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ABSTRACT

Impacts of COVID-19 on Household Welfare in Tunisia*

COVID-19 is likely to have a large impact on the welfare of Tunisian households. First, some individuals might be more vulnerable to contracting the disease because their living conditions or jobs make them more susceptible to meeting others or practicing social distancing. Lack of adequate access to health insurance, overcrowded living conditions, and low access to water at home are reasons that make the Tunisian poor more susceptible to getting infected or not being able to seek health care in the event that they contract COVID-19. In addition, the elderly in the poorest households could be more susceptible to COVID-19 due to higher prevalence of intergenerational households among the poor. Second, many sectors of the labor market have experienced an economic slowdown, and those employed in these sectors are likely to experience disproportionate effects. Combining the labor shock and price shock simultaneously, the simulations in this paper show an increase in poverty of 7.3 percentage points under a more optimistic scenario and 11.9 percentage points under the pessimistic scenario, and individuals in sectors such as tourism and construction are expected to fall into poverty due to COVID-19. The paper estimates that the government's compensatory measures targeted toward the hardest hit are expected to mitigate the increase in poverty. Specifically, the increase in poverty will be 6.5 percentage points under the optimistic scenario if mitigation measures are in place vis-à-vis in their absence, when the increase in poverty is 7.3 percentage points.

JEL Classification: J16, J21, O54

Keywords: COVID-19, Tunisia, labor income, consumption

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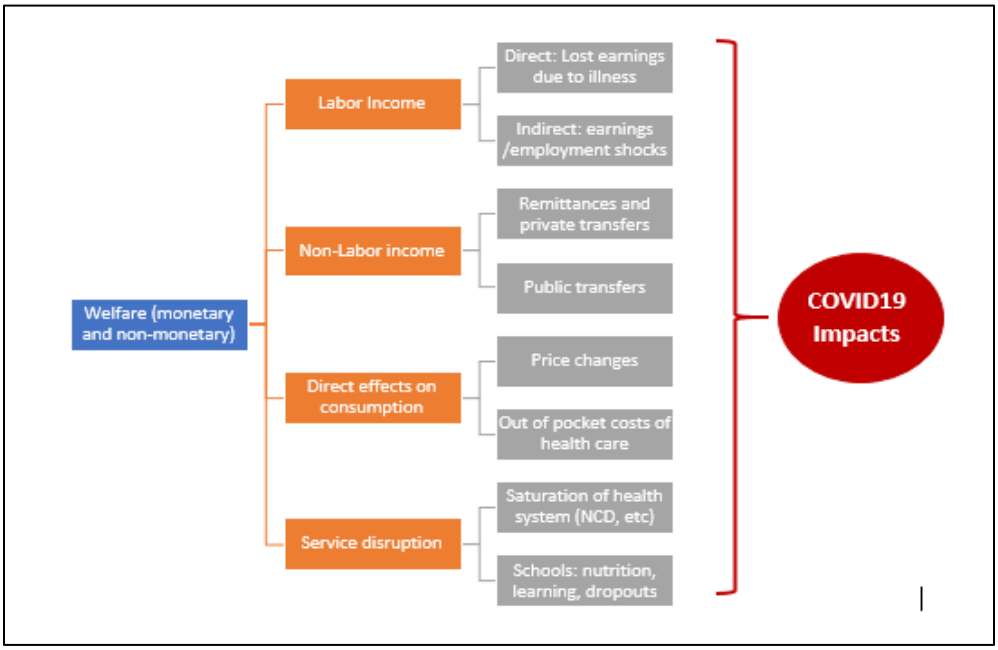
1. Introduction

The Tunisian economy is marred by several political economy, governance and institutional bottlenecks, which has led to a deterioration in its economic performance in the last decade. Even though poverty declined significantly between 2000 and 2015 in Tunisia, from 25.4 to 15.2 percent, spatial disparities remain between urban and rural areas (where extreme poverty remains high), and between coastal regions (where most economic activities are concentrated) and interior regions. The poor population is disproportionately concentrated in rural areas (one-third of population but two-thirds of the poor) and a considerable share of the population in rural and lagging areas remains vulnerable to falling back into poverty.

Tunisia had its first confirmed case of COVID-19 on March 2, 2020, with the victim being a 40-year-old Tunisian man. Since then, according to official estimates, the country has recorded 90,213 cases and 2,935 deaths to date. Even though there were signs that the spread of the disease was slowing down over August, the number of cases again started to spike in October.

The effects of a rapid spread of COVID-19 in Tunisia and potential containment measures are likely to affect poverty and inequality through four broad channels: labor income, non-labor income, direct effects on consumption, and service disruption (World Bank, 2020). The labor income impacts could be both direct through loss of earnings due to illness or through indirect employment and wage shocks. Non-labor income impacts can be driven by changes in patterns of remittances and public transfers. Consumption could be directly impacted either through changes in prices of items having a significant share in household budgets or increase in out-of-pocket costs of health care. Finally, service disruption can ultimately have severe welfare implications through school closures and saturation of health care systems (Figure 1).

Figure 1: Main channels through which COVID-19 can impact poverty and inequality



Source:https://www.worldbank.org/en/topic/poverty/brief/poverty-and-distributional-impacts-of-covid-19-potential-channels-of-impact-and-mitigating-policies

In the case of Tunisia, the COVID-19 pandemic is likely to exacerbate the existing development challenges by potentially reversing the trend of poverty reduction in recent years with the risk of increasing the number of people falling below the poverty line and increasing the degree of poverty severity of those who are already poor. Recent evidence generated by phone surveys during the COVID-19 period, conducted by the National Institute of Statistics (*Institut National de la Statistique* or INS) in collaboration with the World Bank, highlight this disproportionate impact of COVID-19 on the poor and vulnerable Tunisians through the channels highlighted in Figure 1.

The first round[1] of the phone survey revealed that almost two-thirds of households interviewed were affected by COVID-19, either through rising food prices or through loss of employment. More specifically, a third of respondents feared not being able to afford food in the month prior to the survey. This concern was more evident for rural and poorer households. In addition, households seemed to have altered their eating patterns; especially poorer households reduced the quantities consumed or started consuming foods that they do not normally like. To cope with rising food prices or make up for the loss of employment, more than 25 percent of the households interviewed drew on their savings, 25 percent of the households received help or borrowed money from relatives and 15 percent used deferred payment of their obligations. Most of those employed prior to COVID-19 reported loss of job as well as lower income. Indeed, only a third of the respondents who worked before confinement were able to continue their work. Among those who were out of work during the survey period, only 40 percent received all or part of their salary. Family-owned businesses were also heavily impacted by the crisis.

During the second round of the survey, some progress was reported as the economy was partially able to respond to challenges associated with food shortages. Less than 40 percent of those questioned said they had difficulty buying flour and semolina in the second round compared to 65 percent in the first round. In terms of educational outcomes, among households with children, 61 percent said that their children did not participate in any learning activity during the week preceding the interview. Only 26 percent of households reported that their child or non-member of the household was in contact with teaching staff during the week preceding the interview. However, this proportion varied from 12 percent for the poorest quintile to 53 percent for the wealthiest. In terms of employment, 41 percent of those questioned during the second round of the survey and who were employed before confinement were not yet working—that is, 26 percentage points less compared to the period of total confinement. Family business units continued to be severely impacted by the crisis. More than half of them suffered from either a drop or an interruption in their income during the two weeks preceding the interview. Most of them (around 90 percent) were affected by the crisis either directly (closure of the company) or indirectly (no customers, transport of goods, raw materials).

In addition to the phone surveys, studies have been conducted to simulate the impacts of COVID-19 on poverty and welfare by IFPRI-MENA, the UNDP, and UNICEF offices in Tunisia. The results point to the dynamics of increasing poverty. In particular, the UNDP study simulates a post-COVID scenario (S1), which

[1] To monitor the socio-economic impact of COVID-19 on households, phone surveys were conducted with a panel of 1,369 Tunisian households in two rounds—between April 29th and May 8th and between May 15th and May 21st.

includes a decline in supply and a decline in household demand for various basic goods. The simulated drop in household demand (except for food and hygiene goods), and public investment is 40 percent compared to the baseline scenario (pre-COVID scenario). The study shows the poverty rate rising to 19.2 percent from the current 15.2 percent, pulling an additional 475,000 individuals below the income poverty line. The economic recession, with a growth rate of -4.4 percent estimated for 2020, is estimated to elevate multidimensional poverty (estimated using a monetary approach) from 13.2 to 15.6 percent.

The UNICEF study showed that the two months of confinement decreed in Tunisia, during March and April 2020, led to a loss of 7% of household income. Poverty is estimated to have increased over the same period from 14% to 18.5%, or nearly half a million new poor. Poverty among children under the age of 18 years would increase from 19% to 25%, or nearly 900,000 poor children. Mitigation measures taken by the government were not found to have significantly countered the increase in poverty. Moreover, the same study shows that a universal allowance of 1 dinar per day (US$0.37) for each child not covered by social security would reduce child poverty by 5 percentage points.

Measuring real-time impacts of any crisis (financial, pandemics or economic slowdowns) on poverty and inequality is complicated in most countries because of delays in conducting detailed household surveys. As a result, a complementary tool for monitoring crisis impacts through administrative data (e.g., unemployment, school attendance, social benefit applications, etc.) is to assess the potential welfare impacts of crises through simulation tools that can then be used to simulate such impacts on poverty and inequality in short periods of time. In general, the literature showcases a wide variety of approaches used to quantify the distributional impacts of shocks.[2]

In this paper, we follow a methodology similar to that employed by Ajwad, Aran, Azam and Hentschel (2013) and use a hybrid approach that combines the results of macroeconomic projections of a sectoral slowdown of the Tunisian economy over the whole year of 2020 with micro-simulation techniques. Unlike Ajwad, Aran, Azam and Hentschel (2013), however, we introduce the effect of price increase while doing the simulations. In this regard, our study is different from estimates of IFPRI and UNDP as these are based on CGE modeling and focus much more on the macroeconomic impact of the pandemic, and not so much on the distributional implications of the pandemic, which is the key focus of our simulation exercise.

We focus on quantifying the magnitude of the impacts of COVID-19 on poverty and inequality in Tunisia through the labor income and consumption channels using the Tunisia household budget survey conducted in 2015 entitled *Enquête Nationale sur le Budget, la Consommation et le Niveau de Vie des Ménages* (henceforth referred to as EBCNV 2015). The objective of this analysis is three-fold: first, to assess the pre-COVID situation in order to identify and profile the subgroups of population that are most vulnerable to getting infected by COVID-19 and impacted by the associated government measures; second, to simulate the impacts of COVID-19 on consumption, poverty and inequality based on sectoral growth performances over the whole year of 2020 and analyze the distribution of individuals expected to fall into poverty due to COVID-19; and finally, to simulate how the impacts would vary with or without mitigation measures adopted by the Tunisian government.[3]

[2] Refer to Ajwad, Aran, Azam and Hentschel (2013) for a detailed review.

[3] In terms of scope, we seek to estimate the impact of COVID and not the determinants of contamination in Tunisia by COVID-19, which remains out of scope.

Our paper proceeds as follows. Section 2 provides a comprehensive description of pre-crisis situation in Tunisia including trends in poverty, composition of labor markets and individual and household characteristics that make the Tunisian population more susceptible to COVID-19. Section 3 describes the data and the empirical methodology to simulate the impacts of COVID-19 on labor income and consumption. It also discusses the magnitude of impacts in the presence of mitigation measures. Section 4 presents our results under two scenarios. Section 5 concludes and provides policy implications of our results.

We rely on the latest round of data available of the national household survey or EBCNV implemented in 2015. EBCNV 2015 is a quinquennial survey which is the eight survey of its kind carried out by the National Institute of Statistics. The seven preceding surveys were carried out in 1968, 1975, 1980, 1985, 1990, 1995, and 2005. The realization of these surveys coincides with the preparatory work for the Development Plans. The survey on the budget, consumption and household standard of living in 2015 covers data on Household expenditure and acquisitions during the survey period, Consumption food and nutritional situation of households, and Household access to community health and education services. While the National Institute of Statistics (INS) has conducted a household budget survey more recently in 2019, the official estimates are not yet published, and the data are not yet widely available and do not collect the consumption data.

2. Pre-Crisis Situation: Poverty and Labor Markets

Poverty had declined in Tunisia in the pre-COVID-19 period, but significant disparities remained. The poverty headcount rate declined between 2010 and 2015 from 20.5 to 15.2 percent in the country as a whole (Figure 2, panel A). Nevertheless, significant disparities existed between urban and rural areas, and between coastal regions (where most economic activities are concentrated) and interior regions. Extreme poverty is predominantly a rural phenomenon. Moreover, a considerable share of the population in rural and lagging areas remains vulnerable[4] to fall back into poverty. About 49 percent of rural residents were vulnerable in 2015 as opposed to 21 percent of urban residents. In fact, the vulnerability in the poorest regions remains very high despite the decrease in poverty. For example, half of the population in the Central West region is vulnerable compared to one tenth in the Grand Tunis area.

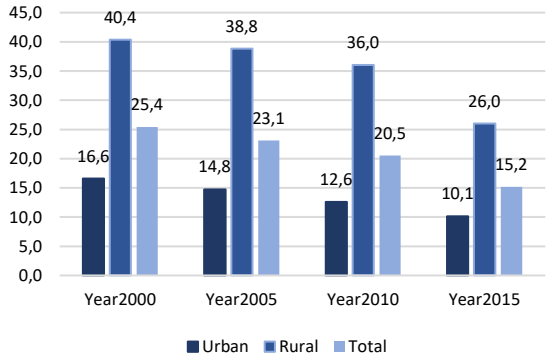
Overall, economic growth has been pro-poor but the decline in inequality was rather modest. Inequality, as measured by the Gini coefficient, has declined over time, especially between 2010 and 2015 from 40.4 to 36.5. Figure 2, panel B shows the growth incidence curve (GIC) for Tunisia, which displays the annualized increase in consumption per capita by percentile of the consumption distribution (the left side of the horizontal axes is the poorest and the right side is the richest). It is observed that the poorest observed

[4] We use the methodology in Atamanov and Lopez-Acevedo (2018) to examine the level and trend of vulnerability in Tunisia between 2000 and 2015. Using this methodology, the poverty and vulnerability lines in 2015 defined below are 2.7 TND per day and 6.1 TND per day, respectively, which translates into 986 TND per year and 2,227 TND per year. Note that the official extreme and upper poverty lines stood at 1,035 TND per year and 1,706 TND per year in 2015, respectively. The population with consumption per capita below US$3.4 2011 PPP per day per capita is defined as poor. The population with consumption per capita between US$3.4-US$7.7 2011 PPP per day can be defined as vulnerable. The population with consumption per capita between US$7.7-US$15.8 2011 PPP per day can be defined as secure. And the population with consumption above US$15.8 2011 PPP per day belongs to the middle class.

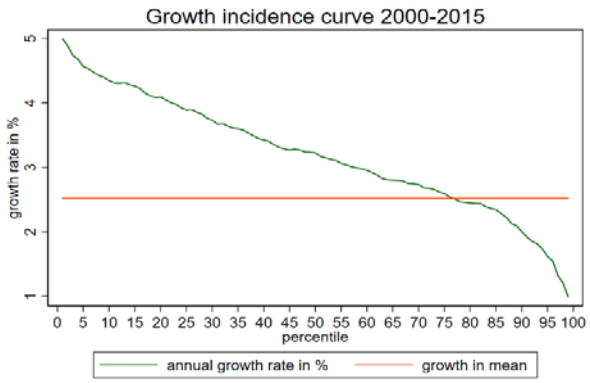
the largest percentage increase in consumption and this increase declines as one along the consumption distribution to richer households.

Figure 2: Poverty and growth incidence

Panel A. Poverty headcount, %



Panel B. Growth incidence curve

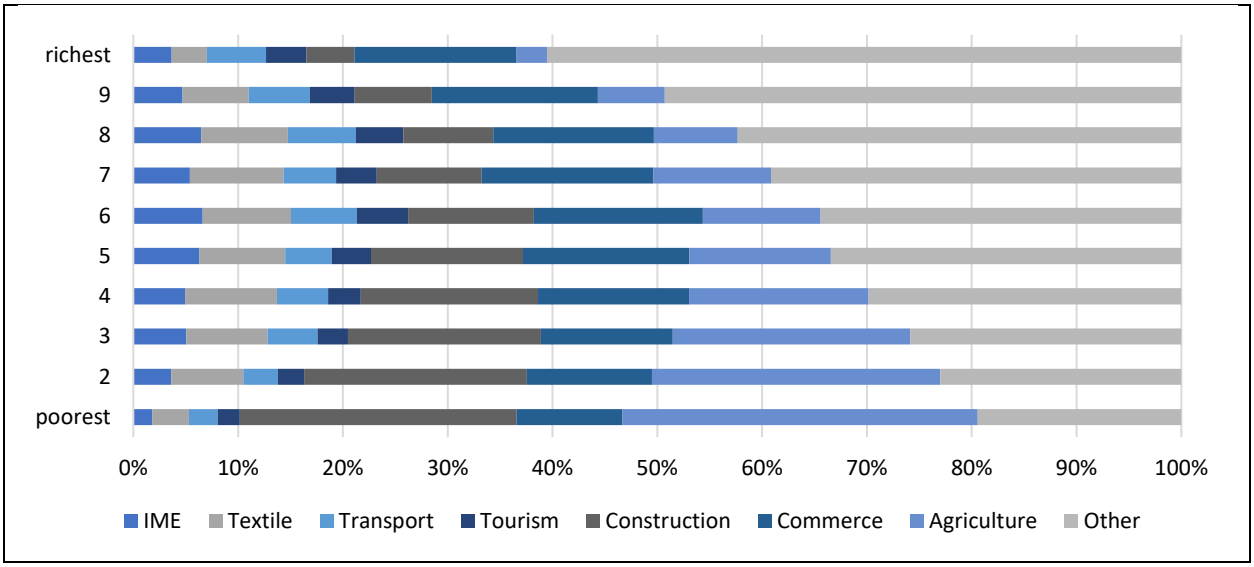


Source: Authors' calculations. Note: The growth incidence curve shows the annualized increase in consumption per capita by percentile of the consumption distribution.

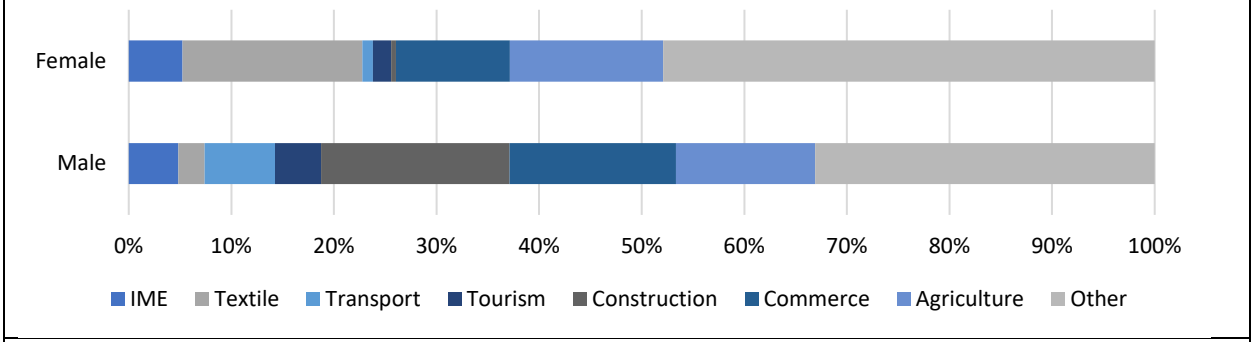
There are four broad ways in which COVID-19 and associated containment measures could impact labor market outcomes. First, there are six high-risk sectors that are expected to be most hardly hit by containment measures against COVID-19- Tourism or Hotels, Cafes and Restaurants; Textiles; Mechanical and Electric industry; Transport; Commerce; and Construction or Civil engineering and Building. These subsectors employ a large share of the population, ranging from 47 percent of those employed among the poorest decile to ranging between 53 and 54 percent among the 4th, 5th and 6th deciles (Figure 3). The center and north east region workers are most likely to see a sharp decline in income, given the large percentage of those employed in high- risk sectors. About 46 percent of those employed in Grand Tunis region also work in high-risk sectors. We also find that a high percentage of women employed in the textile sector and men employed in construction are likely to be negatively affected by COVID-19 containment measures.

Figure 3: Share of employed in each sector, by consumption decile and region

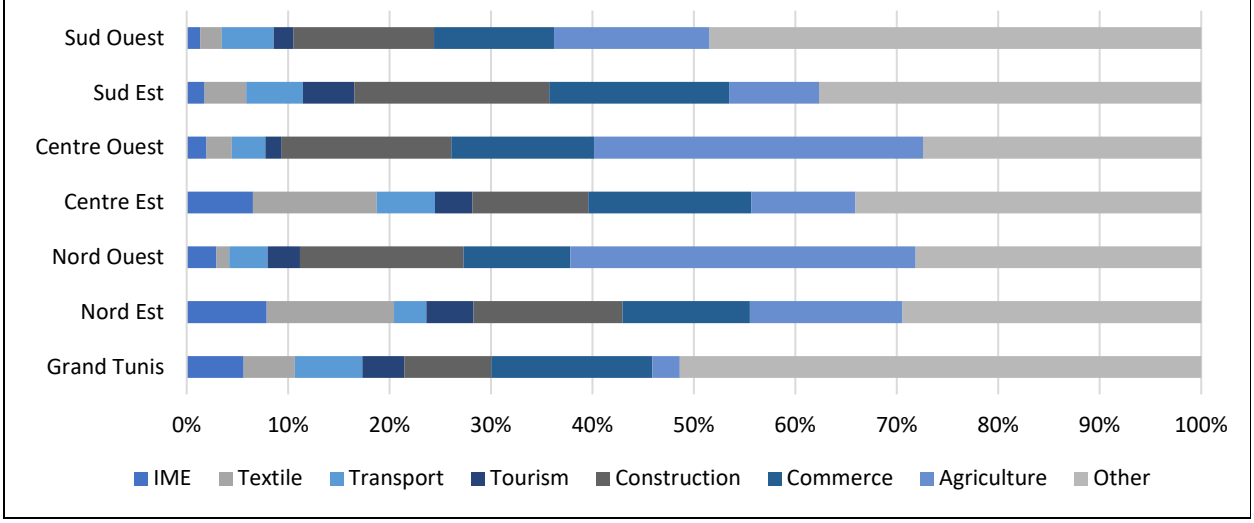
a. By decile



b. By gender



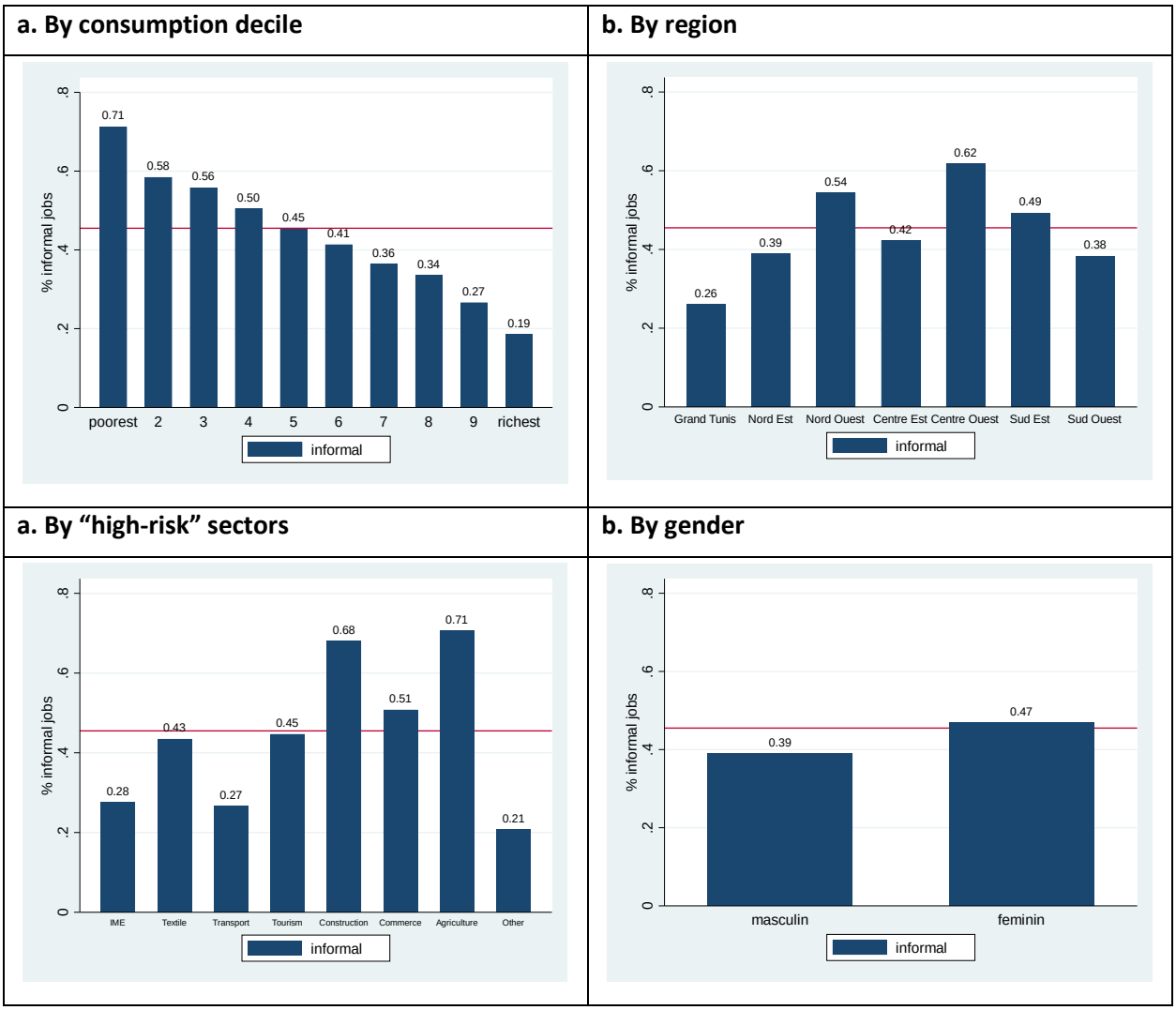
c. By region



Source: Author's calculations based on EBCNV 2015
Note: IME refers to Mechanical and Electric Industry

A second way in which the labor market will be impacted is the high proportion of workers who are engaged in informal work. Informal employment is widespread in Tunisian labor markets. Informal employment, defined as those employed and not affiliated to social security (*Caisse National de Securite Social* or CNSS), tends to be higher for lower consumption deciles, ranging from 56 to 71 percent in the lowest three consumption deciles in contrast to between 19 and 34 percent for highest three consumption deciles (Figure 4). Substantial heterogeneity can also be observed among regions with an average share of informal jobs being more than 54 percent in North West region and 62 percent in Centre West region. Interestingly, even among the six "high-risk" sectors identified previously, informal employment is widespread and the highest in construction (68 percent), commerce (51 percent), tourism (45 percent) and textiles (43 percent). Informal employment also tends to be higher for women in contrast to men.

Figure 4: Share of those employed in informal jobs

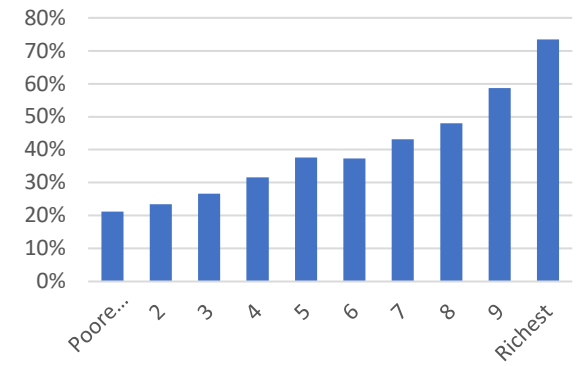


Source: Author's calculations based on EBCNV 2015

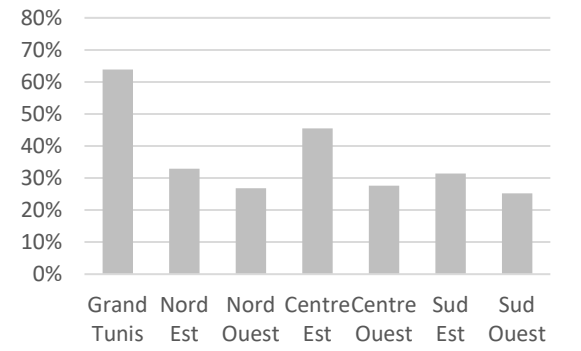
A third way in which labor market could be impacted is through the impact of COVID-19 related measures on commuters traveling to work. Not only could labor mobility be limited during the outbreak, but there is also a higher risk to contract the infection while using public transport due to contact with fellow commuters. About 43 percent of those employed in Tunisia rely on public transport to get to work (Figure 5). The more well-off individuals are more likely they are to use public transport. This is because a high share of the poor walk to work. Looking at regions, as expected, about two-thirds of those employed in Grand Tunis use public transport.

Figure 5: Use of public transport to travel to work

a. By consumption decile



b. By region



Source: Author's calculations based on EBCNV 2015

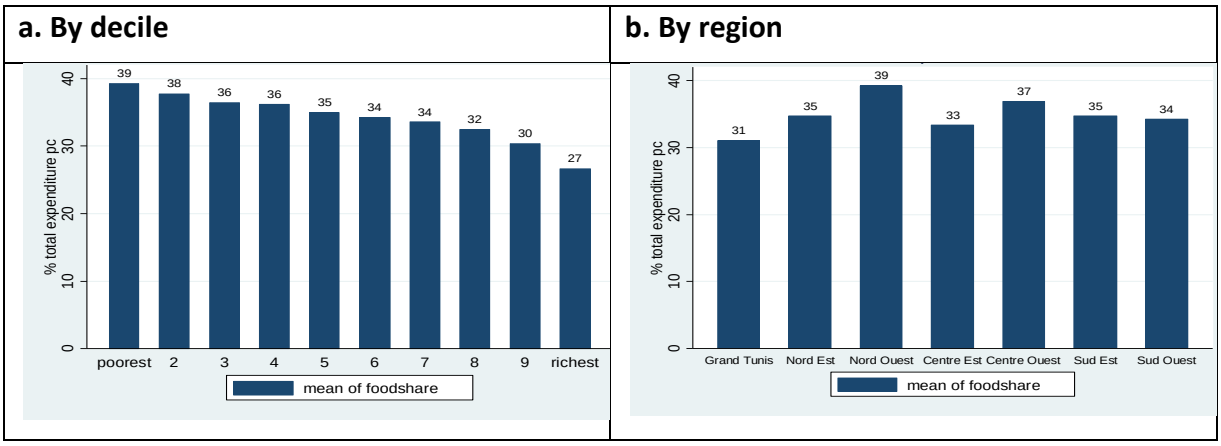
Note: Public transport is defined as the use of any of the following to go to work: metro, train, bus, taxi, driver car or passenger car

A fourth way through which labor market could be impacted is by the viability of certain jobs to be performed from home. Dingel and Neiman (2020) compute a score measure of teleworking or home-based work (HBW) which illustrates the possibility of working from home. Hence, workers with the lowest HBW scores may be most likely to immediately lose their job due to COVID-19. Analysis using this approach shows that most jobs in sectors such as education, finance and communication could plausibly be performed at home, but very few jobs in agriculture and industries such as textiles and mechanical and electrical can be performed at home, putting workers engaged in these sectors at a greater risk of loss of employment. We also observe that the ability to work from home tends to be higher for higher consumption deciles in contrast to lower consumption deciles. In addition to the four ways mentioned in this note, there are other ways in which the labor market could be impacted by the outbreak and government's measures.

Finally, households spending high share of expenditures on food are more vulnerable to a decline in real disposable income as a result of price increases. Food expenditures constitute a major part of the household budget for Tunisians, more so for the poor. Not surprisingly then, households that spend a lot of money on food items that are likely to observe increase in prices are going to be impacted more due to the crisis. Figure 6 shows the share of food expenditure in total expenditure of Tunisian households by consumption deciles and region. Food expenditure tends to be higher for households in the poorest

deciles. Across regions, average share of food expenditure is highest for North West at 39 percent and Centre West at 37 percent.

Figure 6: Share of food expenditure



Source: Author's calculations based on EBCNV 2015

Several demographic or living characteristics of the Tunisian population also make the poor more vulnerable to get affected by COVID-19. First, overcrowded living conditions and low access to health insurance put the Tunisian poor at a higher susceptibility to get infected or to not be able to seek health care in the event that they contract COVID-19. Not surprisingly, poor households tend to live in denser environments, ranging from 7 to 28 percent in the three poorest deciles, in contrast to 1 percent or less in the three richest deciles.

Second, living in an inter-generational household is linked to higher susceptibility to COVID-19, as elder members are more likely to be in closer contact with the younger household members. Inter-generational households are defined as those that include at least one member below the age of 18 years and one member above the age of 64 years. Overall, 10 percent of the population lives in an inter-generational household. Nevertheless, this type of household is disproportionately represented among the poor, ranging from 14 to 17 percent in the three poorest deciles. This type of household is also more prevalent in the South-East region, followed by the North-West and South-West regions.

3. Methodology

Using a methodology similar to that employed by Ajwad, Aran, Azam and Hentschel (2013), this paper employs a hybrid approach that combines the results of macroeconomic projections of a sectoral slowdown over the whole year of 2020 of the Tunisian economy with micro-simulation techniques. Combining information on GDP growth projections by sector and employment elasticity of growth of each sector (to capture how elastic employment is to changes in sectoral GDP), we estimate the loss of employment in each sector. Using household survey data, we then identify individuals who are likely to lose their jobs based on regression analysis and simulate the impact on consumption under various assumptions. With this, we can identify a new distribution of post-pandemic consumption and assess

impacts on poverty and inequality.[5] To simulate price shocks as a result of COVID-19, we use the published consumer price index (by INS) by product categories. We then apply new prices on household consumption and simulate the decline in real disposable income/ consumption. We also assume that this trend of change in prices will continue during the rest of the year.[6] Note that we account for heterogeneity of consumption patterns across households, in particular between poor and non-poor households, by using information on consumption of products collected in the household survey.

These impacts are assessed under two scenarios: (1) *The first (optimistic)* uses World Bank recent estimates with -8.8% real GDP growth, at constant factor prices.[7] (2) *The second (pessimistic)* simulates a growth of -11.9%, i.e. the economy achieves the same growth as that achieved during the first half of the year. Below we provide a detailed methodology of how these impacts are estimated.

Estimation of loss of income

Suppose that the economy is partitioned into S sectors $(s = 1, \dots S)$, the level of activity is observed before the pandemic period 0 and after the pandemic period 1.

Let g_s be the sectoral growth rate during the pandemic period, and g the growth rate of the economy. Let E be the total employment in the economy and E_s the employment in sector s.

The growth elasticity of employment is given by ε_s.

We first estimate the sectoral growth of the economy. Our starting point is the sectoral projection of growth g_s $(s = 1, \dots S)$ carried out by the WB projections according to several scenarios of the evolution of the pandemic.

This is followed by *estimating the loss of employment at the level of each sector:* The loss of employment at the level of each sector is given by $L_s = E_s \times g_s$.

Identification of individuals who will lose their jobs: in this step a logit model is estimated to predict the probability that each worker in the household loses his/ her job depending on four variables (education, age, gender, region of residence). Individuals with the lowest predicted probabilities[8] are assumed to leave the labor market. At this level, several hypotheses are adopted: each household has a certain amount of savings or employment insurance (even informal) that allows it to smooth its consumption. Some households can liquidate certain assets to finance current consumption. Thus, in each sector of activity we find two types of individuals: those who have managed to preserve their jobs and those who have lost them. For the first group, the impact of the pandemic on the household of an individual *i* who continues to work in sector *s* is given by $I_s^i = C_s^i \times g_s$, where C_s^i and I_s^i stand for pre-crisis and post-crisis

[5] According to INS, the national rate translates to 15.2% using the 2015 data. Given this, we first update the 2015 data to create a new distribution of consumption, and observe a pre-covid 19 (2019) poverty rate. We then use growth projections to identify the distribution of post-pandemic consumption and assess impacts on poverty and inequality.

[6] We do not observe the evolution of prices over the whole year. Thus, we use the inflation rate observed up to the date of the simulation (September) and we assume that for the rest of 2020 we observe the same trend.

[7] These are recent World Bank projections estimated by the Macro, Trade and Investment team at the World Bank Group using the MFMod model and information from government and other sources to inform the forecast.

[8]Consider a sector that will lose 20% of jobs (according to the estimated elasticity). Thus, we assume that 20% of those with the lowest predicted probability will lose their jobs. The imputed level of consumption for those who lost their job will be equal to the average observed consumption of an unemployed person. The calculation is made for workers in the household but adopting the simplifying assumption that they contribute equally to household consumption.

consumption respectively of household of individual I and working in sector *s*. For the second group, post-pandemic per capita consumption is set at the same level as the mean of the consumption[9] of a household whose head is unemployed (in their area of residence). It is also useful to note that we assume that public sector workers (including SOEs) and retirees will not suffer any loss of income generated by the pandemic. This methodology allows us to estimate the impact of the pandemic on household consumption levels.

Estimation of price changes on household welfare

Let x_i the per capita total expenditure of household $i(= 1, \dots N)$ on $\boldsymbol{q}(1 \times K)$ goods at price $\boldsymbol{p}_0$ $(1 \times K)$. All pre-pandemic prices are normalized to 1. Let $\boldsymbol{p}_1$ $(1 \times K)$ the vector of post-pandemic prices. $p_{k,1}$ denotes the price of good k (=1,…,K).

The simplest way to estimate the loss of purchasing power is to use the published CPI and define the post-pandemic purchasing power as

$$\Gamma_i = \frac{x_{i1}}{CPI} = \frac{x_{i0}(1+I_i)}{\boldsymbol{p}_1} \qquad (1)$$

Where I_i is the pandemic impact on household i consumption.

Such approach ignores the heterogeneity of consumption patterns across households, in particular between poor and non-poor households. For more precise estimates of the impact of price increases, it is important to estimate a price index at the household level. To do so, we rely on the approach adopted bu King (1983) and define the equivalent income. Under the budget constraint defined by $(p_1, x_{i,1})$, the equivalent income is defined as the income level which, in the reference price system p_1, generates the same level of utility as the level of utility achieved under $(p_1, x_{i,1})$:

$$v(p_0, \Gamma_i(p_0, p_1, x_{i1})) = v(p_1, x_{i1}) \qquad (2)$$

where $v(.)$ denotes the indirect utility function, and $\Gamma_i(.)$ the equivalent income function of household i.

Given that all households face the same price p_1, $\Gamma_h(.)$ can be considered as a monetary measure of utility. $v(p_1, x_{i1})$ given that $\Gamma_h(.)$ is a monotonic transformation of $v(.)$. Inverting the indirect utility function, the equivalent income can be derived as:

$$\Gamma_{i0} = \Gamma_i(p_0, p_1, x_{i0}) = x_{i0} \qquad (3)$$

$$\Gamma_{i1} = \Gamma_i(p_0, p_1, x_{i1}) = x_{i0} - EL_{i1} \qquad (4)$$

where Γ_{i0} and Γ_{i1} denote pre and post pandemic equivalent incomes, and EL_{i1} is the equivalent loss. The price effect of the pandemic on household i is estimated by the EL_{i1}.

Suppose that consumer preferences are represented at the Stone-Geary utility function. The corresponding indirect utility function is given by:

$$v(p, x) = \frac{x - \sum_{k=1}^{K} p_k \gamma_k}{\prod_{k=1}^{K} p_k^{\beta_k}} \qquad (4)$$

[9] Consumption surveys only provide information on consumption and not income.

with $\sum_{k=1}^{K}\beta_k = 1$, γ_k is the subsistence need of good k, and β_k is the share of residual income (i.e., $x - \sum_{k=1}^{K} p_k\gamma_k$) devoted to consuming good k after the minimum expenditure $p_k\gamma_k$ is incurred.

Based on equations (2)-(4), the equivalent income function for the household i, facing the pandemic, is given by:

$$\Gamma_i(p_0, p_1, x_{i1}) = \sum_{k=1}^{K} p_k\gamma_k + \frac{x_{i1} - \sum_{k=1}^{K} p_{1,k}\gamma_k}{\prod_{k=1}^{K}\left(\frac{p_{1,k}}{p_{0,k}}\right)^{\beta_{k,i}}} \qquad (5)$$

The equivalent income function given in (5) has a clear interpretation in terms of real income. Indeed, if $\sum_{k=1}^{K} p_{1,k}\gamma_k$ represents the subsistence expenditures, only the residual income $x_{i1} - \sum_{k=1}^{K} p_{1,k}\gamma_k$ is available for the discretionary allowance, which is deflated by a household-specific price index, $\pi_{1i}^{0} = \prod_{k=1}^{K}\left(\frac{p_{1,k}}{p_{0,k}}\right)^{\beta_{k,i}}$. If one then adds the initial cost of subsistence needs to the actual residual income, we obtain the equivalent income.

One can further simplify and assume that subsistence needs are low (converging to 0), in which case , $\beta_{k,i}$ becomes the budget share devoted to good k, and the equivalent income function is reduced to that generated by Cobb-Douglas preferences.

$$\Gamma_i(p_0, p_1, x_{i1}) = \frac{x_{i1}}{\pi_{1i}^{0}}$$

Based on this exercise, post-pandemic consumption is generated and the effects of the crisis on poverty and inequality are estimated.[10]

4. Results

Based on the recent World Bank projections in Tunisia, the sectoral breakdown of the GDP contraction due to COVID-19 can be estimated to be such that the six hardest hit sectors in terms of a decline in employment are Tourism or Hotels, Cafes and Restaurants (expected to contract by 29 percent under Scenario 1 and 47.4 percent under Scenario 2), Textiles (expected to contract by 21 percent under Scenario 1 and 28 percent under Scenario 2), Mechanical and Electric industry (expected to contract by 17 percent under Scenario 1 and 23 percent under Scenario 2), Transport (expected to contract by 19 percent under Scenario 1 and 32 percent under Scenario 2), Construction (expected to contract by 22 percent under Scenario 1 and 26 percent under Scenario 2), and Commerce (by 5 percent under Scenario 1 and 8 percent under Scenario 2).[11] Combining these projected estimates along with employment growth elasticities, we estimate the projected employment losses in these sectors as shown in Figure 7. The biggest employment losses are concentrated in Mechanical and Electric Industry and Tourism or Hotels, Cafes and Restaurants.

[10] While our methodology uses historical elasticities, an important caveat of this approach is that the impact of the growth shock due to COVID-19 could affect unemployment trends differently from past shocks.

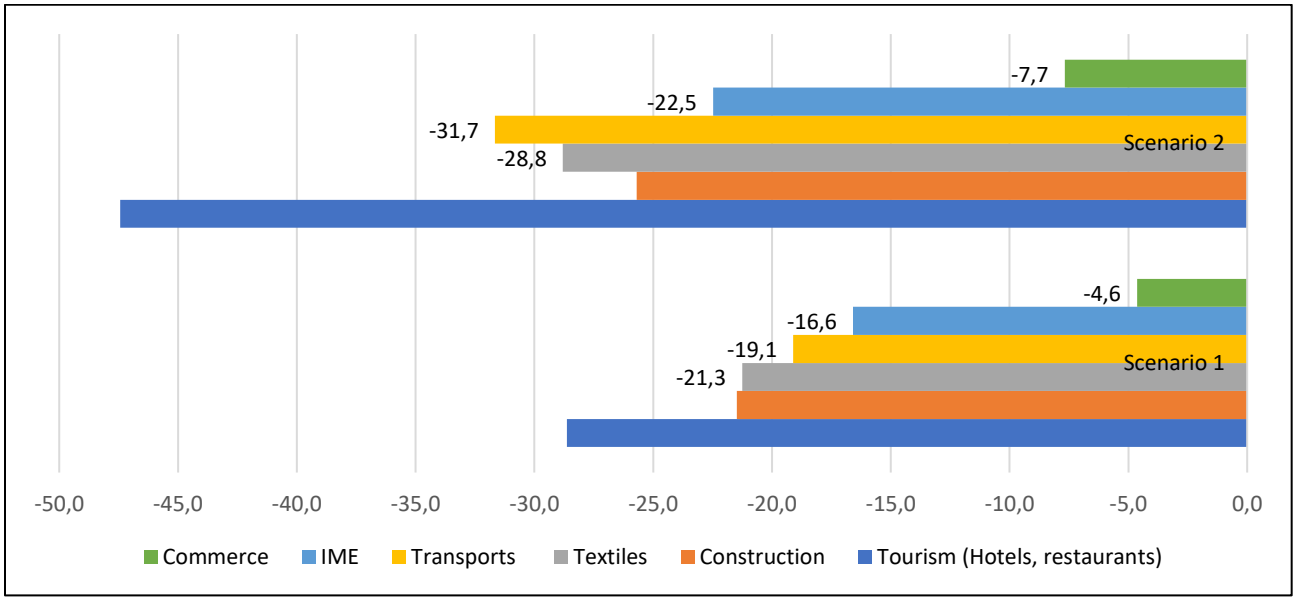
[11] These are calculated based on recent World Bank projections estimated by the Macro, Trade and Investment team at the World Bank Group using the MFMod model and information from government and other sources to inform the forecast.

Table 1: Estimated percentage decline in employment across sectors

Sector	Scenario 1	Scenario 2
Building Materials, Ceramics and Glass Industry	-17.3	-23.5
Mechanical and Electrical Industry	-16.59	-22.5
Textile, Clothing and Leather Industry	-21.25	-28.8
Miscellaneous Industries	-15.21	-20.6
Building and Civil Engineering	-21.47	-64.22
Commerce	-4.63	-7.7
Transport	-19.1	-31.7
Hotels, Cafés and Restaurants	-28.63	-47.5
Various Merchant Services	-9.99	-16.6

Source: WB estimates and Author's calculations

Figure 7: Projected contraction in employment (%) in sectors



Source: WB estimates and Author's calculations

Note: We have used sectoral growth projections estimated by WB combined those with growth elasticity of employment to generate projected employment contract in "high-risk" sectors.

With the projected sectoral and employment contraction discussed above, poverty is projected to increase by 7.3 percentage points under Scenario 1, and by 11.9 percentage points under Scenario 2 (Table 2). This implies a more than 50 percent increase in poverty in Scenario 1 and almost a doubling of the poverty rate in Scenario 2, thus reversing the trend of declining poverty over the past decade. What is worse, many more are expected to lose income and become vulnerable to falling into poverty in the future. The poverty gap, which measures the poverty deficit of the entire population, would increase from

3.2 to 4.4 percent under Scenario 1, and 5 percent under Scenario 2. Income inequality is also expected to increase as a result of the sustained crisis, with the Gini coefficient rising from 37.2 to 39.4 under Scenario 1 and to 41.4 under Scenario 2. Overall, we observe the economy to be hit hard due to the pandemic and the associated shutdown.[12]

Table 2: Projected impacts on Poverty and Inequality

	Pre-COVID19	Post-COVID19 Scenario 1	Difference Scenario 1	Post-COVID19 Scenario 2	Difference Scenario 2
Extreme poverty rate	2.9%	7.4%	4.5	11.8%	8.9
Extreme poverty gap	0.5%	0.8%	0.2	0.9%	0.3
Poverty rate	13.7%	20.9%	7.3	25.6%	11.9
Poverty gap	3.2%	4.4%	1.2	5.0%	1.8
Gini coefficient	37.2	39.4	2.2	41.4	4.2

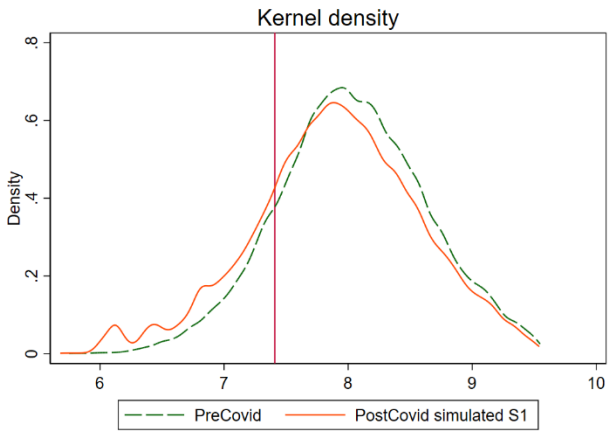
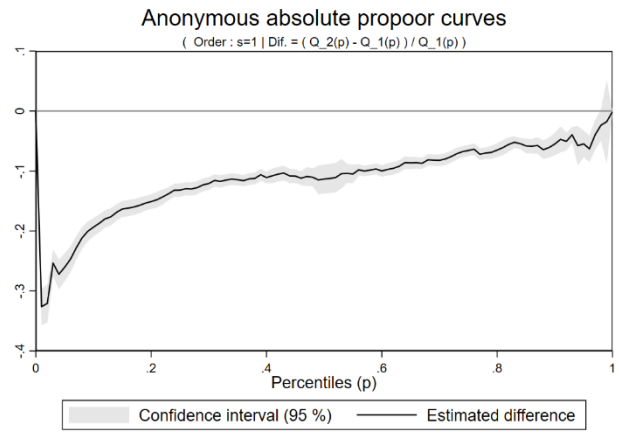
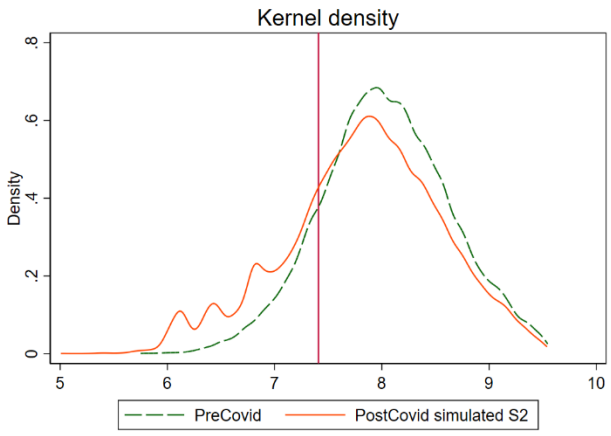
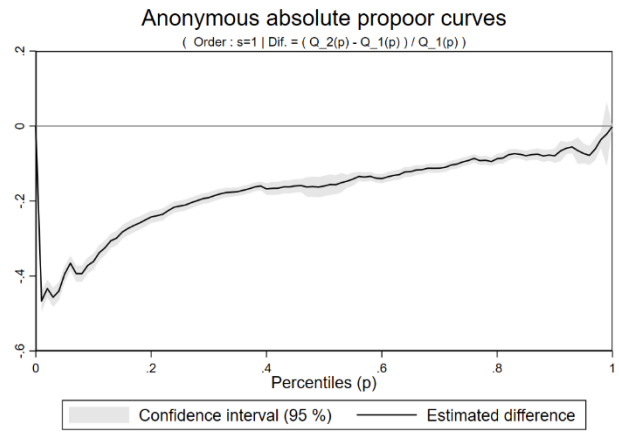
Source: Author's calculations based on EBCNV 2015

Not surprisingly and in line with global estimates,[13] the poor in Tunisia are more likely to be hit the hardest due to the COVID-19 crisis. To analyze the subgroups of the population along the welfare distribution that are most likely to be affected by economic slowdown, we plotted density and Growth Incidence Curves (GIC). Figure 8a shows the pre-crisis and post-crisis consumption distribution under Scenario 2, along with poverty line (red line). One can see that the poor will become poorer due to the economic shock induced by COVID-19. The GIC curve presents this information in a different way and plots the growth rate of consumption per capita across two time periods under Scenario 2, pre-crisis and post-crisis, for each percentile of the distribution. Not surprisingly, Figure 8b shows that for almost all subgroups of the population of Tunisia along the welfare distribution, there is expected to be a decline in consumption per capita (see that GIC is below 0). Households with per capita consumption in the poorest 20 percent of the distribution are simulated to be hit most, experiencing large declines.

[12] We have also considered the growth of certain sectors in our simulations (such as agriculture). In some African countries such as Uganda, the remittances have increased as per their Central Bank estimates. In the case of Tunisia, we do not know which way remittances would move. Intuition suggests that given the economic situation in Europe, remittances would probably decrease but there is no evidence of an increase or decrease in remittances. Hence, we do not consider this in our simulations.

[13] According to World Bank (2020), the COVID-19 pandemic is estimated to push about 49 million people into extreme poverty in 2020 and will hit the poorest the hardest. https://blogs.worldbank.org/voices/covid-19-will-hit-poor-hardest-heres-what-we-can-do-about-it.
According to the latest Poverty and Shared Prosperity Report (2020), The COVID-19 pandemic is estimated to push an additional 88 million to 115 million people into extreme poverty this year, with the total rising to as many as 150 million by 2021, depending on the severity of the economic contraction. Extreme poverty, defined as living on less than $1.90 a day, is likely to affect between 9.1% and 9.4% of the world's population in 2020.

Figure 8: Distribution of per capita consumption and growth incidence curves for Tunisia

a. Distribution of per capita consumption pre and post COVID-19	b. Growth Incidence Curves under the two scenarios
Scenario 1	
	
Scenario 2	
	

Source: Author's calculations based on EBCNV 2015

Using the pre-crisis and post crisis consumption, we identify individuals who have fallen into poverty as a result of the shock induced by COVID-19. We also identify individuals who have faced the largest declines in their consumption (in the population, we identify those with 20 percent with the largest losses). We find that while 38 percent of the population lives in North and Center East regions, these regions host 49 percent of those with the 20 percent largest losses. While 21 percent of the country's population is living in Center West and South East regions, about 30 percent of the individuals who have fallen into poverty as a result of the shock are from these regions. Individuals who have fallen into poverty as a result of the shock induced by the pandemic are more likely to be women, stay in larger sized households, be employed with no contract, and have no access to health coverage, as compared to national averages.

In order to mitigate some of these impacts of the pandemic, an exceptional social and economic emergency plan was announced, enacted and gradually implemented by the Government of Tunisia on March 21, 2020. These compensatory measures targeted the poorest strata of the population and the most vulnerable groups affected by the pandemic to be able to compensate them with incurred losses due to the pandemic. Table 3 below provides a comprehensive description of the measures including the amount of support, period and target number of needy families, families with limited income, families caring for a person without family support and low retirement pensions.

Table 3: Compensatory measures announced by Government of Tunisia on March 21, 2020

Target Population	Amount of support	Period	Target number in theory
Needy families (PNAFN / AMG1)	50TND (15 dollars)	April 2020	260 000 Households
	60TND (17 dollars)	May 2020	
Families with limited income (AMG2)	200 TND 200 TND (70 dollars)	April +May 2020	370 000 Households
Families caring for a person without family support	200 TND (70 dollars)	April 2020	779 Households
Low retirement pensions (less than 180 TND-60 dollars)	100 TND Avril (30 dollars)	April 2020 pension increased to 180 dinars from August	140 000 Households
Famille « Istimarat » (excluding Families with limited income)	200 TND (70 dollars)	May 2020	301149 Households

Source: Data accessed from Ministry of Social Affairs

Simulating the impacts of the pandemic on welfare in the presence of all the above mitigation measures announced,[14] we observe that compensatory transfer measures initiated by the government will have a positive impact on poverty. Specifically, the increase in poverty will be 6.5 percentage points if mitigation measures are in place vis-à-vis in their absence when the increase in poverty will be 7.3 percentage points[15] (see Table 4).

Table 4: Impact of COVID19 with mitigation measures

	Before COVID	After COVID	After mitigation measure	Difference (without	Difference (with

[14] We provide a description of the government measures announced on March 21, 2020. The simulations are based on the announced measures as there is no access to information on actual spending under these measures announced.

[15]The data used to estimate these welfare impacts in the presence of mitigation effects do not allow us to focus on a region, hence we do not provide estimates of these impacts across regions. Moreover, the activities targeted by government measures are more concentrated in coastal regions. The South Region, where some of the riots are concentrated, is characterized by the oil extraction industry and some chemical industries, which do not employ a large workforce.

				mitigation measure)	mitigation measure)
Extreme poverty	2.9	7.4	6.9	4.5	4
Poverty	13.7	20.9	20.2	7.3	6.5
Poverty gap Lower	0.5	2.0	0.7	1.5	1.3
Poverty gap upper	3.2	6.4	4.2	3.2	1
Inequality	37.0	39.5	39.2	2.5	2.2

Source: Author's calculations based on EBCNV 2015

5. Policy Implications and Conclusions

Our findings show that the COVID-19 pandemic is likely to affect household welfare depending on the socio-economic characteristics of the population, sector of employment and location. The poor (more likely to be living in overcrowded conditions) and those with chronic diseases are at greater risk to contract the infection, while those without health insurance (largely the poor and those in informal sectors) are faced with greater inability to avail health care. Also given that the dependence on schools for meals and books is the highest among poor, they are most likely to be negatively affected.

The labor market would be impacted by the COVID-19 crisis in various ways. There are six sectors that have been identified as high risk and are expected to be worst hit in Tunisia- Tourism/Hotels and Cafes/Restaurants, Textiles, Mechanical and Electric Industry, Transport, Commerce and, Construction or civil engineering. These sectors engage a larger share of those employed in the Centre and north east regions and 47 percent from the poorest decile. Secondly, the pandemic will negatively affect those employed informally which is widespread and the highest in construction (68 percent), commerce (51 percent), tourism (45 percent) and textiles (43 percent) sectors. Third, jobs which cannot be done from home, including agriculture and industries, face more uncertainty. Last, those who spend more on food will be affected by price shocks, especially the poor for whom food is a major share of their consumption expenditure.

Our analysis combines the labor shock and price shock induced by COVID-19 simultaneously and simulates post-pandemic consumption. Our estimates indicate that poverty is expected to increase by 50 percent under Scenario 1 (optimistic), and to almost double from 13.7 to 25.9 percent under Scenario 2 (pessimistic). At the same time, inequality is expected to increase slightly due to the COVID-19 outbreak in Tunisia. In fact, households with per capita consumption in the poorest 20 percent of the distribution are simulated to be hit the hardest.

Using the post-crisis welfare distribution, this analysis also helps identify the individuals who are expected to fall into poverty due to COVID-19. Individuals who are expected to fall into poverty due to COVID-19 are likely to be disproportionately resident in the Center west and South east regions and are also more likely to be women, stay in larger sized households, be employed with no contract, and have no access to health coverage.

These findings show that, going forward, it would be extremely important to ensure that economic growth benefits the poor and thus be inclusive. Fostering jobs as well as alternative livelihood mechanisms in the

regions and areas that have been left behind may be important to consider. The additional shock introduced by COVID-19 is expected to increase Tunisia's poverty rate and inequality. This bunching of the population just above the poverty line has key implications in the face of a high risk that the country faces in the future. Many households could fall back into poverty due to environmental or economic shocks. Thus, mechanisms to protect this large, vulnerable subgroup should be a top priority.

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