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Direct and Indirect Effects of Lockdown Policies on Poverty and Inequality in Latin America

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Abstract

We estimate the possible effects on poverty and income distribution of the crisis unleashed by Covid-19 on a group of Latin America and Caribbean countries, representing 80% of the total population in the region: Argentina, Brasil, Chile, Colombia, Ecuador, Honduras, Mexico, Paraguay, Peru, and Uruguay. We use household survey data from pre-crisis national household surveys and, based on prospective scenarios of vulnerability to the shock, we compute the impact that income losses may have on a country's poverty levels and inequality. Our vulnerability scenarios are based on the national policies used to prevent the rapid expansion of the Coronavirus. Additionally, for a sub-sample of 6 countries (Brazil, Chile, Colombia, Ecuador, Mexico and Peru) we use Input-Output linkages to estimate direct and indirect shocks to consider how the differences of the productive structures, economic linkages, and labor market characteristics of each country could result in different effects on poverty and inequality. We find a significant increase on poverty headcount ranging from 25% to 33% percent in our different estimations. The results show heterogeneity on the exposure to the shocks. Two main factors explain differences across countries: their level of specialization in activities labeled as essential (e.g., agriculture, public sector, food retail) and their level of employment protection and stability (i.e., type of contract and employment in larger firms). We find a higher vulnerability to the propagation of the shocks in countries with a bigger agricultural sector, and less vulnerability in countries with bigger firms, and lower informality.

Keywords: Covid-19, poverty, inequality, Latin America, lockdown policies, simulations.

JEL-Codes: N36, I38, I14, D57.

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Efectos directos e indirectos de las políticas de confinamiento sobre pobreza y desigualdad en América Latina

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Resumen

Este estudio estima los posibles efectos sobre la pobreza y la distribución del ingreso de la crisis desatada por el Covid-19, en un grupo de países de América Latina y el Caribe. Estos países representan el 80% de la población total de la región: Argentina, Brasil, Chile, Colombia, Ecuador, Honduras , México, Paraguay, Perú y Uruguay. Utilizamos datos de encuestas de hogares nacionales anteriores a la crisis y, con base en escenarios prospectivos de vulnerabilidad al impacto, calculamos el efecto que la pérdida de ingresos puede tener en los niveles de pobreza y desigualdad de un país. Nuestros escenarios de vulnerabilidad se basan en las políticas nacionales utilizadas para prevenir la rápida expansión del Coronavirus. Además, para una muestra de 6 países (Brasil, Chile, Colombia, Ecuador, México y Perú) usamos los encadenamientos derivados de matrices insumo-producto para estimar choques directos e indirectos, con el propósito de identificar cómo las diferencias de las estructuras productivas y las características del mercado laboral de cada país podrían conducir a efectos diferentes sobre la pobreza y la desigualdad. Estimamos un aumento significativo en el recuento de personas en situación de pobreza que oscila entre el 25% y el 33% por ciento en nuestras diferentes estimaciones. Los resultados muestran heterogeneidad en la exposición a los shocks. Dos factores principales explican las diferencias entre países: su nivel de especialización en actividades etiquetadas como esenciales (por ejemplo, agricultura, sector público, venta minorista de alimentos) y su nivel de protección y estabilidad del empleo (es decir, tipo de contrato y empleo en empresas más grandes). Nuestro trabajo pone en evidencia una mayor vulnerabilidad a la propagación de los shocks en países con un mayor sector agrícola, y menor vulnerabilidad en países con empresas más grandes y menor informalidad.

Palabras clave: Covid-19, pobreza, desigualdad, América Latina, políticas de confinamiento, micro simulaciones.

Código JEL: N36, I38, I14, D57.

[α] Autor de contacto: Universidad de Los Andes, Economics – CEDE. Email: ca.alvarez967@uniandes.edu.co . Esta investigación fue financiada a través del proyecto "*El futuro del Trabajo en América Latina y el Caribe: desigualdad en región y el impacto del COVID-19*". Contrato #: C-RG-T3288-P001; BID-CEDE/Universidad de Los Andes, 2020.

1 Introduction

The economic crisis caused by Covid-19's rapid expansion and the policies to contain it represent formidable challenges to economies worldwide. Both economic and health impacts are considerably high among the developing countries. For Latin America and the Caribbean, those challenges expose large vulnerabilities of an emerging middle class that barely escaped poverty in recent decades. The region contributes with a third of the deaths worldwide and represents less than 9% of the world population. The livelihood of many households suffered a direct shock to their sources of income that may have long-term impacts on the welfare of the population. Additionally, preliminary evidence indicates that the economic losses of the crisis will not spread equally across the population, instead, the main consequences of the crisis will affect disproportionately the most vulnerable[1].

The abundant literature on the economic impacts of the current crisis has pointed out different mechanisms that affect the incidence of poverty and inequality in the countries of Latin America and the Caribbean. Beyond the macroeconomic vulnerabilities of the region, due to the fall in the prices of commodities, economic and social weaknesses are associated with the segmentation of its labor markets (Weller et al. 2020), and a high presence of informality and low productivity. Because of this, the high levels of inequality differentially expose its inhabitants to non-pharmaceutical measures (NPM) to face the health crisis.

Beyond the direct effects of the NPM, as selective lockdowns, the economic paralysis triggers both internal and external demand contractions beyond the directly affected sectors (Eichenbaum et al. 2020). The effects propagate from consumers and firms to governments, hampering their policy responses, especially for the already limited fiscal capacities of the Latin America and the Caribbean countries. The depth of the crisis depends not only on policy actions but also on the original economic and social structures receiving the shocks. Given some heterogeneities in the productive structures among the region, one can expect different consequences.

In this paper, we assess the possible effects on poverty and income distribution of the crisis unleashed by Covid-19 on a group of Latin America and Caribbean countries. We selected this group of 10 countries to cover a large part of the total economy and employment in the region and to represent a significant share of its population. These countries are: Argentina, Brasil, Chile, Colombia, Ecuador, Honduras, Mexico, Paraguay, Peru, and Uruguay. They represent more than 80% of the total population and GDP of the region.

We use household survey data from pre-crisis national household surveys and, based on prospective scenarios of vulnerability to the shock, we compute the impact that income losses may have on a country's poverty levels and inequality. Table A 1 contains the list of household surveys we use, with their corresponding collection date.

To identify economic activities directly affected by lockdown policies, we construct a database of policy measures for each country. Our vulnerability scenarios are based on the national policies used to prevent the rapid expansion of the Coronavirus (i.e., lockdowns preventing certain sectors from operating), and the basic characteristics of each person's job

[1] Studies for US (Chetty et al. 2020) and Latin American countries (López-Calva & Meléndez 2020, Busso & Messina 2020) show how the economic shock is asymmetric along income groups, affecting primarily poor and vulnerable households in urban areas.

(occupation, firm size, and job stability). As we discuss below, due to the fragility of employment ties, the effects of the Covid-19 crisis will take a heavy toll on the income of vulnerable households.

Finally, for a sub-sample of 6 countries (Brazil, Chile, Colombia, Ecuador, Mexico and Peru) we study a more complex scenario, aiming at capturing the propagation effects of the shocks. For this, we use Input-Output linkages. This allows us to study separately scenarios for direct and indirect shocks to pin down how the differences of the productive structures, economic linkages, and labor market characteristics of each country could result in different effects on poverty and inequality.

We find three main results. First, using our definition of exposure to direct income shocks due to COVID-19, 27% of workers in the studied countries are exposed to losses in their income. The share of exposed workers ranges between 15% in Uruguay and 42% in Paraguay. Even though the share of exposed workers is relatively homogeneous across countries, the determinants of this share exhibit cross country variation. Overall, two main factors explain differences in exposure across countries: their level of specialization in activities labeled as essential (e.g., agriculture, public sector, food retail) and their level of employment protection and stability (i.e., type of contract and employment in larger firms). Countries like Honduras and Ecuador have a lower level of exposure due to the prevalence of employment in the agricultural sector. In Colombia, Paraguay and Peru the main driver of exposure is informality and the small size of the firms. In Mexico, Chile, Brazil and Uruguay the exposure is low due to a higher concentration in formal-sector employment or large firms.

Second, a partial income loss of 50% of labor earnings of exposed individuals has a devastating shock on poverty levels. Our scenarios suggest that, on average, such a shock to labor income increases the headcount poverty ratio in the studied countries by 6 percentage points (p.p.) on average, from 30.3% to 36.2%. The effects are uneven across the region. Whereas economies like Paraguay have an increase in poverty of almost 12 p.p., economies like Uruguay suffer an increase of 4 p.p.

Third, results differ widely between urban and rural areas. Due to the type of activities restricted under lockdown policies, the Covid-19 crisis has stronger direct effects on urban activities. Our simulations suggest that the direct income shock increases headcount poverty ratio for urban areas 11.1 p.p. on average, from 26.8% to 37.9%; in contrast, the increase in poverty headcount ratios for rural areas[2] is about 6.0 p.p. (from 38% to 44%). This effect does not include indirect income shocks affecting particularly rural households, such as demand reduction for agricultural items due, for example, to the restricted operation of restaurants.

We study the propagation of the of the lockdown shocks for a subsample of countries (Brazil, Chile, Colombia, Ecuador, Mexico and Peru). Using Input-Output matrices to account for the interdependence between economic sectors through intermediate demand. We add, to direct effects of lockdown shocks, the indirect effect. The result shows an increase in headcount poverty rate of 8 p. p. in average, from 25% to 33% in a moderate scenario. However, these effects show a higher vulnerability to the propagation of the shocks in countries with a bigger agricultural sector, as Peru and Ecuador, or with a high level of informality and income vulnerabilities as Colombia and Mexico. These effects are less

[2] Argentina's households survey (EPH) does not include rural areas. Brazil has no official calculation of monetary poverty lines. We update ECLAC's last estimation of Brazil's poverty lines using the official consumer price index.

important in Chile, because of the low proportion of rural labor and because the direct effects already account for an important part of the urban population in the main economic activities.

The rest of the note is organized as follows. In section 2 we describe the methodological considerations used to compute the changes in poverty and inequality measures due to the Covid-19 crisis from household surveys data. In section 3 we present the results, including descriptive statistics and a heterogeneity analysis by urban and rural areas, and some demographic characteristics of the vulnerable households.

2 Methodology

To provide a measure of the potential impact of the Covid-19 crisis on poverty and inequality, we implement micro-simulation methods. Using as a baseline scenario the pre-crisis distribution of per-capita income and the levels of poverty and inequality, we propose a series of prospective scenarios of labor market disruptions, where exposed individuals suffer income losses due to the crisis. Once personal income has been affected, we compute the changes in the household's income and estimate the simulated distribution of per capita income by scenario. Next, we measure the differences on monetary poverty incidence and income inequality indicators between the proposed scenarios.

2.1 Vulnerability to income shocks

A relevant element throughout our analysis is the definition of a person's vulnerability to income shocks due to the Covid-19 crisis. In what follows, we define an individual's level of vulnerability to income shocks based on three dimensions: economic sector, firm size and job stability[3].

First, we consider the degree of vulnerability of the economic sector to confinement and other policy measures that prevented firms from operating on site. The impact of the Covid-19 crisis is different across the different economic sectors. To slow down the contagion rate of the pandemic, governments in the region implemented lockdown policies in which, at least, some sectors were not allowed to operate on-site. The restrictions covered many non-essential sectors, and a few could continue operating remotely. Because of the restrictive nature of the lockdown measures, we consider that jobs in sectors subject to lockdown policies are the most exposed to income losses.

Our second consideration in defining vulnerability to income shocks is that, given a lockdown measure, larger firms tend to be more resilient than smaller ones. Lockdowns and social consumer behavior produced a paralysis of the activity and of the demand of some sectors. The capacity of the affected firms to face such shocks depends on their size. Small firms are financially fragile. Both the lack of available cash and expectations on the duration of the crisis lead to faster layoffs and closures in small business than in larger firms. Small firms have lower cash reserves and access to credit to continue paying their payroll. These liquidity constraints make it very difficult to maintain labor contracts. Hence, workers in small firms face a higher risk of losing their incomes than workers in larger firms.

Finally, the third dimension to determine economic vulnerability is the stability of the job relationship. We classify as more vulnerable job relationships that are easy to terminate because they have low adjustment costs, either because the type of contract is flexible or

[3] We follow a similar methodology as Alfaro et al. (2020) to define vulnerability criteria.

because the lack of employment protection facilitates the dismissal of workers. Therefore, we define vulnerability based on the person's job characteristics[4]. Among workers with flexible labor contracts, we consider vulnerable those salaried workers under fixed-term contracts, and workers whose job does not require or does not have a legal contract, namely, self-employed workers, domestic workers, unpaid workers, and all informal workers (regardless of firm size), the latter proxied by their status to contributory social security systems.

At this stage of our analysis, we only consider direct effects associated with the lockdown and we do not take into account how measures such as teleworking might mitigate the results. According to the existing literature on this issue, the mitigation due to such measures might have different impacts in the countries we analyze[5]. We will consider those elements in a further phase of this work.

Table 1 summarizes the general framework to define the vulnerability criteria. We classify as vulnerable workers those with less stable job relationships, salaried workers in small firms with fixed-term contracts, and informal workers in large firms, all of them working in non-essential sectors. As we detail below, the exact definition of essential and non-essential sectors is country specific, based on the lockdown measures taken in each country. Similarly, the definition of informal (non-contributory) sector workers is based on the country specific question asking whether the worker contributes to the contributory social security system. The definition of small firm as a firm with up to 50 employees is based on data availability, since this exact cutoff is used in most of the household surveys[6].

Table 1: Classification of vulnerable workers

<table>
<tr><th rowspan="2">Type of worker</th><th rowspan="2">Essential sectors</th><th colspan="2">Non-essential sectors</th></tr>
<tr><th>Informal (non-contributory) sector</th><th>Formal (contributory) sector</th></tr>
<tr><td>Workers with less stable job relationships (self-employed, domestic, and unpaid workers)</td><td rowspan="4">Less vulnerable to income shocks. (They may be affected by <u>indirect</u> shocks)</td><td colspan="2" rowspan="2">More vulnerable to income shocks</td></tr>
<tr><td>Salaried workers in small firms (up to 50 employees) with fixed-term contracts (including no contract)</td></tr>
<tr><td>Salaried workers in small firms (up to 50 employees) with permanent contracts</td><td colspan="2">Less vulnerable to income shocks</td></tr>
<tr><td>Salaried workers in large firms (50 or more employees) and public sector workers</td><td>More vulnerable to income shocks</td><td>Less vulnerable to income shocks</td></tr>
</table>

Note: Gray cells characterize the mix of elements defining a vulnerable worker.

[4] A similar approach to the fragility of the labor links is used in Álvarez et al. (2020).

[5] Saltiel (2020) uses worker-level data from the World Bank's Skills Toward Employability and Productivity (STEP) survey to examine the share of urban jobs that can be done from home in ten low- and middle-income countries, including Bolivia and Colombia. Saltiel's (2020) results confirm those of Dingel and Newman (2020) for the U.S. finding that the feasibility of working from home is strongly correlated with GDP per capita. Specific worker characteristics, such as education level, belonging to a low-asset household or working in the informal sector, make it harder for them to work from home. Considering that STEP only covers urban workers it is possible that the total country share of jobs that can be done from home, including rural areas, is lower.

[6] In some countries, like Argentina, the cutoff is defined at 40 employees. In this case, we consider as a small firm those with up to 40 employees.

2.2 Prospective scenarios

Once we define vulnerable workers, we consider two scenarios. The first one only considers the direct effects of the lockdown measures. Every worker in a non-essential sector, regardless of specific job characteristics, is affected with a reduction of 50%[7] in her monthly average income.

In a second scenario, we refine the vulnerability criteria, including characteristics of the worker. In this case, the income loss (again 50% as a benchmark) affects workers in the non-essentials sectors but limited to the most vulnerable type of labor links. This includes: All the informal workers, self-employed, domestic workers, unpaid workers, and salaried working in small firms with fixed-term contracts (see Table 1).

The first scenario can be considered as an upper bound of the shock. It is expected that part of the labor force, working in non-essential sectors, will keep their income source due to the strength of their labor ties, but also to the capacity of the firms to safeguard jobs. However, the capacity of the economy to protect those jobs depends on structural factors of the labor markets and the distribution of labor among economic sectors. An economy with high levels of informality and/or with an important reliance on urban services has a greater exposure in our second scenario.

Regarding the productive structure, Figure A3 in the Appendix A illustrates the distribution of the labor force by economic sectors. Within the set of countries under consideration, it is possible to identify three different patterns. A first group of countries where the agricultural sector gathers an important part of the labor force. In this group are included: Honduras, Ecuador, Peru and Paraguay. On the opposite side appear Chile, Brazil, Argentina and Uruguay. In those countries, the labor force is mainly concentrated in services (notably including financial services), retail and wholesale and manufacturing. A third group of countries shows an intermediate structure, with a high prevalence of commercial activities, services and in, a lesser degree, of manufacturing. In this last group are included Colombia and Mexico.

As mentioned above, countries with a predominance of urban employment, as the second group, are more exposed to lockdown policies. These countries show a higher impact in the first scenario considered. However, some of those countries have characteristics that mitigate the effects in the second scenario. This is interesting enough, because even if the Covid-19 crisis is expected to affect mainly urban employment, the economic and institutional characteristics of those economies make them less vulnerable to the kind of loss we consider in the second scenario. We discuss this trade-off in more detail in what follows.

2.2.1 Identification of vulnerable sectors

To identify the vulnerable sectors, we made an exhaustive review of the decrees that dictate physical distancing and lockdown policies in each country. Those that remained closed and were not susceptible of teleworking were considered the most vulnerable. For Brazil, we used decree

[7] We use a 50% shock as a benchmark because the duration of the lockdown measures and the length of the process to attain the first epidemiological "peak" has lasted, at least, six months. The most common period of high economic disturbance begins in April and ends in August. A 50% shock is a conservative estimation of the shock as it does not consider that the income source disappears completely. We also report the effects of 25%, 75% and 100% shocks on income in section 3.2.

No. 10 282 of March 20th, 2020, which establishes the essential sectors at the national level and is used as a baseline for the analogous decrees at the state level. In the case of Uruguay, since mandatory lockdown has not been implemented, we used the document "Social and Economic Impact of COVID-19 and Policy Options in Uruguay" of the UNDP to identify vulnerable sectors.

Each country uses a different codification to classify economic sectors. For Colombia, Ecuador, Honduras, Peru and Uruguay, we used the of the International Standard Industrial Classification of All Economic Activities Rev. 4 (ISIC). Some codes were added manually because they correspond to local sectors of each country and therefore, they were not included in the international revision. To identify the code of these missing sectors, we reviewed the methodology to classify the economic sectors of each country. For the other countries that did not use the ISIC Rev. 4, we used correspondence tables to identify the equivalent codes in each classification. Chile and Paraguay use the ISIC Rev. 3 and, as mentioned above, we added codes that are not in the international version. Brazil uses their own classification of economic activities, corresponding to the 2nd version of the National Classification of Economic Activities (CNAE for its acronym in Portuguese). Mexico uses an adaptation of the North American Industry Classification System (SCIAN for its acronym in Spanish) adapted for household surveys ("household version"). In Panama, we identify the vulnerable sectors and the coding for each one. Unfortunately, the database includes the economic activity in which the person works at an aggregate level (sector), so the exercise presented in the document could not be carried out for this country[8].

2.3 Accounting for indirect shocks

The setup presented above only accounts for the direct effects of an extended lockdown on economic activity and income inequality. Clearly, this is not the only source of shock that jobs face. Even though some economic sectors were allowed to operate, they supply products to other sectors as intermediate inputs and demand intermediate inputs from others. If those other sectors are subject to lockdown, the economic impact of lockdowns spreads over the entire supply chain affecting employment in other sectors (Alfaro et al., 2020).

To account for the indirect effects that lockdown policies may have on inequality and the production in other sectors via input-output linkages, we implement an approach in which we use input-output matrices. A key element to understand the micro effects of a shock like the COVID-19 pandemics causes on the economy depends critically on how the shock spreads across sectors. Input-Output matrices have been widely used to understand linkages between sectors in different setups, such as in environmental policy evaluation (Goulder et al., 2016), in the analysis of multi-country value chains in international trade (Timmer et al., 2014), and are the basis of general computable equilibrium models and policy evaluation (Wing, 2004).

The input-output analysis has a longstanding tradition in economics starting from Leontief (1936). Leontief's model decomposes the industries' gross output $\boldsymbol{g}$ between intermediate consumption (i.e., consumption by other industries as inputs) and final consumption as

$$\boldsymbol{g} = \boldsymbol{A}\boldsymbol{g} + \boldsymbol{f},$$

[8] In a companion material to this document, we present the results of the definition of vulnerable and less vulnerable economic activities for each country.

where $\boldsymbol{g} \in \mathbb{R}^S$ and $\boldsymbol{f} \in \mathbb{R}^S$ collects the information of gross output and final consumption in S sectors, and $\boldsymbol{A} \in \mathbb{R}^{S\times S}$ is a matrix in which the (i,j)-element represents the input requirements that industry j demands from sector i. Under the assumption that those coefficients are fixed,[9] the effect of a change in final demand on gross output including all the direct effects and indirect effects via upstream and downstream intermediate demands is given by

$$\Delta \boldsymbol{g} = (\boldsymbol{I} - \boldsymbol{A})^{-1}\Delta \boldsymbol{f}.$$

The matrix $(\boldsymbol{I} - \boldsymbol{A})^{-1}$ is the matrix of Leontief multipliers, and it gives the gross output values of all products that are generated in all stages of the production process of one unit of a specific final product (Timmer et al., 2014).

We use the input-output analysis to create a measure of jobs' economic exposure to lockdown shocks cause to the COVID-19 crisis. To do this, we use the official data from input-output tables from each country and assume that jobs vulnerability in a sector depends directly on lockdowns in a given sector and indirectly due to the lockdown in other sectors, weighted by the Leontief multipliers. Due to availability of data sources and aiming at study a representative subset of economies with enough diversity in their productive and labor market structures, we selected six countries for this analysis of indirect shocks: Brazil, Chile, Colombia, Ecuador, Mexico and Peru. We compute the indirect effects of lockdowns using the following steps:

1. Based on information of input-output tables per country, we compute input-output Leontief multipliers.[10] They allow us to estimate the final effect on the demand for one activity as an input to produce all other activities. If, for instance, food industry activities demand agricultural activities as inputs, this simple model can capture to what extend the latter are affected by a lockdown in the former, even if agricultural activities are considered essential and not subject to lockdown policies.
2. In each country, we match the economic sectors reported in household surveys to one sector of the input-output tables' classification. In general, there were more than one household survey sector for each input output table sector. In most countries the aggregation can be done in a straightforward manner, nonetheless, in a few cases we have to select manually the correspondence between the two categories.
3. For each sector in the input-output tables classification, we compute a direct shock per sector. To do this, we assume that changes in production are proportional to changes in employment and, therefore, we translate the intermediate demand shocks into job losses for each economic activity. We compute this direct shock as the share of workers that we classify as affected by the direct lockdown shock. Next, we compute the indirect shock as the sum of all the direct shocks, weighted by their respective Leontief multiplier. Thus, for the input-output sector $\hat{s}$ the indirect shock is defined as

$$indirect\ shock_{\hat{s}} = \sum_{s\neq\hat{s}} l_{\hat{s},s} \times direct\ shock_s,$$

   where $l_{\hat{s},s}$ is the Leontief multiplier for sectors $\hat{s}$ and s.
4. Once we have the direct and indirect effects from the lockdown, we compute the overall shock to sector u in household surveys as

[9] An implicit assumption in this model is that changes in demand do not change relative prices.

[10] Leontief multipliers account for linkages between sectors, as they capture the effects of the expansion of one activity on all others connected sectors via direct and indirect purchases. This model assumes that productive structures are linear and homogeneous, such that production is the based on a constant relationship between final product and productive factors.

$$overall\ shock_u = \min\{1, direct\ shock_u + indirect\ shock_{\hat{s}(u)}\},$$

where $\hat{s}(u)$ denotes the sector in the input-output tables to which the sector u belongs to. Thus, an overall shock equal to one means that workers in industry u are fully exposed to income shocks due to lockdown, while overall shocks less than one mean that workers in industry are partially exposed.

5. Finally, we assume that the crisis affects monetary income of person i depending on the economic sector where she or he performs her or his primary economic activity. A person whose primary activity is u, loses a fraction α of her monetary income with probability $overall\ shock_u$. Formally,

$$income\ post_i = overall\ shock_u \cdot \alpha \cdot income\ pre_i + (1 - overall\ shock_u) \cdot income\ pre_i,$$

note that, in absence of indirect shocks, her income after shock is equal to the one described in previous sections.

In what follows, we refer to direct or indirect shocks on income following the above definitions. It is worth noticing that given a level shock, for instance of 50%, the indirect effect may be less than 50%. This is interesting because, even when including indirect shocks, the effect on rural household may be stronger. The effects are thus potentially bigger for urban activities.

2.4 Income distribution, poverty and inequality measures

The final step in our methodology is to compute the resulting effect of the shocks on the per-capita distribution of income. This distribution is estimated using standard methods to calculate monthly current income at the level of a household, or the expenditure unit. We then divide this value among the members of this unit to obtain per-capita income.

The distribution of per-capita income allows us to estimate monetary poverty incidence, Gini coefficients and some heterogenous effects on particular populations. In this section we explain in detail each step and the methodological choices we made. According to the availability of some variables (or lack thereof) and the differences in their definitions within each survey we closely follow the general conceptualization of income sources adopted by the ECLAC for their estimations of poverty and inequality for Latin American and Caribbean countries (ECLAC 2019).

2.4.1 From current personal income sources to per-capita income

We first define personal and per-capita income. We classify the sources as follows:

We differentiate 5 income sources:

1. Primary Activity Monetary Income (PAMI): monetary earnings perceived by any employed individual from her main economic activity. This includes wages of salaried workers, and monetary returns to a productive activity for self-employed.
2. Primary Activity In-Kind Income (PAKI): any non-monetary remuneration declared by employed individuals, perceived as part of their remuneration for her primary economic activity.
3. Secondary Activity Income (SAI): monetary and in-kind earnings perceived by any employed individual from other productive activities but the primary economic activity.

4. Unemployed Income (UI): any form of income perceived by a non-active (unemployed) individual, other than transfers. This mainly refers to income sources related to temporal jobs or a source from a productive activity recently lost, earned by individuals currently reported as unemployed.
5. Other Income Sources (OIS): here we include any reported monetary or in-kind income perceived by any person, regardless of her occupational status. Under this category, if available, we differentiate between different types of earnings: government transfers, pensions and retirement benefits, remittances, capital yields, imputed rents, and other declared and non-classified amounts of income.

The main conceptual idea behind the above classification relies on the separation of primary and secondary sources of income. Our strategy requires to clearly identify the sources of income that can be lost because of the actual crisis. As already explained, at this stage of the analysis, we only consider direct income shocks and the loss of income suffered by employed members of the household. Furthermore, we do not consider the possible losses of secondary sources of income or the reduction in remittances, that could be an important source of income in many households in the region.

For the whole set of countries, but Colombia, we use the harmonized data bases provided by IDB. These datasets include estimations of current income and, in some cases, of per-capita income, as part of the harmonized variables. These variables were created for similar purposes (estimation of poverty incidence and income distribution). However, we could not rely on those estimates for two reasons. First, these variables do not allow us to separate between primary and secondary activity income sources as defined above. And second, because in some cases the official estimations of income distribution and poverty incidence contained imputed values the harmonized variables do not include.

For those reasons, we performed a detailed step by step reconstruction of the sources of current individual income following our classification and aiming at reproducing, as closely as possible, the distribution of official statistics from national statistics offices in each country. The first step consists in selecting the set of variables in each household survey necessary to estimate the individual current income. In Appendix F (in the companion Excel file) we report the names of the original variables we use as listed in each household survey.

In some countries, like Uruguay or Mexico, the original dataset contains some imputed income sources at the level of the household. In those cases, we divide those values by the number of members of the household and include the result as part of the OIS of every member of the household.

One important decision when estimating per-capita income is whether to include imputed rents for homeowners to make households who own their homes comparable with those who do not. The problem is that in an important number of surveys there is no information about the estimated rent or imputed value. We decided not to include those imputations and to show comparable levels of per-capita income. This may overestimate the incidence of monetary poverty. Therefore, focus should be on the variations of the percentage level of poverty incidence rather than on our reported values of poverty incidence. We discuss below the difference between our estimation with the official figures.

Once we obtain the current monthly personal income, we calculate the aggregate income of each household (expenditure unit) by adding up those values. We finally compute the per-capita income for every individual in the database through a simple division of the

household's aggregate income into the number of members of the household. For some countries however, notably Chile and Argentina, the official definition of per-capita income uses a different method to go from the level of aggregate income of the expenditure unit (household) to per capita income. In those cases, according to the age and gender composition of the household, the denominator used to estimate per-capita income varies across households with the same number of members. Following a more general methodology, and particularly ECLAC's, we keep the direct calculation method mentioned above to estimate the per-capita income distribution. Figure A 1 in Appendix A shows the Quantile-Quantile plots comparing our estimated variable of per-capita income with the official original one. We observe some differences, mainly in the lowest income deciles of the distribution. We shall come back to the discussion of those differences soon, when discussing other methodological choices, we made to estimate per-capita values. Nonetheless, the average values of the individual current monthly income are very close to the official values, as shown in the comparison of the Kernel distributions in Figure A 2 (Appendix A).

2.4.2 Poverty lines and poverty headcount ratio

With the estimated per-capita income, we can define the baseline values of the monetary poverty incidence and income distribution. To estimate the poverty headcount ratio, we use, where available, the official values of the poverty lines in local currencies by regional domain. Using the official documents published by each national statistical agency, we estimate the proportion of the population whose per-capita income is lower than the correspondent monetary poverty line measure. Appendix E lists the sources of those documents.

We make two important decisions concerning this headcount ratio of monetary poverty incidence. First, as mentioned above, we do not include any form of imputation of house rent. Second, we include zeros as part of the distribution. The latter can produce slight differences in the inequality measures. Nonetheless, our estimations are not significantly different from the official figures. Table 1 shows the comparison between the value of the Gini coefficient we calculate for each country, using our estimation of the per-capita income distribution, and the last official figure available.

Table 1: Comparison of official, ECLAC's and Estimated Baseline Gini coefficient

Gini coefficient		
	Last available official level	**Baseline estimation**
Brazil	0,52	0,54
Honduras	0,53	0,54
Colombia	0,52	0,53
Paraguay	0,49	0,51
Mexico	0,47	0,47
Argentina*	0,44	0,44
Chile	0,5	0,44
Peru	0,35	0,44
Ecuador	0,47	0,43
Uruguay	0,38	0,39
*The database used for Argentina is urban. Source: own elaboration based on official data.		

Table 3 compares our estimation of the poverty headcount ratio with the last official level (when available), and the ECLAC's estimations. This table shows our estimations of the baseline keep the between-countries order of magnitudes. In terms of the poverty measures, the differences between the official figures and our calculations are very small. Nonetheless, there are two countries where our estimation differs considerably from the official source or the ECLAC's estimation: Argentina and Paraguay. The difference for Argentina is related with the use of the above-mentioned method of equivalent ponderation to distribute the aggregate household income among the members of the household. When using that method, we obtain the exact value of the official figures. Concerning Paraguay, the main difference is related with the imputation of house rents as part of the household income. These amounts are particularly important for the group of households with a level of per-capita income slightly above the poverty line.

Table 2: Comparison of official, ECLAC's and Estimated Baseline poverty rates

National headcount ratio of monetary poverty (%)			
	Last available official level	ECLAC (2019)	Baseline estimation
Honduras	48,3	54,8	56,0
Argentina*	35,5	26,7	46,1
Mexico	48,8	41,9	42,9
Paraguay	26,4	19,4	34,4
Colombia	27,0	29,0	32,8
Brazil	26,5	19,2	23,1
Ecuador	25,0	25,7	22,7
Uruguay	8,8	2,9	19,5
Peru	20,5	16,5	17,4
Chile	8,6	9,8	11,0

*The database used for Argentina is urban.
Source: own elaboration based on official data and ECLAC (2020)

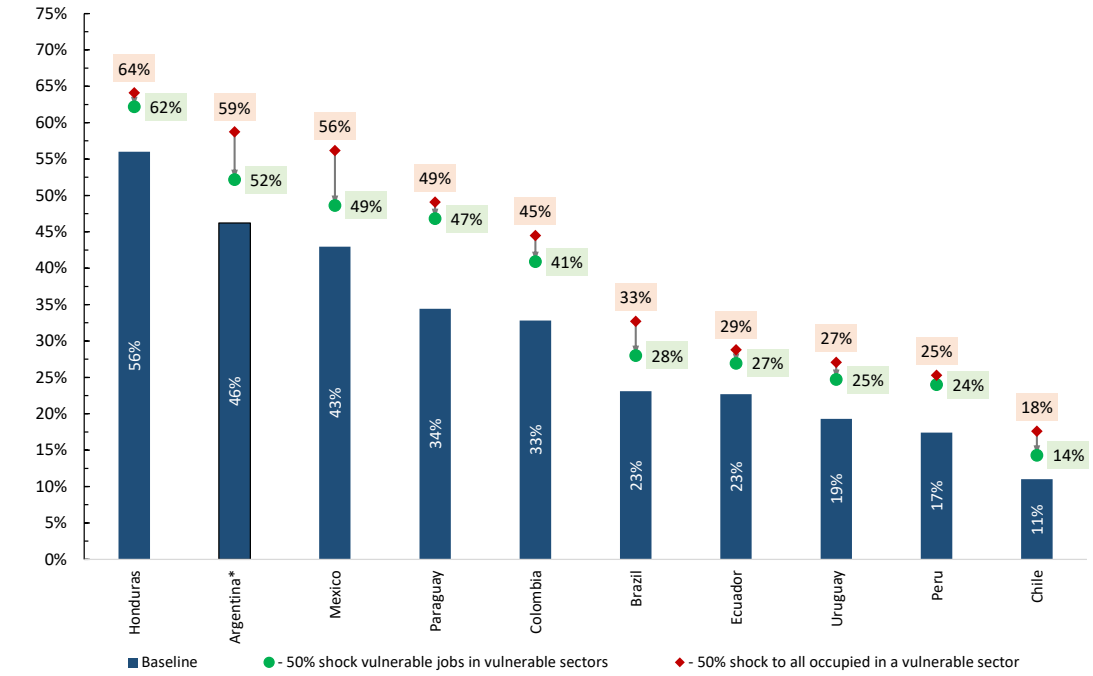
3 Results

In this section, we present the main results for the scenarios with direct shocks for 10 selected Latin American and Caribbean economies and indirect shocks for a sub-sample of 6 countries. In this section we discuss separately direct and indirect shock scenarios.

3.1 Direct effects of income losses on poverty incidence and inequality

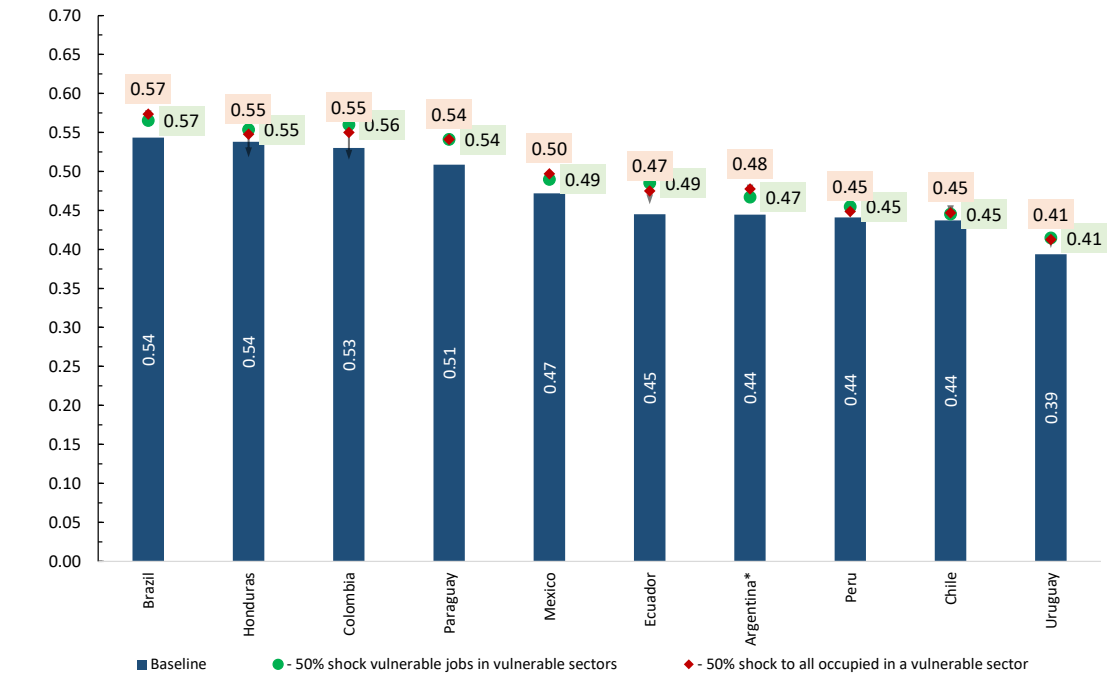
Figures 1 and 2 present the main results of our simulation under the assumptions and choices discussed above. They present the estimated poverty headcount ratio (Figure 1) and Gini coefficient (Figure 2) for the baseline scenario (solid bars) and our simulation results of shocking 50% of labor income in non-essential sectors for the most vulnerable workers (first scenario, marked by circles) and all workers in the same sectors (second scenario, diamonds). Thus, for each country, the distance between the height of the bar and each of the points is the effect of the shock on poverty or inequality, and the distance between the points shows the difference between scenarios. Tables 4 and 5 also present the detailed results from simulation scenarios in which we assume income losses ranging from 25% to 100% of labor income.

Figure 1: Simulated effects of a 50% direct income shock to workers in sectors affected by lockdowns on poverty headcount ratio (% of population)



*The database used for Argentina is urban.
Source: own elaboration based on official data.

Figure 2: Simulated effects of a 50% direct income shock to workers in sectors affected by lockdowns on income inequality – Gini coefficient



*The database used for Argentina is urban.
Source: own elaboration based on official data.

Table 4: Simulated effects of direct income shocks to workers in sectors affected by lockdowns on monetary poverty

Monetary poverty headcount ratio (% of population)									
Country	Baseline	Direct Income losses to vulnerable workers in vulnerable sectors (% of total labor income)				Direct Income losses to all workers in vulnerable sectors (% of total labor income)			
		25%	50%	75%	100%	25%	50%	75%	100%
Argentina*	46.2	50.0	52.2	54.1	55.5	52.9	58.7	63.6	67.4
Brazil	23.1	25.3	28.0	31.5	34.4	27.0	32.7	41.3	48.5
Chile	11.0	12.4	14.3	16.8	20.0	13.5	17.6	24.5	33.5
Colombia	32.8	36.7	40.9	45.6	48.4	38.0	44.5	51.9	57.8
Ecuador	22.7	22.4	26.9	31.7	37.0	23.1	28.8	36.9	46.4
Honduras	56.0	59.1	62.2	64.8	67.1	59.9	64.1	68.5	71.4
Mexico	43.0	45.9	48.6	51.0	53.0	49.4	56.2	62.1	66.7
Paraguay	34.4	40.3	46.8	53.9	59.1	40.9	49.1	58.5	65.0
Peru	17.4	19.8	24.0	29.4	35.2	20.1	25.3	32.6	41.1
Uruguay	19.3	21.6	24.7	28.3	31.4	22.4	27.1	33.3	39.2
*The database used for Argentina (EPH) is urban.									
Source: own elaboration based on official data.									

Table 5: Simulated effects of direct income shocks to workers in sectors affected by lockdowns on income inequality

Income inequality - Gini coefficient									
Country	Baseline	Direct Income shocks to vulnerable workers in vulnerable sectors (% of total labor income)				Direct Income shocks to all workers in vulnerable sectors (% of total labor income)			
		25%	50%	75%	100%	25%	50%	75%	100%
Argentina*	0.44	0.45	0.47	0.49	0.52	0.45	0.48	0.52	0.60
Brazil	0.54	0.55	0.57	0.58	0.61	0.55	0.57	0.61	0.68
Chile	0.44	0.44	0.45	0.45	0.47	0.44	0.45	0.47	0.51
Colombia	0.53	0.54	0.56	0.58	0.62	0.54	0.55	0.58	0.66
Ecuador	0.45	0.47	0.49	0.51	0.54	0.46	0.47	0.50	0.56
Honduras	0.54	0.54	0.55	0.57	0.60	0.54	0.55	0.57	0.61
Mexico	0.47	0.48	0.49	0.51	0.53	0.48	0.50	0.53	0.58
Paraguay	0.51	0.52	0.54	0.58	0.64	0.52	0.54	0.58	0.67
Peru	0.44	0.45	0.45	0.47	0.50	0.44	0.45	0.47	0.50
Uruguay	0.39	0.40	0.41	0.43	0.46	0.40	0.41	0.44	0.48

*The database used for Argentina (EPH) is urban.

Source: own elaboration based on official data.

Our results show a looming risk of losing the recent gains in reducing poverty and inequality in the region. Despite the visible differences in poverty rates between countries, an income shock of 50% to individuals in non-essential sectors makes households in the region prone to poverty. Comparing poverty in the baseline with that in the scenario where we shock labor income of all workers in non-essential sectors, all countries exhibit a large increase in poverty rates. On average, under the scenario affecting all non-essential workers, an additional 9.8% of total population would not have enough resources to cover their basic expenses, and the headcount poverty ratio would increase from 30.6% in the baseline to 40.4%. The effect is heterogeneous, showing the larger effects on countries with higher poverty rates. Except for Honduras, all countries with higher poverty headcount ratios (Argentina, Mexico, Paraguay, Colombia, and Brazil) exhibit changes in poverty rates above 10 p.p. each (up to an alarming 15p.p. in Paraguay), highlighting the devastating effect that Latin American economies may face due to the pandemic. Nonetheless, even Uruguay and Chile (the countries with the lowest poverty headcount ratios), face a potential increase in poverty between 7 and 8 p.p. As the figures in Appendix B show, the countries with the highest increases in poverty have a large fraction of population located just above the threshold of the poverty line, which makes population highly vulnerable to fall into poverty.

The results shown in Figure 3 also highlight the importance of the countries' labor market characteristics on determining their vulnerability to the Covid-19 crisis. By our definition of vulnerability, a country's exposure to income shocks is lower if employment is concentrated in large firms or if most of their workers have employment protection, because they have permanent job contracts and work in the formal sector. When we bring these features into the analysis, headcount poverty ratios increase 6.2 p.p. on average, from 30.6% to 36.8%. The countries where refining the definition of vulnerability generates the largest

differences in the simulated poverty headcount ratios are Argentina (6.6 p.p.), Mexico (7.6 p.p.), Brazil (5.2 p.p.), and Chile (3.7 p.p.).

The effects of the simulated shocks on income inequality measured by the Gini coefficient are presented in Figure 5. Our simulations show an increase in income inequality due to the Covid-19 crisis in all countries. In the scenario where all non-essential workers face the income shock, the simulated income shock increases Gini coefficients by 0.025 on average, from 0.473 to 0.498. The largest effects on income inequality are reported in Argentina and Brazil (0.03 each), while the smaller effects are found in Honduras, Chile and Peru (0.01 each).

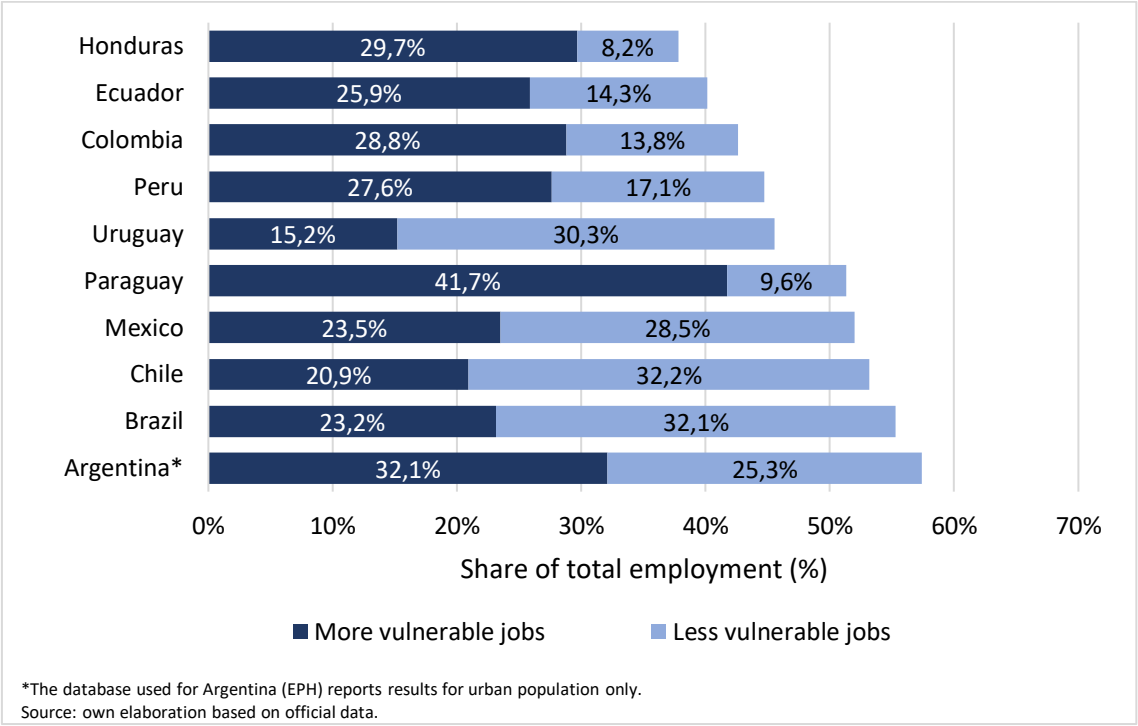
Figure 5 also compares the results obtained in income inequality between our two simulation scenarios. Since income inequality measured by the Gini coefficient takes into account the whole income distribution, income shocks that affect disproportionately a group of the population will have a larger impact on the Gini than income shocks affecting all the population. Since vulnerable workers are workers with low job protection and this characteristic is correlated with lower income levels, there is no great difference between the scenario with an income shock for the most vulnerable and that in which we shock all non-essential workers. Even in some countries like Peru and Ecuador, income inequality is larger in the scenario in which only the vulnerable are affected.

For a better understanding of the differences in vulnerability by scenarios, Figure 3 shows the share of non-essential workers depending on their level of vulnerability. The total height of each bar corresponds to the share of workers in non-essential sectors by country. Within each bar, we classify workers according to whether they are more or less vulnerable, following our definitions from Table 1. The graph highlights the differences in exposure to income losses by country, which clearly determine our results. On the one hand, there are countries like Honduras and Ecuador that have an overall low exposure to shocks because they have a high incidence of rurality and production in non-essential sectors. In contrast, countries like Brazil and Argentina have a higher incidence of employment in non-essential sectors, because they have a higher intensity in services and manufacturing. On the other hand, countries with a higher concentration in non-essential sectors also tend to have higher shares of employment in large firms, with permanent contracts and less informal employment, offsetting most of the exposure due to higher exposure. On average, 48% of workers in the selected countries work in non-essential sectors, and 27% of workers in these economies are considered as more vulnerable.

The previous results highlight the importance of the economic structure in determining the overall effect of the Covid-19 crisis on monetary poverty and income inequality. Nonetheless, lockdown policies had a disproportionately high effect on non-essential sectors, which typically exclude agriculture. As a result, the aggregate direct effect of the crisis on rural areas tends to be lower than that of urban areas.

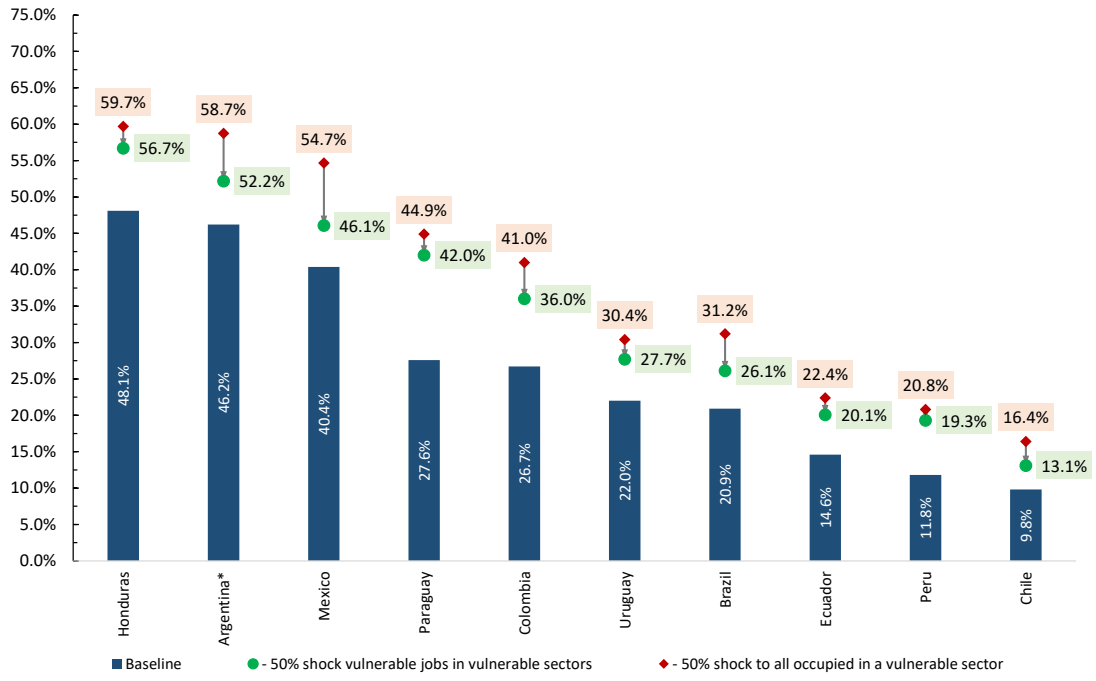
Figures 4 and 5 shows the poverty headcount rates obtained when we difference rural and urban areas considering only direct shocks. As expected, the average change in poverty rates for the selected sample is larger for urban areas, increasing 11.1 p.p. from 26.8% to 37.9%, while the change for rural areas is about 6 p.p., from 38% to 44%. When comparing both simulation scenarios, the main differences arise in urban areas, since most of the employment in rural areas exhibit lower levels of job protection.

Figure 3: Share of non-essential workers by job vulnerability



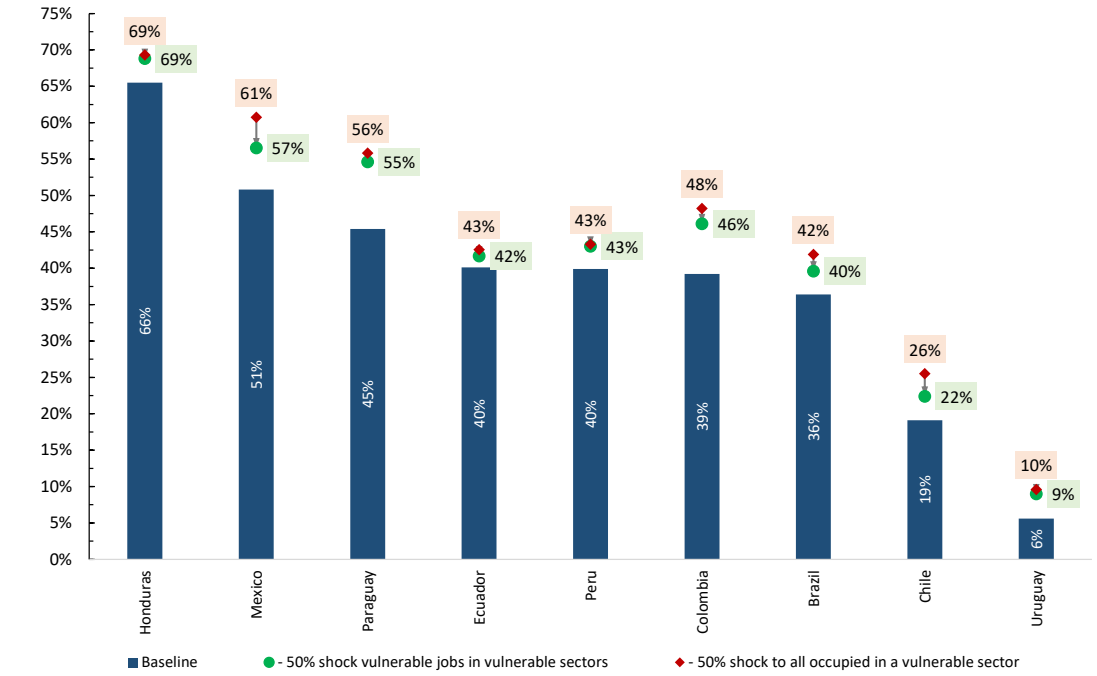
*The database used for Argentina (EPH) reports results for urban population only.
Source: own elaboration based on official data.

Figure 4: Simulated effects of a 50% income shock to workers in sectors affected by lockdowns on poverty headcount ratio for urban areas (% of population)



*The database used for Argentina is urban.
Source: own elaboration based on official data.

Figure 5: Simulated effects of a 50% income shock to workers in sectors affected by lockdowns on poverty headcount ratio for rural areas (% of population)



Source: own elaboration based on official data.

3.2 Who are the more vulnerable to lockdown shocks?

The definition of vulnerability used throughout the paper are based on the worker's job characteristics. The economic sector, firm size and job stability are the dimensions used to identify more vulnerable workers given a lockdown. Because these characteristics are correlated with certain demographic characteristics, the overall effects of income losses do not spread uniformly over the population.

Table 6 presents the demographic characteristics of households comparing their status before and after the simulated (direct) shock presented earlier for Chile and Honduras. As discussed above, these two countries have important differences in their economic structures and labor market characteristics. We use this comparison as an example of the general conclusions of this analysis. The results for the rest of the countries are presented in the Appendix C.

To classify households, we divide the sample in three groups, depending on whether they were above or below the poverty line before and after the shock: households that before and after the shock have income below the poverty line, households that transit to poverty because of the shock (i.e., they were above the poverty line before the shock and below it after the shock), and households with income above the poverty line before and after the shock.

Even though the general characteristics of the sectors affected by COVID-19 vary per country, there are common characteristics in the households by income and those who transit to poverty because of the shock across countries. Consistent with the fact that most of non-essential employment is concentrated in urban areas, 80% of the people who transit to poverty lives in an urban area. Households that transit to poverty due to the shock tend to have heads of households slightly younger than the other groups, with a medium level of education. Although households transiting to poverty tend to have a larger size than the households that stay above the poverty line after the shock, they tend to have a lower number of members older than 65 and younger than 14 per adult, as indicated by a lower dependency ratio. With slight differences, those patterns hold for all countries in the sample, as presented in Appendix C.

Table 6: Characteristics of the households by vulnerability to shocks

after 50% income shock to workers in sectors affected by lockdowns on poverty headcount ratio

	Below poverty line before shock/ below poverty line after shock	Above poverty line before shock/ below poverty line after shock	Above poverty line before shock/ Above poverty line after shock
	Chile		
Median Income per capita (LCU)	122,315.0	196,867.0	372,185.0
Share of women (% within category)	56%	52%	53%
Share of urban population (% within category)	70%	83%	83%
Average age of the head (years)	48.81	44.85	54.38
Average years of education of the head	8.81	10.20	10.44
Average household size (persons)	3.52	3.79	2.92
Average household dependency ratio	0.38	0.29	0.35
	Honduras		
Median Income per capita (LCU)	928.0	3,121.0	4,375.0
Share of women (% within category)	51%	50%	51%
Share of urban population (% within category)	44%	80%	61%
Average age of the head (years)	48.82	47.23	50.90
Average years of education of the head	4.55	6.48	7.34
Average household size (persons)	4.47	4.38	3.52
Average household dependency ratio	0.42	0.29	0.32

3.3 Direct and indirect effects of income losses on poverty incidence and inequality

Along with the results presented in the previous section, we also run simulations in which we allow for potential indirect effects in sectors that were not affected by lockdown policies. As we describe in the methodology section, we measure the indirect effects affecting a sector by assuming that employment shocks are proportional to the relative importance of other sectors in the economy, as indicated by their input-output linkages. Due to data availability, we restrict our analysis to six countries which have recent data from input-output tables: Brazil (2015),

Chile (2017), Colombia (2015), Ecuador (2018), Mexico (2013) and Peru (2015). A description of the data sources of the input output tables is presented in Appendix E. Each input-output table has a different level of aggregation, ranging from 20 economic sectors in Mexico to 111 in Chile.

3.3.1 Linkages between sectors and the indirect shock

Appendix D shows a graphical representation of the input-output tables for the six selected countries. We aggregate each input-output variable to large sections (using ISIC rev 4 labeling) to gain comparability across countries. Each of the nodes in the graph stands for a section, in which darker nodes represents sections with a higher level of exposure to lockdowns. To show the relative importance of each sector is measured from the fraction of gross output sell as intermediate sales to other sectors, showing only the largest economic relationship.

The goal of this graphical representation is to show to what extent a confined sector (darker node) can transfer the shock, via a fall in its intermediate demand, to a non-vulnerable sector. For instance, the manufacturing sector is highly vulnerable in every country, while the agricultural sector was considered an essential sector. The former receives a direct shock effect from lockdown policies and transfers a part of the shock to the later. This occurs via a loss of the demand for agricultural products as inputs in the production of manufacturing goods.

The differences in the productive structures of the countries led to an interesting result of the inclusion of indirect shocks. As the incidence of poverty among rural households is higher, their vulnerability to income shocks can also be higher as an important part of them belong to the vulnerability to poverty segment of the income distribution. This makes a difference in the final results between countries. Those countries with a more urban leaning structure of production, as Chile, are less exposed to this increase in poverty due to the "contagion" effect of the indirect shocks in agriculture.

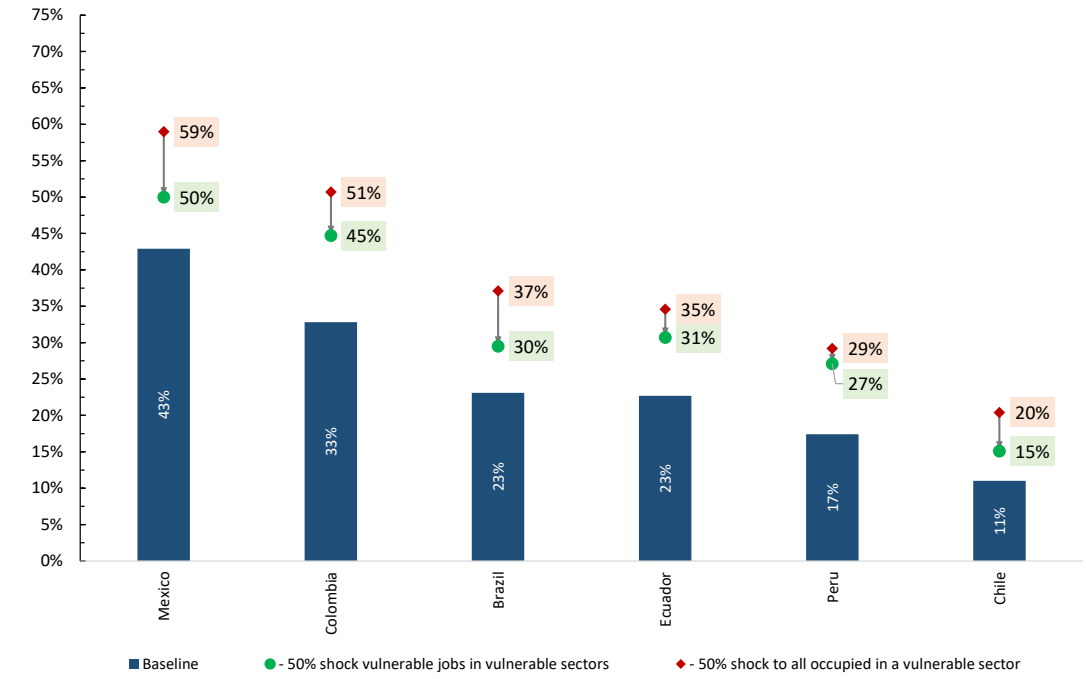
3.3.2 Results on poverty and inequality including indirect shocks

Figures 6 and 7 present the simulated effects on poverty incidence and economic inequality accounting for indirect effects. As expected, accounting for indirect effects raises vulnerability to poverty due to a higher fraction of workers exposed to economic shocks. The average poverty headcount ratio for the selected countries increases from 25% to 33% in the scenario affecting only vulnerable workers in affected sectors, and to 39% when the shock affects workers based only in their economic sector. The smaller simulated effects are observed in Chile where the increase in the poverty headcount ratio ranges between 4 to 9 percentage points (p.p.), while the largest effects are reported in Colombia, where the increase ranges between 12 p.p. to an astonishing 18 p.p. Comparing our results with the previous scenario in which we only affected workers in sectors subject to lockdowns, about 30% of the changes in poverty are explained by the changes associated with indirect shocks.

In contrast to the effects on poverty, the results of the effects of the COVID-19 crisis on income inequality are not straightforward. Accounting for indirect shocks causes that the negative income shock extends over a larger fraction of the population. As a result, even though there is a reduction in monetary income, the post-shock distribution can be more egalitarian than the pre-shock distribution. This is certainly the case obtained in Chile, where income inequality measured by the Gini coefficient slightly reduces compared with the baseline (0.44 to 0.43). Overall changes in inequality are rather moderated in this scenario.

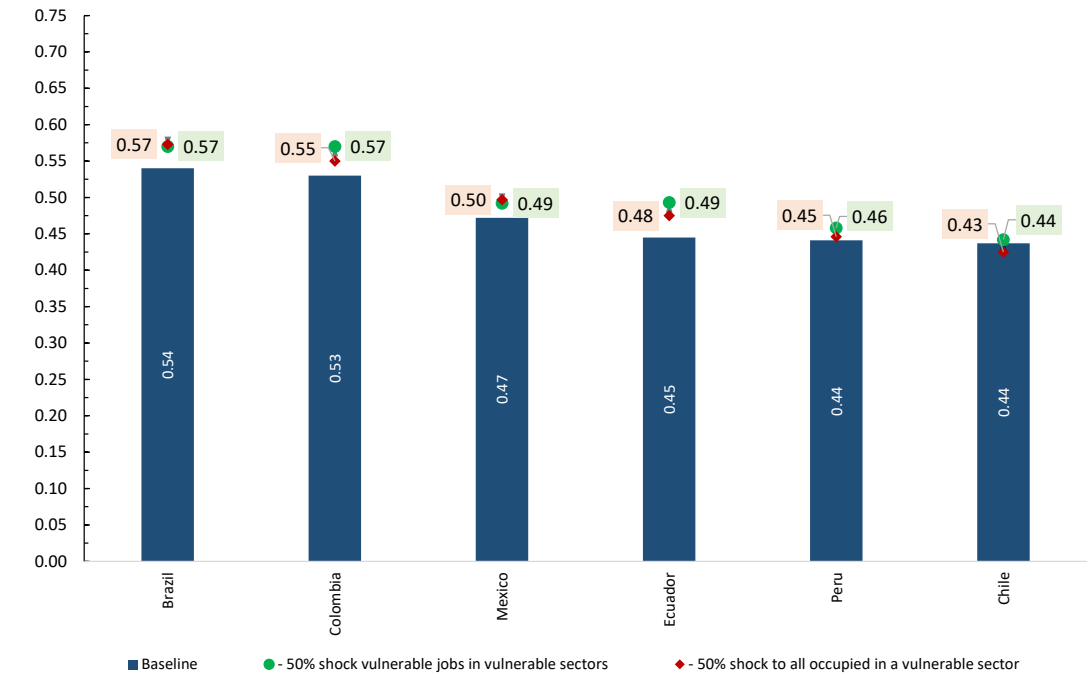
Given our simulated shocks, the average Gini coefficient for the selected countries increases from 0.48 to about 0.50.

Figure 6: Simulated effects of a 50% income shock (including indirect effects) to workers affected by lockdowns on poverty headcount ratio (% of population)



.Source: own elaboration based on official data.

Figure 7: Simulated effects of a 50% income shock (including indirect effects) to workers affected by lockdowns on income inequality – Gini coefficient



.Source: own elaboration based on official data.

As mentioned above, the important differences in the results of indirect shocks are related with the economic structure of the countries. Chile makes part of those countries where an important part of the employment was already affected by the direct shocks, while in Colombia, the indirect shocks touch an important part of other activities with higher vulnerable workers, as agriculture in the rural areas. It is also important to notice that Brazil, Colombia, Ecuador, Mexico and Peru, have a bigger vulnerable to poverty share of the population, compare to Chile. Contrary to the later, the propagation of the shocks, even if small for some activities, can increase the poverty headcount very fast in the former set of countries.

The results on inequality show also differences between Chile and the other 5 countries. In particular, the distributive effects in Chile, when considering the propagation of shocks, show practically no effect, or even a slight reduction of the Gini coefficient in the upper bound scenario. This is possibly related with the effects on higher-middle class groups whose primary economic activities are performed in sectors as services to firms, finance and other service sectors which can be active amid lockdown policies because they are tele-workable but affected by the indirect shocks.

4 Final remarks

The economic difficulties that the Covid-19 crisis has brought to Latin American countries are already visible. But the multiple dimensions of this crisis require a careful analysis of the productive structures and the labor markets specificities. In this work we seek to contribute to a better understanding of the mechanisms behind the effects on poverty and inequality,

through a combination of analysis of microdata and characteristics and productive structures and sectorial interlinkages.

Our analysis shows the vulnerabilities to the Covid-19 crisis are more important in countries where informality, small average size of firms, and rural employment are salient. Even if the initial effects of the lockdown can produce a generalized increase in poverty in the whole region, countries with structural vulnerabilities maybe more exposed to the propagation of the effects of the initial shock.

The likelihood of the scenarios presented in this work depends on the extend of the destruction of formal labor sources and. Our analysis does not provide an evaluation of the dynamic aspects of the recovery process. Nonetheless, it can be a departure point to assess these dynamic aspects. The main goal of this work was to provide a general framework and methodology, which can be adapted to alternative scenarios and hypothesis about vulnerabilities and the dimension of the shocks.

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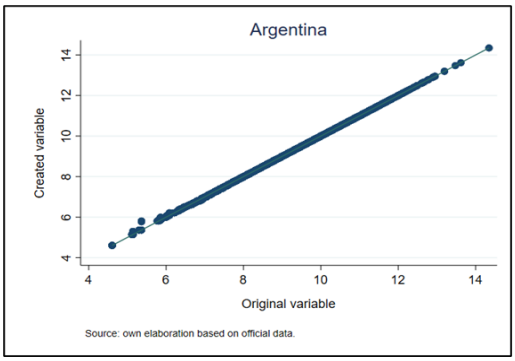
Appendices

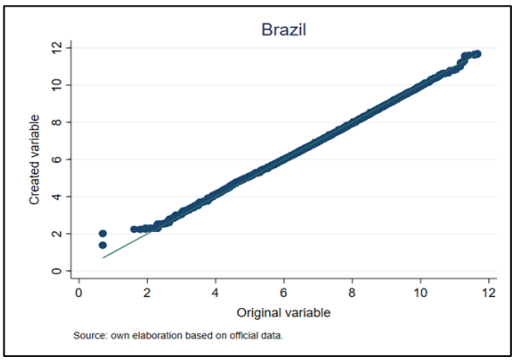
Appendix A

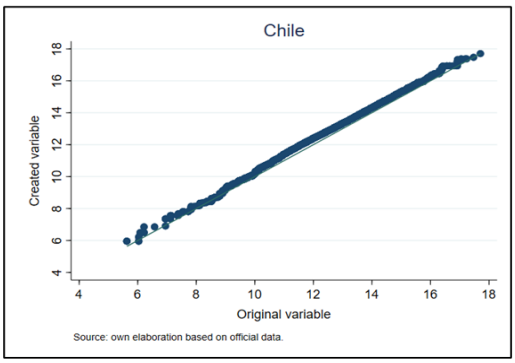
Table A 1: Sources of microdata - Household surveys

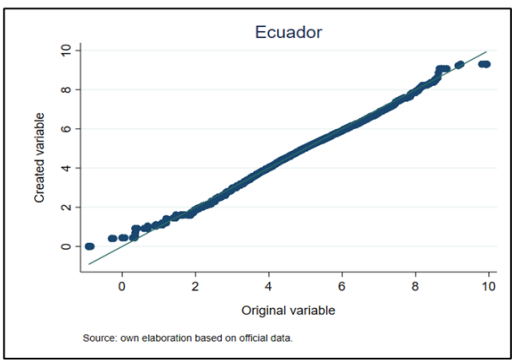
Country	Survey	Date
Argentina	Encuesta Permanente de Hogares	2019 (Q3-Q4)
Brasil	Pesquisa Nacional por Amostra de Domicílios Contínua	2019
Chile	Encuesta de Caracterización Socioeconómica Nacional	2017
Colombia	Gran Encuesta Integrada de Hogares	2019
Ecuador	Encuesta Nacional de Empleo, Desempleo y Subempleo	2018 (Q4)
Honduras	Encuesta Permanente de Hogares de Propósitos Múltiples	2018
Mexico	Encuesta Nacional de Ingresos y Gastos de los Hogares	2018
Paraguay	Encuesta Permanente de Hogares	2017
Perú	Encuesta Nacional de Hogares	2018
Uruguay	Encuesta Continua de Hogares	2019

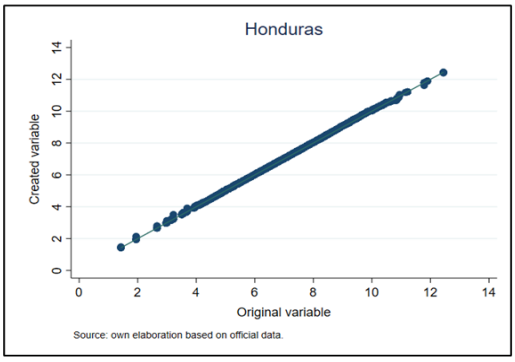
Figure A 1: Q-Q Plot Logarithm transformation of per-capita income - original vs. estimated

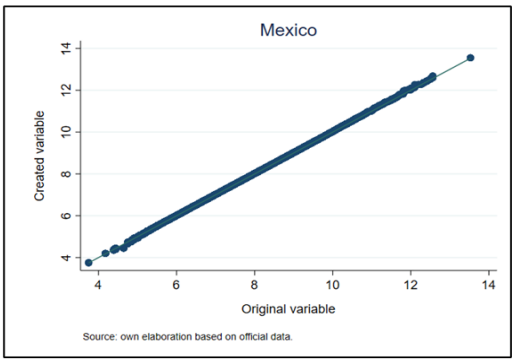


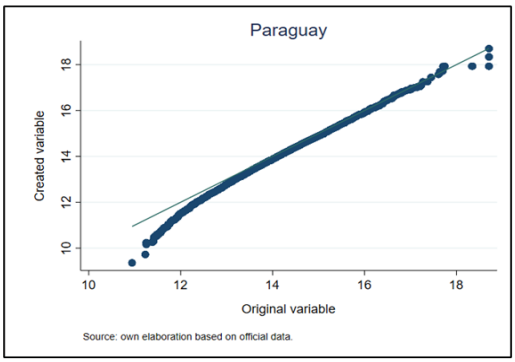


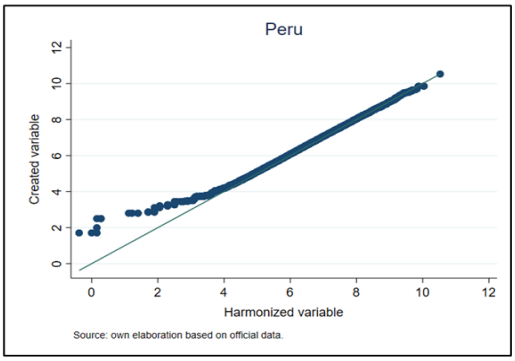












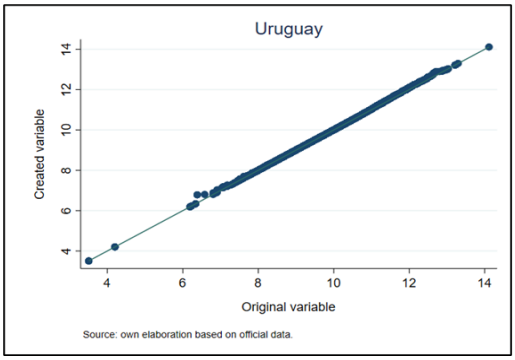


Figure A 2: Comparison of the Kernel distributions of the logarithm of per-capita Income Official vs. Estimated

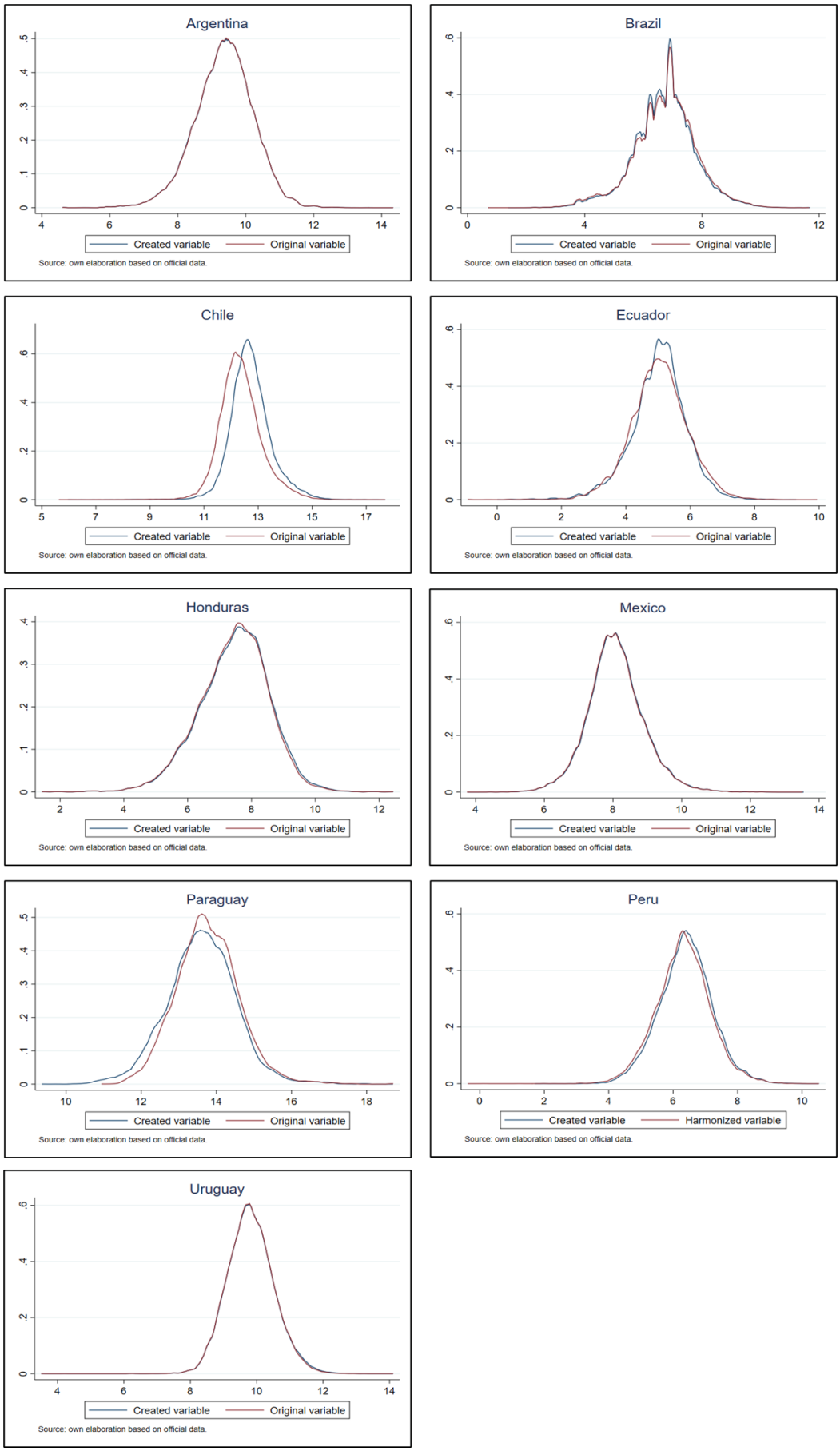
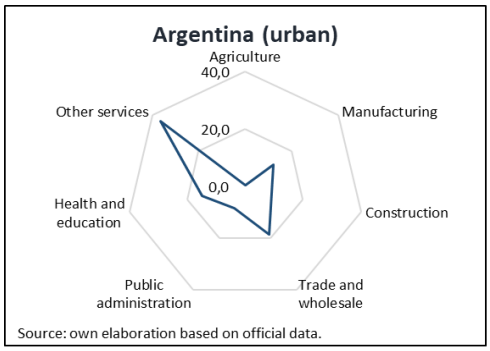
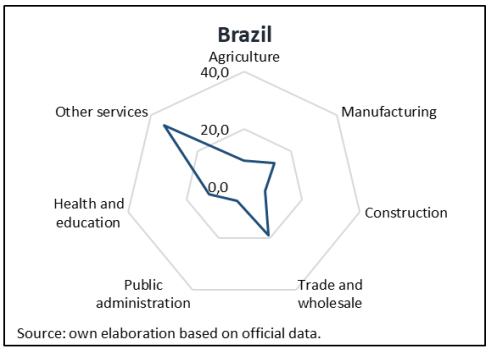
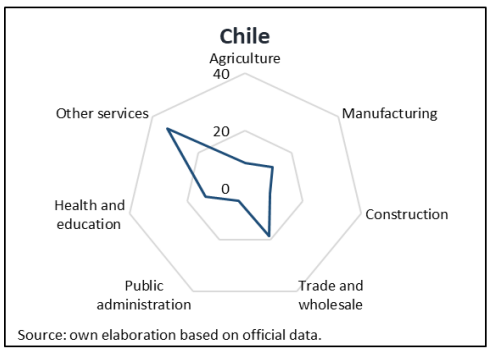
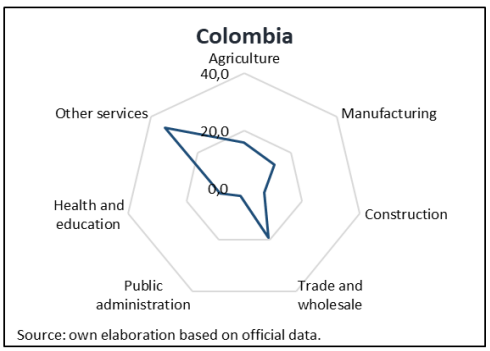


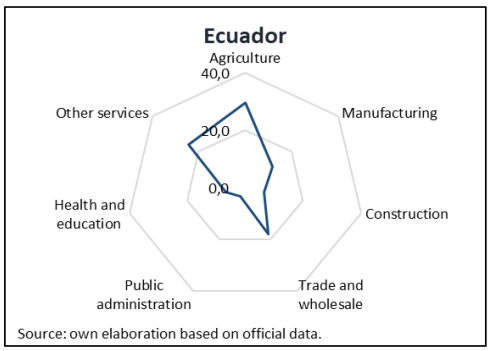
Figure A 3: Distribution of the labor force by economic activity

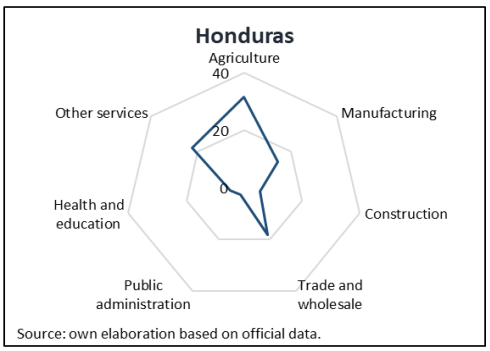


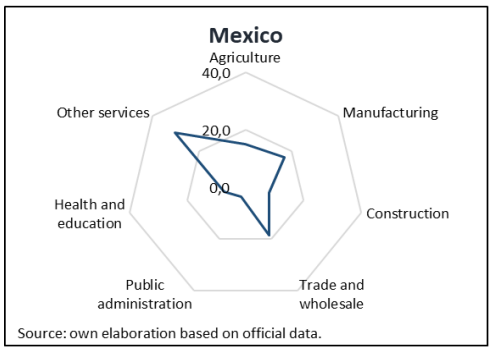


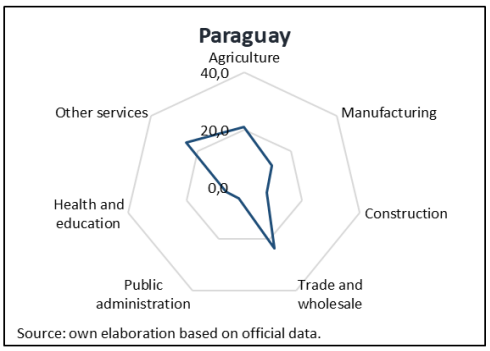


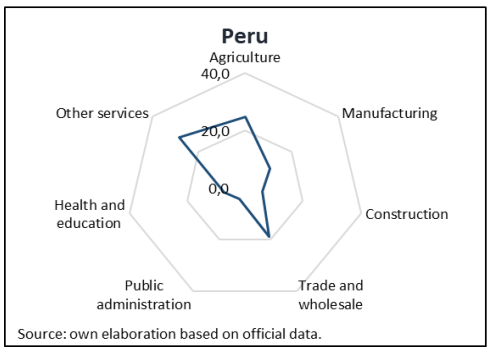


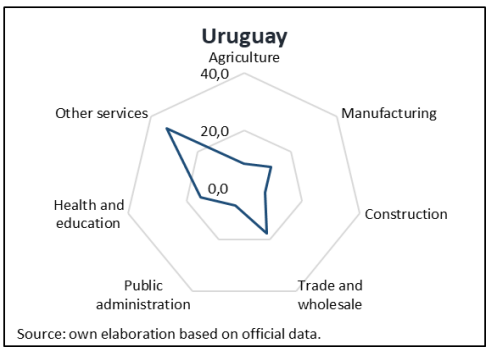










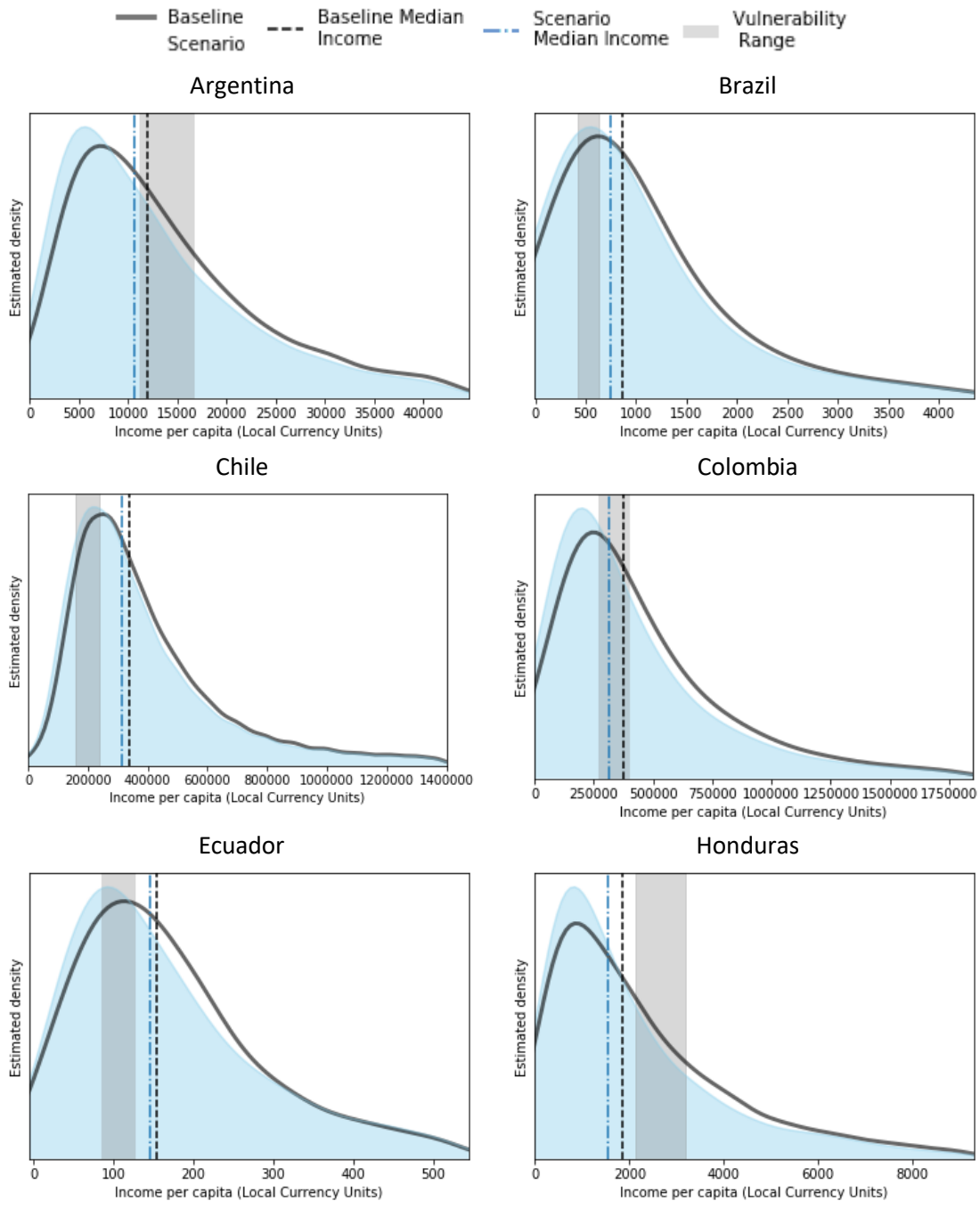


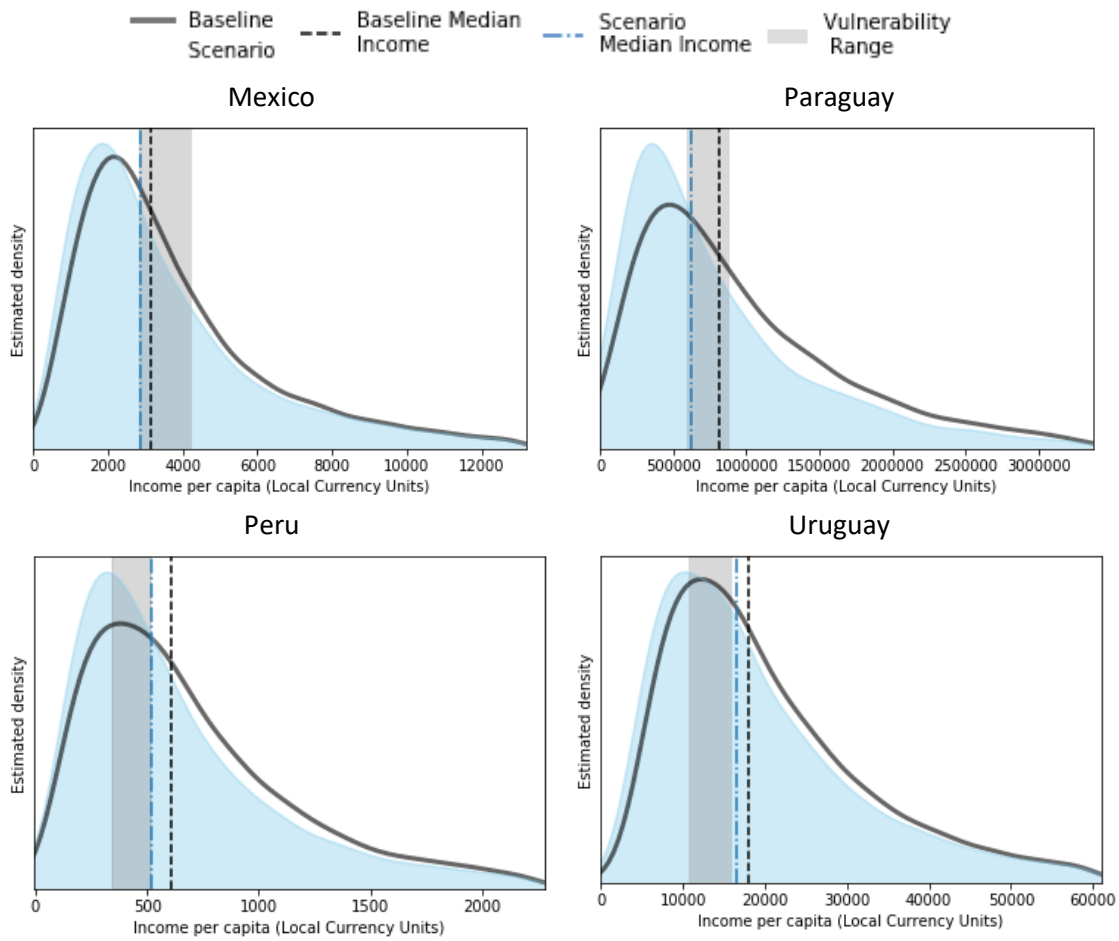
Appendix B: Effects on income distribution in lower bound scenario.

The following figures show the changes in the distribution of income per-capita as a consequence of the shock in our lower bound scenario. Namely, a reduction of 50% in the primary activity income for workers in a vulnerable sector and a vulnerable job. The horizontal axis measures per-capita income in local currency, and the vertical axis measures the frequency of the total population.

The continuous dark gray line represents the distribution of per-capita income estimated for the baseline. The blue area depicts the resulting distribution after the shock. The black dashed vertical line shows the level of the median per-capita income before the shock. The blue dashed-dotted vertical line shows the level of the median per-capita income after the shock. The gray shadowed area shows the vulnerability zone: between the average level of the monetary poverty line and 1.5 times this value.

Simulated effects of a 50% income shock to workers in sectors affected by lockdowns on per capita income distribution




Baseline Scenario
Baseline Median Income
Scenario Median Income
Vulnerability Range
Mexico
Paraguay
Peru
Uruguay
Estimated density
Income per capita (Local Currency Units)
0
2000
4000
6000
8000
10000
12000
500000
1000000
1500000
2000000
2500000
3000000
500
1000
1500
2000
10000
20000
30000
40000
50000
60000

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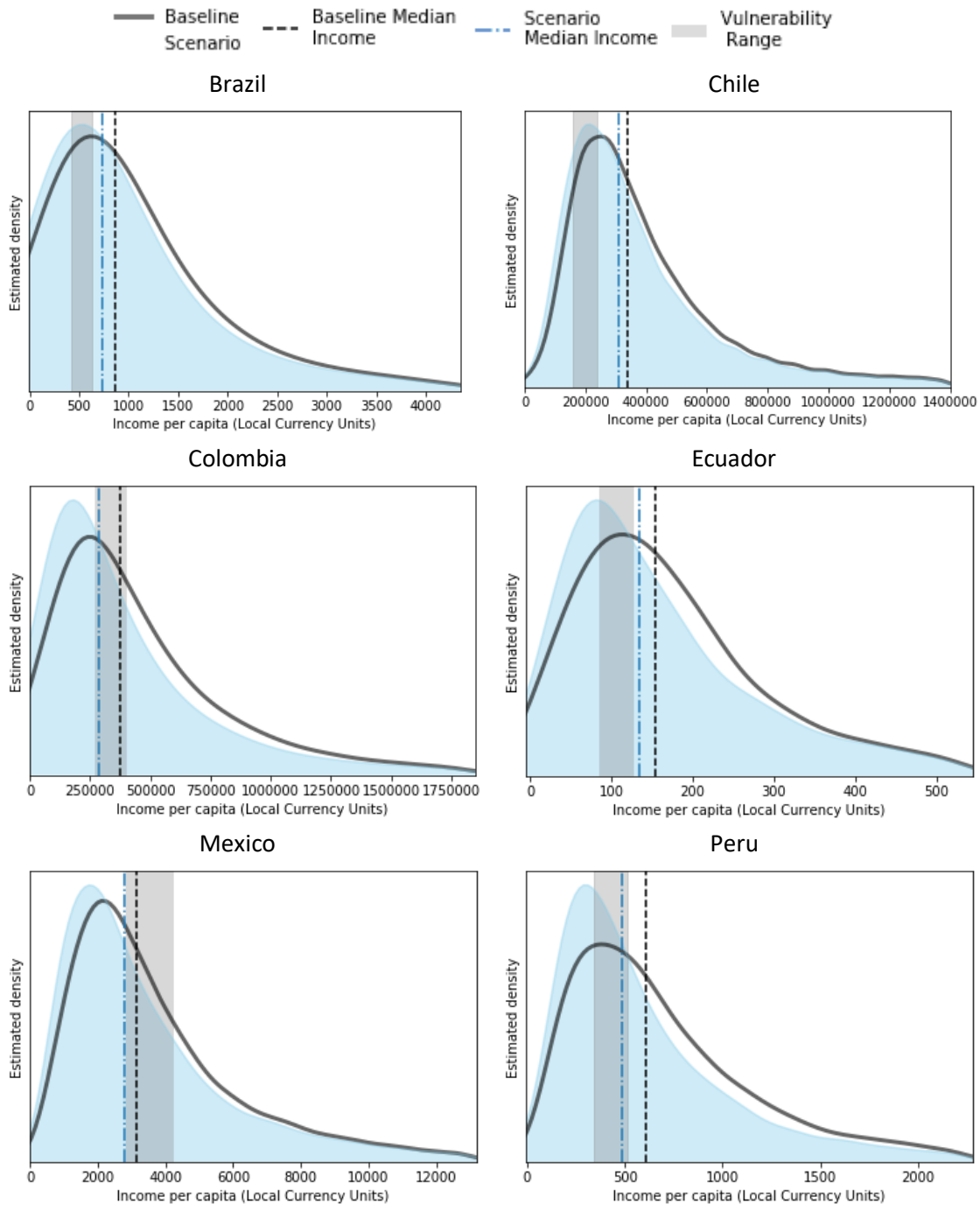
Simulated effects of a 50% income shock to workers in sectors affected by lockdowns on per capita income distribution, accounting for indirect shocks



Appendix C: Characterization of demographics and educational level of vulnerable and less vulnerable households.

Table A2: Characteristics of the households by vulnerability to shocks after 50% income shock to workers in sectors affected by lockdowns on poverty headcount ratio

	Below poverty line before shock/ below poverty line after shock	Above poverty line before shock/ below poverty line after shock	Above poverty line before shock/ Above poverty line after shock
Argentina			
Median monthly Income per capita (LCU)	6 250	13 350	21 000
Share of women (% within category)	52%	50%	52%
Share of urban population (% within category)	100%	100%	100%
Average age of the head (years)	47,03	46,46	55,30
Average years of education of the head	9,65	11,21	12,22
Average household size (persons)	3,87	3,28	2,58
Average household dependency ratio	0,36	0,22	0,38
Brasil			
Median monthly Income per capita (LCU)	223,6	544,3	1 090
Share of women (% within category)	52%	52%	51%
Share of urban population (% within category)	63%	85%	75%
Average age of the head (years)	25,96	28,53	39,97
Average years of education of the head	7,13	8,83	9,99
Average household size (persons)	3,72	3,41	2,66
Average household dependency ratio	0,32	0,24	0,30
Chile			
Median monthly Income per capita (LCU)	122 315	196 867	372 185
Share of women (% within category)	56%	52%	53%
Share of urban population (% within category)	70%	83%	83%
Average age of the head (years)	48,81	44,85	54,38
Average years of education of the head	8,81	10,20	10,44
Average household size (persons)	3,52	3,79	2,92
Average household dependency ratio	0,38	0,29	0,35

	Below poverty line before shock/ below poverty line after shock	Above poverty line before shock/ below poverty line after shock	Above poverty line before shock/ Above poverty line after shock
Colombia			
Median monthly Income per capita (LCU)	170 000	365 972	666 667
Share of women (% within category)	54%	52%	52%
Share of urban population (% within category)	77%	87%	80%
Average age of the head (years)	48,02	44,94	49,26
Average years of education of the head	6,92	8,41	9,36
Average household size (persons)	3,87	3,79	2,93
Average household dependency ratio	0,42	0,30	0,28
Ecuador			
Median monthly Income per capita (LCU)	50,6	107,8	213,3
Share of women (% within category)	51%	51%	50%
Share of urban population (% within category)	38%	71%	69%
Average age of the head (years)	53,89	47,65	50,21
Average years of education of the head	5,92	7,20	9,10
Average household size (persons)	4,03	4,29	3,54
Average household dependency ratio	0,50	0,39	0,33
Honduras			
Median monthly Income per capita (LCU)	928	3 121	4 375
Share of women (% within category)	51%	50%	51%
Share of urban population (% within category)	44%	80%	61%
Average age of the head (years)	48,82	47,23	50,90
Average years of education of the head	4,55	6,48	7,34
Average household size (persons)	4,47	4,38	3,52
Average household dependency ratio	0,42	0,29	0,32
Mexico			
Median monthly Income per capita (LCU)	1 719	3.355	5.200,9
Share of women (% within category)	52%	50%	51%
Share of urban population (% within category)	59%	65%	60%
Average age of the head (years)	47,76	46,58	51,95
Average years of education of the head	6,89	8,47	10,13
Average household size (persons)	4,40	4,01	2,95
Average household dependency ratio	0,41	0,28	0,29

	Below poverty line before shock/ below poverty line after shock	Above poverty line before shock/ below poverty line after shock	Above poverty line before shock/ Above poverty line after shock
Paraguay			
Median monthly Income per capita (LCU)	331 718	767 725	1 372 543
Share of women (% within category)	51%	49%	49%
Share of urban population (% within category)	42%	69%	59%
Average age of the head (years)	47,39	44,32	47,16
Average years of education of the head	6,10	7,81	9,70
Average household size (persons)	4,45	4,50	3,44
Average household dependency ratio	0,43	0,33	0,28
Peru			
Median monthly Income per capita (LCU)	192	402	705
Share of women (% within category)	51%	52%	51%
Share of urban population (% within category)	34%	79%	69%
Average age of the head (years)	50,84	46,82	54,30
Average years of education of the head	6,44	9,13	9,61
Average household size (persons)	4,32	4,57	3,36
Average household dependency ratio	0,46	0,36	0,35
Uruguay			
Median monthly Income per capita (LCU)	7 862	13 293	22 810
Share of women (% within category)	54%	51%	53%
Share of urban population (% within category)	95%	91%	79%
Average age of the head (years)	46,28	44,96	54,32
Average years of education of the head	7,61	8,82	9,96
Average household size (persons)	3,80	3,36	2,57
Average household dependency ratio	0,36	0,25	0,37

Appendix D: Network representation of Input-Output technical coefficients matrices

These graphs show a network representation of the technical coefficients of the Input-Output matrices. Each economic sector is represented as a node. The edges are directed, showing the intermediate demand of the sector at the start of the edge to the sector at the end point of the arrow. The latter is an input of the former. The thickness of the edges shows the size of the technical coefficient. The darker the color, and the bigger the size of the node, the higher the proportion of the labor force under lockdown restrictions.

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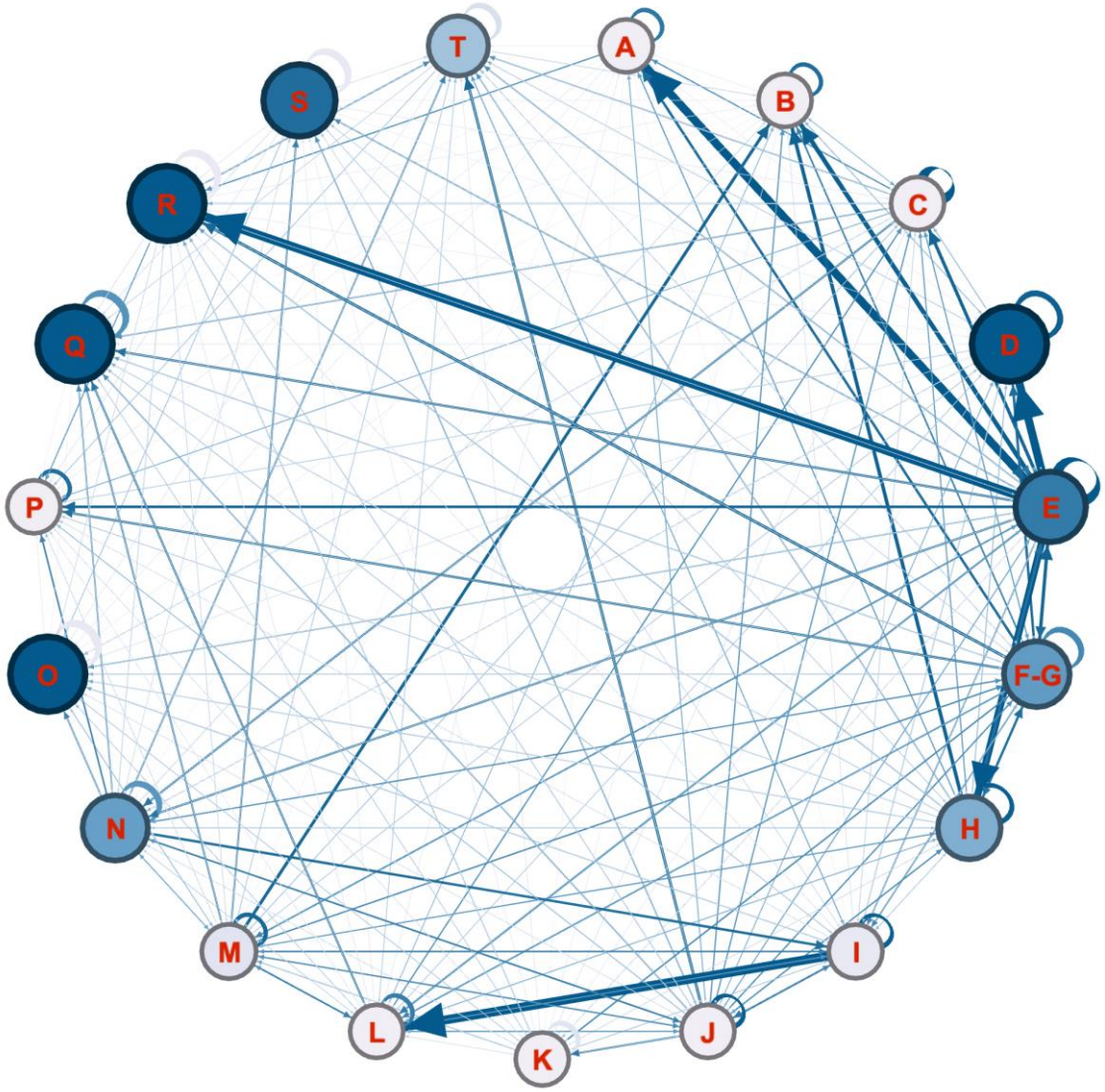
Brazil

Label	Aggregate Economic Sector
A	Agriculture, Forestry, Fishery
B	Mining
C	Energy and water supply, sewerage and waste management
D	Construction
E	Manufacturing
F	Whosale trade
G	Retail trade
H	Transportation, postal services and storage
I	Media
J	Financial services
K	Real state
L	Professional services
M	Corporate and mangement services
N	Business support
O	Educational services
P	Health services
Q	Arts, entertainment and recreation
R	Hospitality and Tourism
S	Other services
T	Public administration and Legislative activities



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Chile

Label	Aggregate Economic Sector
A	Agriculture, Forestry, Fishery
B	Mining
C	Energy and water supply, sewerage and waste management
D	Construction
E	Manufacturing
F	Whosale trade
G	Retail trade
H	Transportation, postal services and storage
I	Media
J	Financial services
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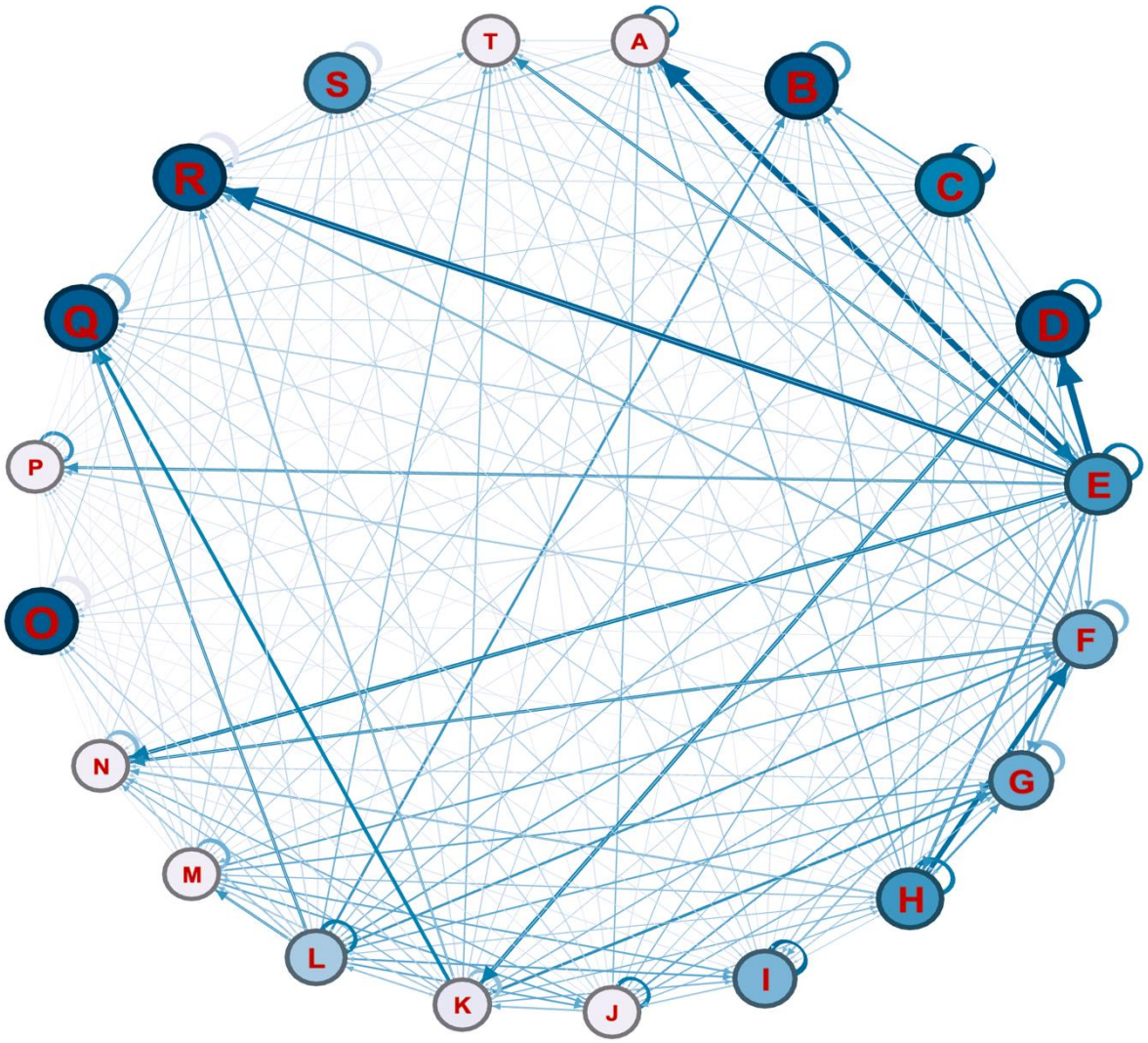
L	Professional services
M	Corporate and mangement services
N	Business support
O	Educational services
P	Health services
Q	Arts, entertainment and recreation
R	Hospitality and Tourism
S	Other services
T	Public administration and Legislative activities



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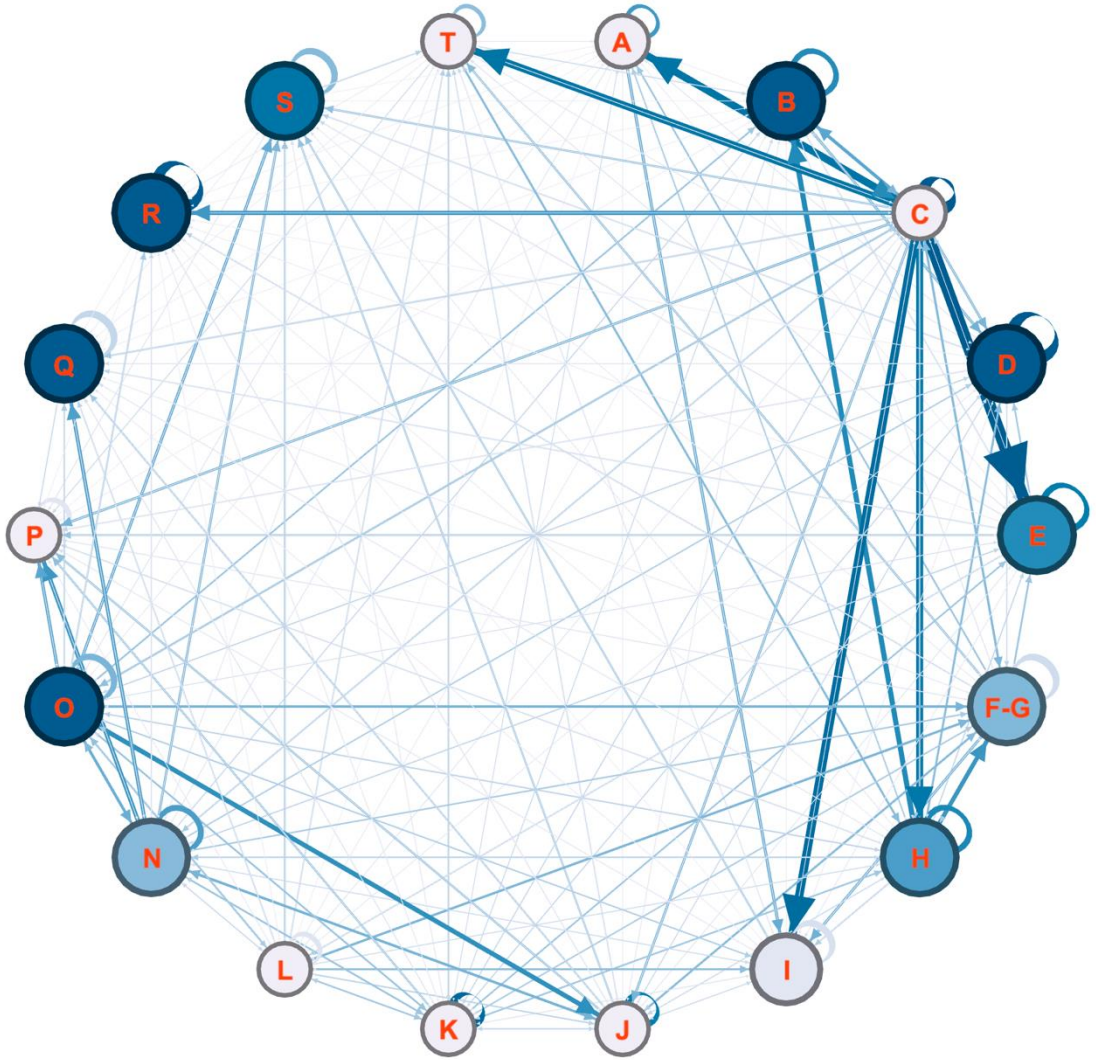
Colombia

Label	Aggregate Economic Sector
A	Agriculture, Forestry, Fishery
B	Mining
C	Energy and water supply, sewerage and waste management
D	Construction
E	Manufacturing
F	Whosale trade
G	Retail trade
H	Transportation, postal services and storage
I	Media
J	Financial services
K	Real state
L	Professional services
M	Corporate and mangement services
N	Business support
O	Educational services
P	Health services
Q	Arts, entertainment and recreation
R	Hospitality and Tourism
S	Other services
T	Public administration and Legislative activities



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Ecuador

Label	Aggregate Economic Sector
A	Agriculture, Forestry, Fishery
B	Mining
C	Energy and water supply, sewerage and waste management
D	Construction
E	Manufacturing
F	Whosale trade
G	Retail trade
H	Transportation, postal services and storage
I	Media
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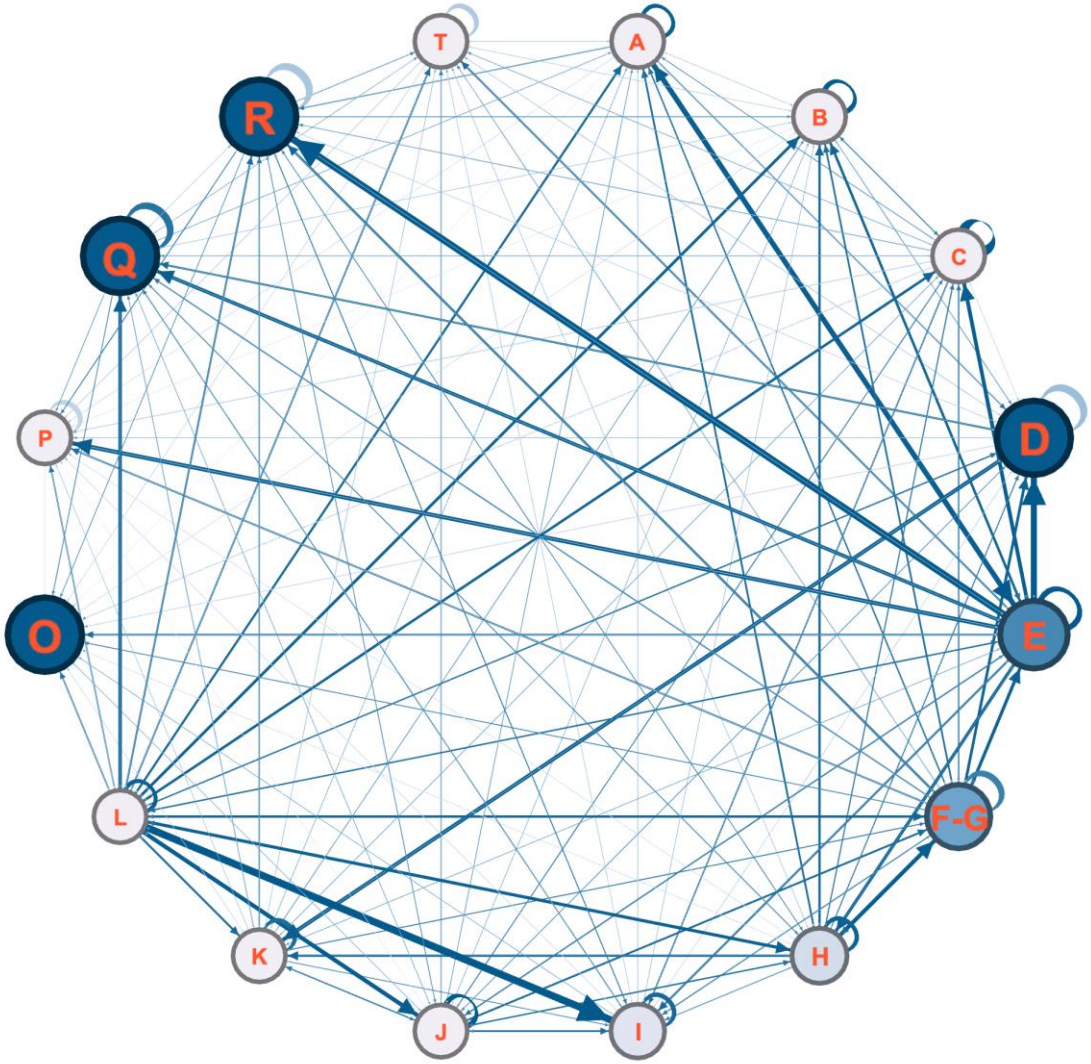
P	Health services
Q	Arts, entertainment and recreation
R	Hospitality and Tourism
S	Other services
T	Public administration and Legislative activities



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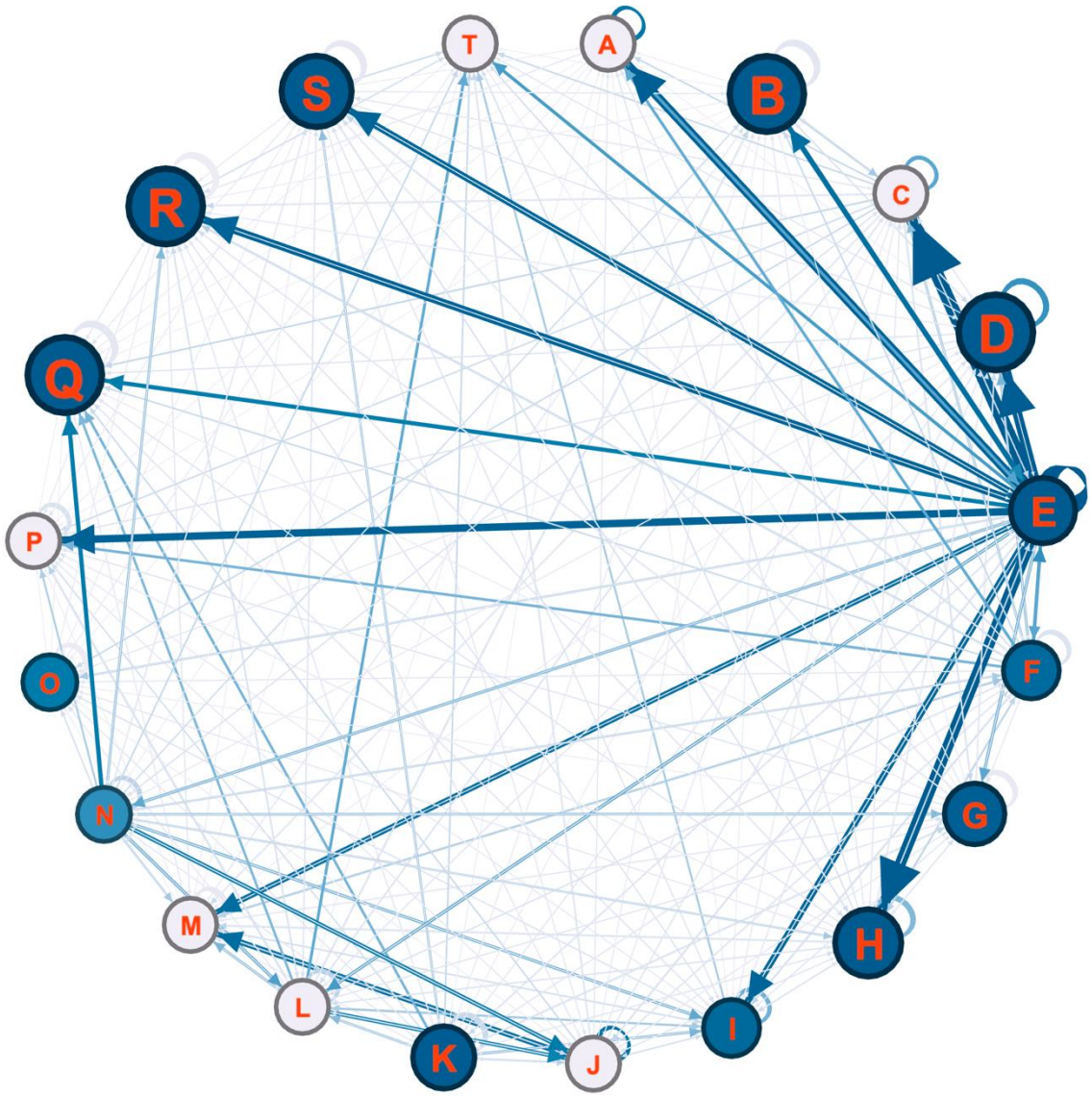
Mexico

Label	Aggregate Economic Sector
A	Agriculture, Forestry, Fishery
B	Mining
C	Energy and water supply, sewerage and waste management
D	Construction
E	Manufacturing
F	Whosale trade
G	Retail trade
H	Transportation, postal services and storage
I	Media
J	Financial services
K	Real state
L	Professional services
M	Corporate and mangement services
N	Business support
O	Educational services
P	Health services
Q	Arts, entertainment and recreation
R	Hospitality and Tourism
S	Other services
T	Public administration and Legislative activities



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Peru

Label	Aggregate Economic Sector
A	Agriculture, Forestry, Fishery
B	Mining
C	Energy and water supply, sewerage and waste management
D	Construction
E	Manufacturing
F	Whosale trade
G	Retail trade
H	Transportation, postal services and storage
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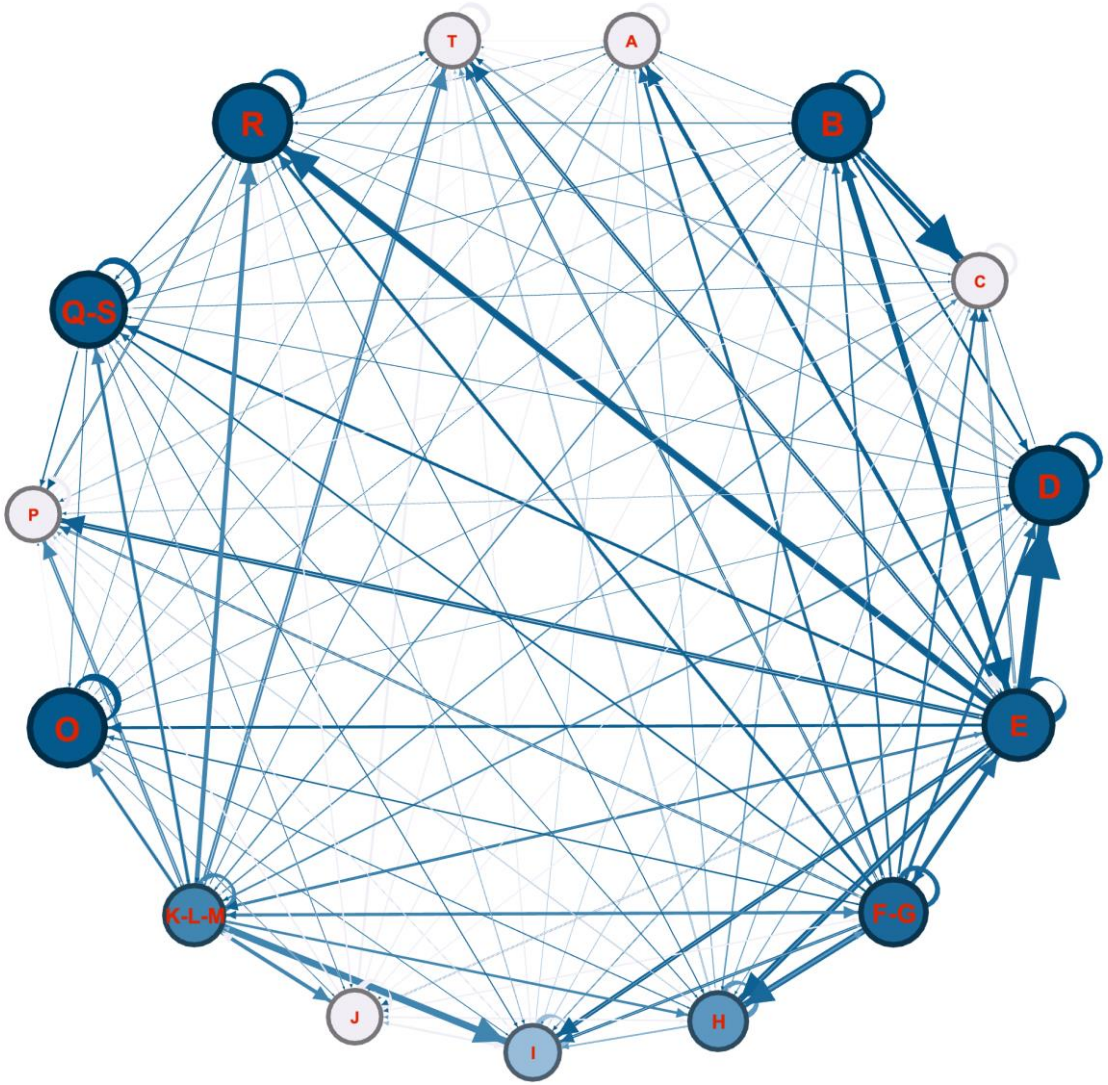

Appendix E: Sources of official poverty levels, Gini coefficients and input-output tables

Data sources of poverty incidence and Gini coefficients

We list the documents containing the values of the poverty lines, the headcount ratios of poverty incidence, and the values of poverty lines in local currencies. Brazil does not have an official estimation of the later values at the national level. In the case of Brazil, we use the urban and rural poverty lines in local currency estimated by ECLAC, available in its last report on poverty (ECLAC 2020). Next, we list the national official sources of input-output tables.

Argentina

The National Institute of Statistics and Censuses of the Republic of Argentina (2019) Incidencia de la pobreza y la indigencia en 31 aglomerados urbanos [Incidence of poverty and indigence in 31 urban agglomerates] Recovered from https://www.indec.gob.ar/uploads/informesdeprensa/eph_pobreza_02_195EFE752E31.pdf

The National Institute of Statistics and Censuses of the Republic of Argentina (2019) Evolución de la distribución del ingreso (EPH) [Evolution of income distribution (EPH)] Recovered from https://www.indec.gob.ar/uploads/informesdeprensa/ingresos_4trim19631D7F2C43.pdf

Brazil

The Brazilian Institute of Geography and Statistics (2020) Summary of Social Indicators. Recovered from https://www.ibge.gov.br/en/statistics/multi-domain/living-conditions-poverty-and-inequality/18704-summary-of-social-indicators.html?edicao=23360&t=resultados

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Chile

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Appendix F: Variables used for the estimation of per-capita income

For this appendix, please see the companion Excel file available by request from the authors.