation, specification and unit roots

Note that in Eq. (1), the dependent variable depends on country-specific unobservables. Consequently, the dependent variable, lagged, also depends on the country specific unobservables. Since lagged dependent variables are also included as explanatory variables in Eq. (1), OLS-based fixed effects estimators that purge the effect of unobservables are biased and inconsistent (Baltagi 2005). We, therefore, estimate the coefficients of Eq. (1) using Dynamic Panel Data estimators which sequentially use differencing and generalized methods of moments (GMM) instrumental variable estimators to eliminate the endogeneity of the autoregressive terms (e.g., see Arellano and Bond 1991). Lagged endogenous variables, including lagged dependent variables and lagged differenced dependent variables, serve as valid instruments.

We use standard errors clustered by country to capture serial correlation in economic outcomes over time within the same country. We also compute heteroscedasticity and autocorrelation consistent standard errors in all estimations. Given the unbalanced nature of the dataset, and to be consistent across the different estimated equations, we set the lags in Eq. (1) at 4 for all models. To avoid possible

endogeneity of a contemporaneous contraction in GDP to employment and other outcomes, we do not use contemporaneous GDP contractions, that is we include *contraction* lagged 1 year or greater for constructing the set of contraction variables ($q = 1 \ldots 4$ in Eq. (1)). Standard errors of the impulse response functions to construct confidence bands were calculated using a bootstrap approach that draws repeated samples from the distribution of the of the estimated Dynamic Panel Data coefficients. The impulse response function for each outcome response is presented with 90 percent confidence bands drawn from a thousand Monte Carlo simulations.[3]

A standard consideration in time series econometrics is the presence of unit roots in the data. Regressions based on nonstationary data can yield completely misleading results, with estimates implying statistically significant and strong relationships between variables when no relationship exists. Such regressions have been termed nonsense or spurious regressions. To avoid estimating spurious relationships we use unit root tests to make sure the main variables of interest are stationary (or do not contain an unit root). While there are alternative panel-data unit-root tests, the majority of the tests assume a balanced panel dataset. The Im–Pesaran–Shin and the Fisher-type tests allow for unbalanced panels.[4] We employ the above two tests to determine transformations of the economic series into stationary processes, if needed, to be able to draw valid statistical inferences from the data.

4 Results

The IPS and Fisher unit root tests fail to reject the null hypothesis of a unit root in employment and other outcome variables under a battery of specifications of the test equations. Therefore, we use differenced versions of all outcome variables in our estimations. Since the level variables, Y_{it}, are in logs, their differenced versions used in the estimation can be interpreted in annual percentage change units. The data have missing observations for some periods yielding unbalanced panels.

With a balanced panel, data over 29 years (1991–2019) for 5 countries in West Africa would yield 145 observations and for 11 countries in South Asia would yield 319 observations. However, the available observations differ across outcome equations due to missing data. In total we estimate 7 models: *female employment* ($N = 264$) and *male employment* ($N = 264$) for South Asia; *female employment* ($N = 120$) and *male employment* ($N = 120$) for West Africa; *consumption* ($N = 229$, $N = 91$) for South Asia and West Africa, respectively; and *sanitation* ($N = 52$) for West Africa.[5] We treat observations from different country-year pairs as points spanning the space

[3] IRF calculations were coded in STATA, following Cerra and Saxena (2011) and by adapting code provided in Mueller (2012) for the specification in Eq. (1).

[4] In general the tests are based on the Dickey–Fuller(DF) test equation of the form: $\triangle y_{it} = \rho y_{it-1} + \mu_i + \Sigma\theta_i \triangle y_{it-j} + e_{it}$. Im, Pesaran and Shin for instance examine the null hypothesis of unit roots in the data and allows the autoregressive parameter of the DF unit root test to be different across panels, viz., $\triangle y_{it} = \rho_i y_{it-1} + \mu_i + \Sigma\theta_i \triangle y_{it-j} + v_{it}$, and remove cross-sectional means from the series. The IPS test statistic is obtained by averaging individual Dickey–Fuller unit root tests, $t_{IPS} = \sqrt{N}(\bar{t} - E[t_i|\rho_i])/\sqrt{Var[t_i|\rho_i]} \rightarrow Z(0,1)$ where t_i are the individual dickey fuller test statistics for cross-section i, and the expected value and variance terms in t_{IPS} are computed using Monte Carlo simulations.

[5] Limited data on access to sanitation is available and only for the West Africa sample.

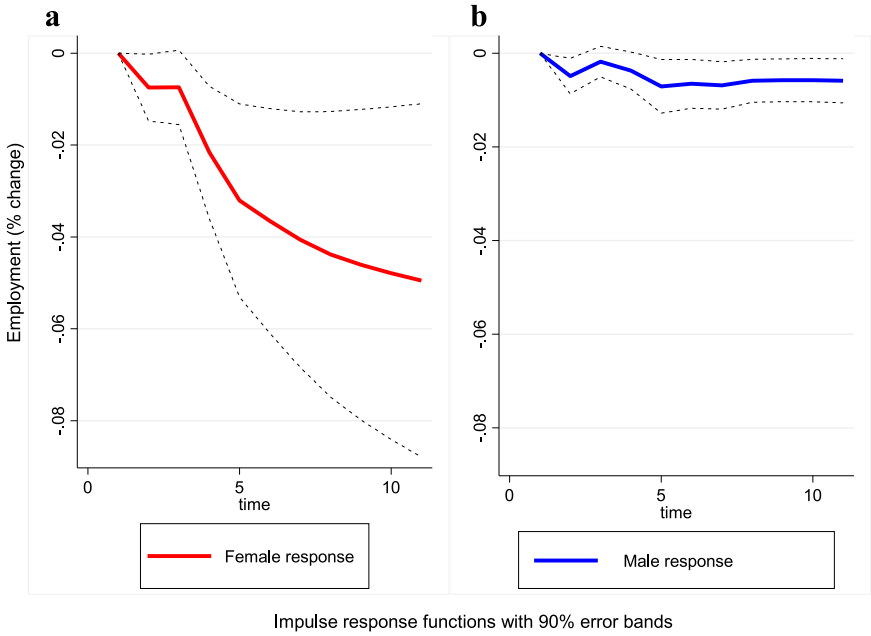


Fig. 6 Employment response to GDP contractions: S. Asia

from which we seek to extract economic response patterns, and utilize fixed effect estimators to remove country specific influences so that any gender differentiated patterns we find are not dominated by individual country observations.

We draw our main conclusions from analyzing IRFs which are calculated based on the estimated coefficients of the autoregressive models.[6] Figure 6a and b present the gender differentiated IRFs for female and male employment equations, respectively, for South Asia. An economic growth shock creates a sharp decline in *female employment* by 3 percentage points within the first 5 years after the shock (Fig. 6a). The magnitudes of the employment declines are large. For instance, applied to the Indian context, the total number of female workers according to the 2011 census is about 150 million. A 3 percentage point drop implies that, following a GDP contraction, there are 4.5 million jobs lost 5 years after the shock over the previous year. The sharp decline persists and deepens over time and stays statistically significant over the long term as indicated by the confidence bands in Fig. 6a. The results strongly support the hypothesis that the effect of an economic growth shock for women work is negative and persistent over time without signs of recovery.

The estimates in Fig. 6b provide evidence of striking gender differences in the response of employment. *Male employment* losses are lesser in magnitude, and the loss of employment for women are more than double than that of men within 5 years after shock. Moreover, unlike females, male employment losses are transient and dissipate over time. Females could be going into unemployment or exiting the labor

[6] The table of results of the autoregressive models for each outcome are hard to interpret without impulse response function estimates, and are available upon request.

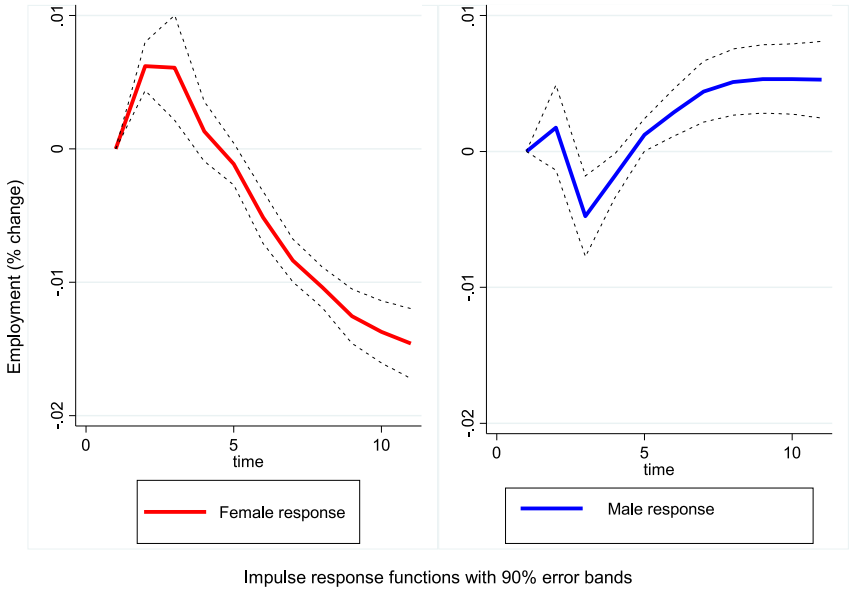


Fig. 7 Employment response to GDP contractions: W. Africa

market indicating the presence of possible net "discouraged worker" effects which has large implications for household consumption and poverty status.

The IRFs in Fig. 7a and b show gender differentiated employment responses to a GDP contraction for West Africa. *Female employment* goes up immediately following the shock consistent with a dominant "added worker effect" as more women enter the labor market plausibly as a coping strategy to make up for lost household income (Fig. 7a). Over time however the surge in employment disappears and women face persistent employment losses. Male employment, in contrast follows a "V-shaped" recovery path where the growth contraction has a small and short lived negative impact on employment (Fig. 7b). These econometric estimates reflect descriptive accounts in the literature on the impacts of Ebola West Africa (see Korkoyah and Wreh 2015). In Liberia, for instance, the majority of women were self-employed, primarily in petty trade and food processing of perishable items, and suffered long term declines in livelihoods following the Ebola outbreak. Men were mostly engaged in wage employment primarily as skilled labor and teachers and so were able to recover quickly after the shock. Similarly in Sierra Leone border closures shut down international agricultural trade leaving women who already had less labor market security impoverished longer than men.

Male and female labor market responses can be linked through household decisions and require concerted policy action. For both Africa and Asia, further analysis with more detailed datasets can reveal the age, education and social profiles of women who either leave the labor market or contribute to the added worker effect and join the labor market in times of crises. Overall, in low-income countries in Sub-Saharan Africa, where a large share of the poor population depends on small-scale autarkic agricultural farming, women may be relatively insulated from global market

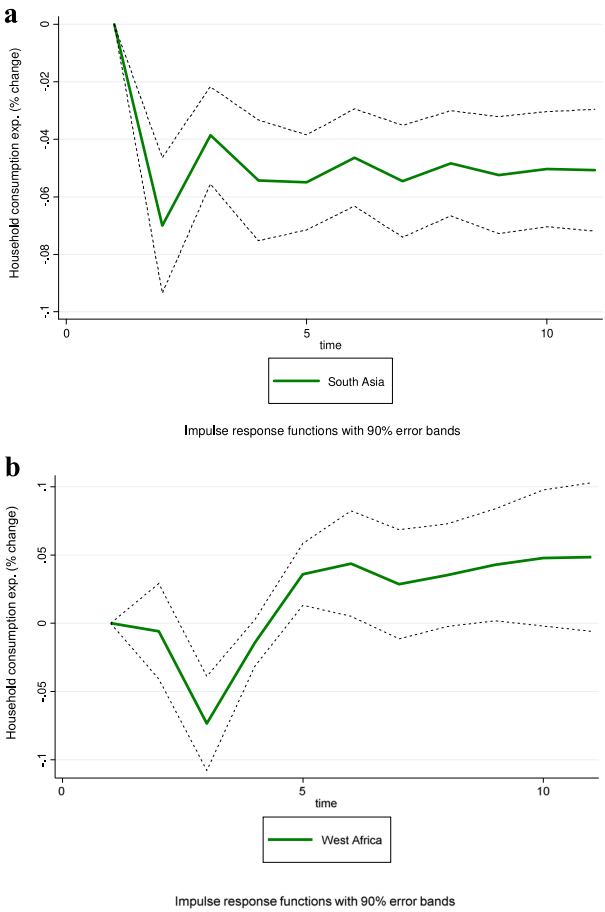


Fig. 8 Household consumption response to GDP contractions: S. Asia and W. Africa

shocks although the reliance on migrant workers on farms as hired labor and disruptions in access to local output sales and input markets leave them exposed to the effects of the pandemic. In Southern Asia (e.g., Bangladesh, Cambodia, Philippines, Thailand) where women are heavily engaged in export manufacturing and high-value agriculture, women face the risk of direct employment losses from global demand shocks. The most vulnerable are women in countries with large informal service sectors in urban areas (e.g., India, Indonesia, Thailand) that are directly hit by lockdowns, restaurant closures and international tourism (World Bank 2020b).

Results for non-gendered household outcomes which are equally, although indirectly, important for women and their households are reported in Fig. 8a, b. Household *consumption* decreases significantly over the first 5 years following the shock by about 5%. In West Africa, consumption recovers over time, while for South Asia the effect is persistent. The pattern of consumption expenditure declines has large implications for household welfare and poverty in developing countries where typically the consumption elasticity of poverty is very high. For instance, in India the

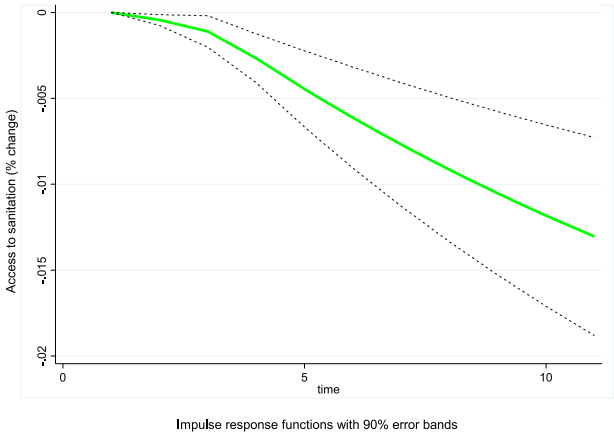


Fig. 9 Access to sanitation response to GDP contractions: W. Africa

elasticity estimate is −2.07, with almost 270 million people estimated as being in extreme poverty (Datt and Ravallion 2011). A 5% drop in consumption implies that millions of households (~60 million according the above estimates) are added to poverty post-crisis. COVID-19, thus, poses a serious threat to poverty alleviation and the progress made under the MDGs and current UN Sustainable Development Goal of ending poverty by 2030.

Our results on the response of access to *sanitation*, based on a smaller West Africa sample for which data is available, shows a striking and consistent decline in access to safe sanitation by people following a GDP contraction (Fig. 9). This finding is alarming and particularly relevant for COVID-19 containment policies. Most communicable disease cases, particularly COVID-19, are linked to limited access to safely managed sanitation and hygiene services, and people with weaker access to these services are considered significantly more vulnerable to the disease (World Health Organization 2019).

5 Conclusions

The COVID-19 pandemic is an unprecedented health and economic emergency with wide-ranging and long-term implications for individuals and households. Primarily channeled through labor markets, expected long term economic impacts on labor supply, migration, child care, elderly care, household consumption and access to services, intra-household resource allocation, and, intimate-partner relationships within the household are significant concerns. Public health scholars and social science researchers complain about the lack of evidence to inform gender sensitive COVID-19 recovery policies and call for overcoming the "tyranny of the urgent" whereby outbreak response policies put aside social and gender issues in favor of addressing immediate biomedical needs (Smith 2019). In this paper, we examine how GDP contractions affect men and women using large panel datasets from South (south and south-east) Asia and West Africa. We develop an intuitive econometric

framework for extracting dynamic gender differentiated patterns of economic responses to a crisis using fixed effects GMM estimators and impulse response functions based on Monte Carlo simulations. The general approach can be applied to other outcomes and other regions (developing or developed) and demonstrates how the analysis of historical data can uncover the nature of gender differences and help COVID-19 recovery policies stay ahead of crisis.

Our results reveal strong evidence that COVID-19 pandemic will likely have a disproportionate negative effect on women's employment opportunities and the gender gap in employment will significantly widen over time. The finding of net discouraged worker effects for women in South Asia requires prioritizing cash transfers for consumption smoothing if women exit the labor or policies of extended leave benefits if they enter unemployment. Challenges of targeting such policies need to be addressed since the majority of women are in poor countries are informal employment. Evidence of net added worker effects for women in West Africa requires provision of employment guarantee schemes to absorb new entrants and availability of micro-finance for the newly self-employed. The magnitude of the potential of COVID-19 to increase poverty in both South Asia and West Africa is significant. Findings on access to sanitation have direct implications for COVID-19 containment policies in the coming years. Given the enormous economic costs of COVID-19, the economic importance of sanitation is at the forefront of policy discussions with an estimated global benefit–cost ratio of 5.5 for investments in improved sanitation (UNESCO 2020; UN Women 2020).[7] However, currently, more than half of the world's population does not have access to safely managed sanitation. An understanding of the behavior of access to sanitation during a crisis, and the striking decline in access documented here, will provide further impetus for investments in sanitation infrastructure.

Acknowledgements This research benefitted from a SAS grant. I would like to thank Brent Swallow for encouraging discussions and participants of the online seminar at REES.

Compliance with ethical standards

Conflict of interest The author declares that he has no conflict of interest.

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[7] Children with access to improved sanitation have also been shown to have lower risk of stunting compared to children without access South Asia and sub-Saharan Africa, underscoring the importance of achieving universal access to these services under the Sustainable Development Goals (Cumming and Cairncross 2016). Further, access to improved sanitation is more frequently associated with reduced stunting risk than access to improved water in Ethiopia, India, Peru, and Vietnam (Dearden et al. 2017).

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