

A first exploratory analysis of the regional economic impact of COVID-19 in Argentina¹

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Abstract

In this article, we present a first exploratory analysis of the regional economic impact that COVID-19 pandemic and lockdown measures adopted in Argentina could have had during the last weeks of March and the month of April, the period of greatest economic impact, when restrictions were mainly raised at the sectoral level, without taking into account any regional criteria. To this end, we built an index of territorial economic impact by COVID-19 (ITEI-COVID), which takes into account, on the one hand, the regional production structure in terms of formal private employment, and on the other hand, the operational level of each sector. Results show that the regional impact of COVID-19 on private economic activity in Argentina was highly heterogeneous and that these unequal effects were largely related to the degree of productive diversity or the type of regional specialization. All these results are relatively stable and robust when comparing different geographical units of analysis, when changing the period chosen to define the private production structure, or when considering the informality and self-employment in addition to formal salaried employment.

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1. Introduction

Both the analysis and measure of the economic impact of the COVID-19 pandemic necessarily require taking into account a regional perspective, not only to fully understand and manage the unequal impacts of the pandemic and isolation measures but also because the economic problems that arise tend to be region-specific (Bailey et al., 2020). The marked heterogeneity in the territorial distribution of economic activities, production, and employment in Argentina, which is expressed in different regional specializations, allows us to anticipate an unequal impact of the pandemic and the lockdown measures (named as Preventive and Compulsory Social Isolation or ASPO in Spanish). In this article, we present a first exploratory analysis of the regional economic impact that the pandemic and ASPO could have had during the last weeks of March and the month of April, when lockdown restrictions and exceptions were mainly raised at the level of sectors or economic activities, without taking into account any regional criteria. In this way, we aim to provide a territorial view of the heterogeneous impact that the pandemic and lockdown measures had on private economic activity in different geographical units of analysis: Provinces, Local Labor Markets (LLMs), and Urban Agglomerates¹.

At the beginning of the ASPO (last weeks of March and the month of April), while excepted or essential activities continued relatively normal (e.g. food and beverage processing, health services), many others faced a significant reduction in their operational level (transport) or even a complete and indefinitely lockdown (tourism, leisure, and cultural services). Despite mobility restrictions, some activities were able to adapt to working from home (various professional services, education), but others that naturally require the physical presence in the workplace (manufacturing, construction) have been much more affected (Albrieu, 2020; Bonavida Foschiatti and Gasparini, 2020; Delaporte and Peña, 2020; Dingel and Neiman, 2020; Hatayama et al., 2020; Saltiel, 2020).

To analyze the regional economic impact of the pandemic and ASPO, we built an index of territorial economic impact by COVID-19 (ITEI-COVID). This index takes into account, on the one hand, the regional production structure in terms of formal private employment, and on the other hand, the operational level of each sector. Although this is a relatively simple exercise, similar analyzes can be found, for example, for the United States (Muro et al.,

¹ The 24 Argentine provinces represent the main subnational political level in the country, and generally the territorial level for which more data is available. However, the provinces in Argentina are considerably larger than in some developed countries. For example, the size of the province of Buenos Aires is similar to Poland or Italy. In this sense, having reliable information about different geographical units within the provinces is particularly useful for territorial analysis in Argentina. The LLMs are formed by a central city or node and a set of other cities based on the daily movements of workers between their workplace and their home (Borello, 2002; Rotondo et al., 2016). As a whole, the main 85 LLMs defined in Argentina account for 86% of total population (and 95% of registered employment in private companies), while the 32 urban agglomerates surveyed by the National Household Survey (NHS) barely exceed the 60% of total population.

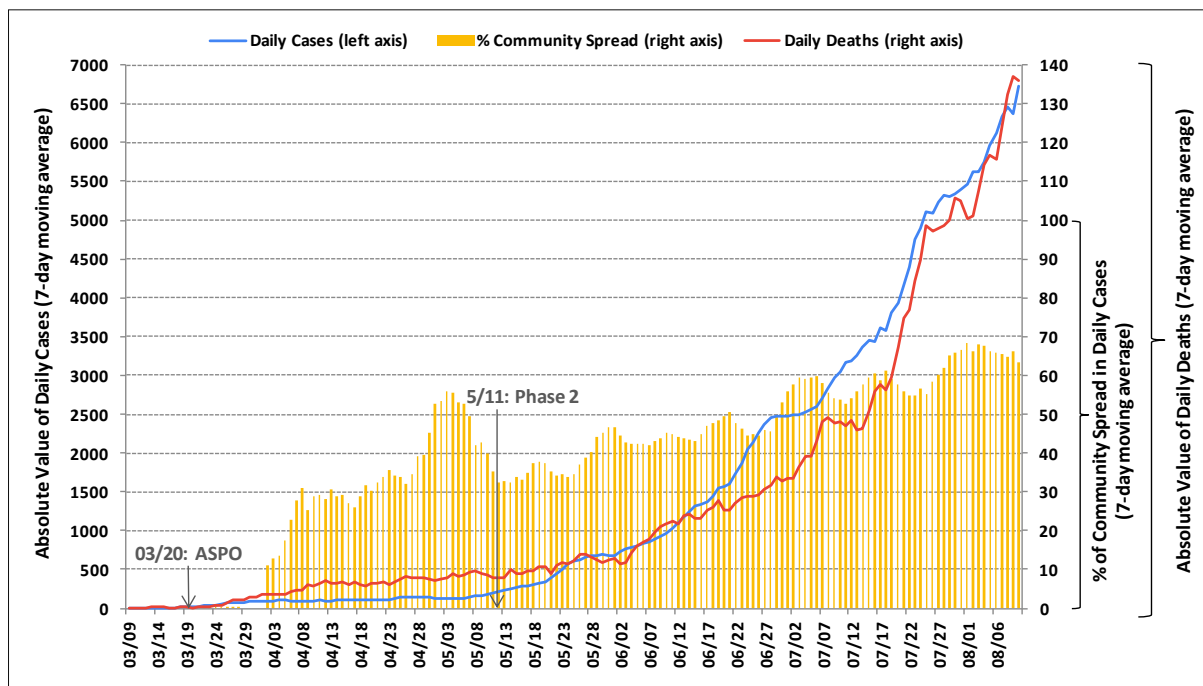
2020), different countries or regions in Europe (Bachtrögler et al., 2020; Kitsos, 2020; González Laxe et al., 2020; Pérez and Maudos, 2020; Prades Illanes and Tello Casas, 2020), Colombia and Brazil (Bonet-Morón et al., 2020; Haddad et al., 2020), or the municipalities of Buenos Aires Province, in Argentina (Lódola and Picón, 2020).

After this introduction, in section 2 we contextualize the period under analysis in terms of the evolution of the COVID-19 pandemic and lockdown measures adopted in Argentina. In section 3, we present the index of territorial economic impact by COVID-19 and discuss some issues about the available databases and their respective limitations. Then, in section 4 we show and discuss de ITEI results according to the different geographical units of analysis. Finally, we close with some conclusions.

2. The COVID-19 pandemic and lockdown measures in Argentina

The first imported case of COVID-19 in Argentina was confirmed on March 3th. A few days later, the national government established a mandatory quarantine for travelers entering or returning to the country (and then the closure of national borders), the suspension of all artistic and sports shows, as well as classes at all educational levels. On March 19th, when confirmed cases in the country were barely 130 and there were still no signs of community circulation (80% of cases were imported and the remaining 20% were close contacts, see Figure 1), the President announced the beginning of a strict and mandatory quarantine for the entire population (the so-called ASPO), with the exception of those activities and workers that were considered essential (e.g. medical services and supplies, security personnel, food production, pharmacies, local food and cleaning supplies stores, public services, public transportation for essential workers, fuel dispensing, among others). It is worth noting that on the day of the announcement, about half of the 24 provinces of the country had not yet registered positive cases. Moreover, in more than half of the provinces with cases, there were only one or two infected people. In the vast majority of cities in the country, there were no confirmed cases for several weeks. However, during this first phase of strict quarantine and isolation, no territorial differences were recognized. It was not until May 11th, when phase 2 (administrative isolation) began, that the government began to take into account the context and the epidemiological evolution of each province and city. The latter was deepened on May 27th with the passage to phase 3, of geographical segmentation.

Figure 1. COVID-19 daily cases, deaths, and percentage of cases by community spread in Argentina (7-day moving average)



Source: Authors' calculation based on data reported by the Ministry of Health and compiled by Jorge Aliaga.

The economic downturn in the last weeks of March was practically total. For example, according to Google's mobility index, the presence at the workplace in Argentina fell 83 points from Wednesday March 11th (previous to any measures) to Wednesday March 25th. In the provinces, the decrease was about 86 points on average, with a minimum drop of 77 and a maximum of 100. According to a survey carried out in the first days of April to 1,000 companies distributed throughout the country, only 10% of them were fully operational, while more than half were completely non-operational. Around two-thirds of manufacturing and commercial companies and three-quarters of construction companies were non-operational (FOP, 2020a).

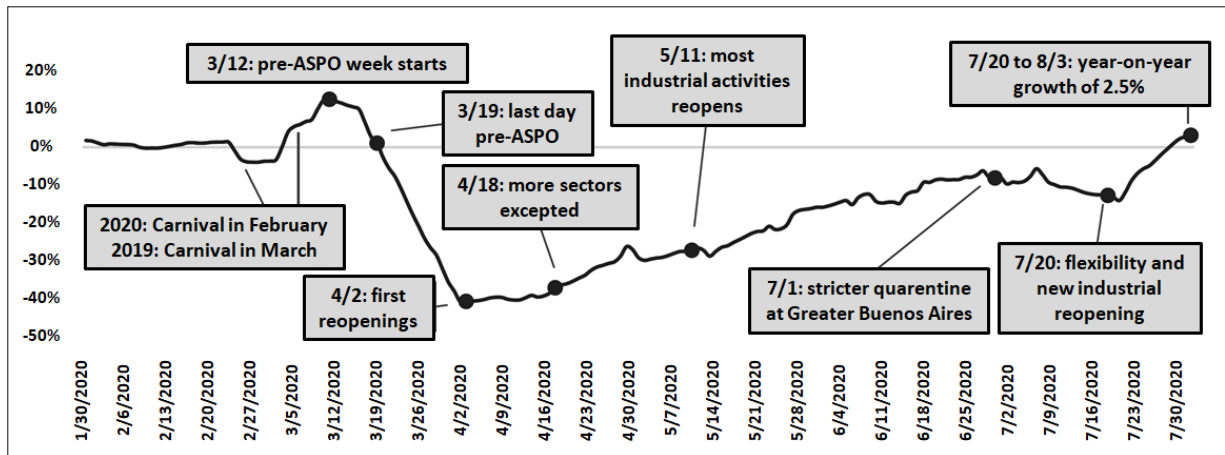
Throughout April, some sectors began to resume their activities, either because: a) the first essential activities managed to adapt their labor and transport protocols for their workers, b) some new sectors were excepted during the month (for example, primary activities, such as forestry or mining, or industrial continuous processes), or c) remote working conditions were established when possible (mainly in service activities). However, official statistics show a historical decline in this month, of which there are practically no similar records. According to the National Institute of Statistics and Censuses (INDEC in Spanish), the monthly economic activity estimator registered a fall of more than 26% compared to April 2019, while the contraction registered in March (the whole month) had been 11.5%, compared to the same

month of 2019. The industrial manufacturing production index (IMPI), showed a year-on-year fall of almost 17% in March and of more than 33% in April.

As we mentioned before, during this first stage, the restrictions and exceptions to the economic activity were raised at the level of sectors or branches, without taking into account any territorial criteria. However, as we will show in this article, given the differences in regional production structures, there were naturally regions more and less affected by the economic downturn. For example, according to another survey of FOP (2020b), carried out between May 7th and 12th (end of the strictest phase of quarantine), the Patagonia (South) region showed the highest percentage of non-operational firms, in contrast to the North of the country. Regarding sectoral differences, while a quarter of all surveyed companies were not operational, this percentage reached only 7% in the agricultural and natural resources sectors and between 30% and 40% in manufacturing and construction.

From then on, the restrictions on different economic activities were gradually eliminated, taking into account the epidemiological evolution of each province and city. The economic rebound compared to the worst month in history was not long in coming (see Figure 2) and the seasonally adjusted series of the IMPI showed a recovery of 9% in May (in comparison to April 2020) and 14% in June (in comparison to May). On the other hand, the psychosocial and economic exhaustion generated by a long and sustained quarantine (phase 5, of social distancing or new normality, would only begin in June just in some regions) was reflected in mobility indices, which demonstrated a marked distance between *de jure* quarantine and *the facto* isolation (Levy Yeyati and Sartorio, 2020). This not only accounts for the gradual reduction in the effectiveness of quarantine measures but also the real impossibility of sustaining or restoring strict restrictions, even when the epidemiological situation has been worsened markedly. At the beginning of August, Argentina overcame the barrier of 200,000 confirmed cases, with an average of around 5,500 new cases per day and about 60% by community circulation (Figure 1).

Figure 2. Manufacturing activity (year-on-year change, 14-day moving average)



Source: Own translation of CEPXXI (2020).

Although the early and strict quarantine had a considerable popular and political support, since it allowed the government to buy time to develop protocols and expand the capacity of intensive care beds, a retrospective look and the current results invite at least to discuss part of the proposed strategy. In particular, the first phase of the ASPO, between the end of March and the first days of May, predictably coincided with the greatest economic impact of the pandemic and quarantine measures in Argentina. However, as we will see in this article, along with the absence of territorial criteria, the regional economic impact was also highly heterogeneous.

3. Calculation and scope of the index of territorial economic impact by COVID-19

The ITEI-COVID in region j is calculated as:

$$ITEI_j = 100 - \sum_{i=1}^n S_{ij} * OP_i$$

Where S_{ij} is the weight of sector i in region j and OP_i is the operational level of sector i in the country. The ITEI-COVID should be interpreted as a negative index, since it takes higher values (near 100) if the economic activity has been severely affected (non-operational) by the pandemic and ASPO, and vice versa.

Since in Argentina we do not have complete, homogeneous and updated sectoral value-added statistics at the territorial level, to define the sectoral weights we use data on total salaried employment registered in the private sector, from the provincial and LLM databases of the Employment and Business Dynamics Observatory (EBDO), under the Ministry of

Labor, Employment, and Social Security. In particular, in the case of the LLMs, we use average employment data from the 2016-2018 period -which in other working paper allowed us to describe the regional production structure before the pandemic (Niembro et al., 2020)- and we calculated the weight of formal private employment in each sector (ISIC at 2 digits) over the total formal private employment of each LLM. In the case of the provinces, we carry out the same calculation both for the 2016-2018 period and the second quarter of 2019, which includes the month of April.

It is worth noting that data on formal salaried employment in the private sector -provided by the EBDO both for provinces and LLMs- cover the entire universe, since they are based on administrative records of the Argentine Integrated Social Security System (SIPA in Spanish) and the Federal Public Revenue Administration (AFIP). In other words, they are not estimates or projections based on sample data -as occurs, for example, with the National Household Survey (NHS) of INDEC-. Obviously, the main limitation of these databases to describe the regional (private) production structure is that they leave aside informal employment and self-employed². For this reason, we also use data of the NHS, from the second quarter of 2019, to calculate the sectoral weights not only for formal salaried employment but also for informal employment and self-employed. In section 4.3 we show that, although some changes occur when incorporating data on informality and self-employment, the territorial patterns remain quite similar.

The operational level of each sector ranges from a maximum of 100 (complete) to a minimum of 0 (null), going through intermediate values of 75 (high), 50 (medium), and 25 (low). In order to carry out a simple sensitivity analysis, we define for each sector a hypothesis of minimum operational level and another of maximum level, based on the search and interpretation of secondary information, such as recent statistics published by INDEC and other official agencies, reports from consultants and research centers, and information from various surveys and sectoral chambers. Annex 1 presents the list of the sectors considered, the two hypotheses defined, and the sources reviewed in each case. It is worth mentioning that the definition of an operational or vulnerability level for each sector has also been a common step in other recent studies (Bachtrögler et al., 2020; Bonet-Morón et al., 2020; González Laxe et al., 2020; Lódola and Picón, 2020; Pérez and Maudos, 2020; Prades Illanes and Tello Casas, 2020).

It is important to highlight that the ITEI does not intend to account for the changes in formal salaried employment in the private sector in each region during the pandemic and ASPO. Instead, the index is based on the production structure, approximated by previous data on

² Employment in the public sector is also not taken into account, but it is not the purpose of this article to analyze the impact of the pandemic or ASPO on the production of services in the public sector.

formal private employment, with the aim to analyze the heterogeneous impact that the quarantine could have had on the private economic activity at the territorial level in Argentina. Taking into account that the government established different restrictions on firing formal workers, as well as some important support measures, such as the Emergency Assistance Program for Work and Production³, it is expected that, at least for a while, formal employment could be dissociated from the effective level of production and sales. According to the Ministry of Labor, Employment, and Social Security, although there was a drop in jobs in April, other adjustments during this month took the form of suspensions and wage reductions, along with a significant drop in hiring.

Finally, It should be noted that the impact on private economic activity may be due to the restrictions (and exceptions) imposed by the ASPO and the feasibility (or not) of working from home in the activities that were not excepted, as well as to the decrease in domestic or external demand and other logistic complications, all factors that may be associated in one way or another with the pandemic. For these reasons, and as with any other index, the ITEI should be interpreted with some caution, prioritizing a relative comparison between regions and not an interpretation of the absolute values in each case.

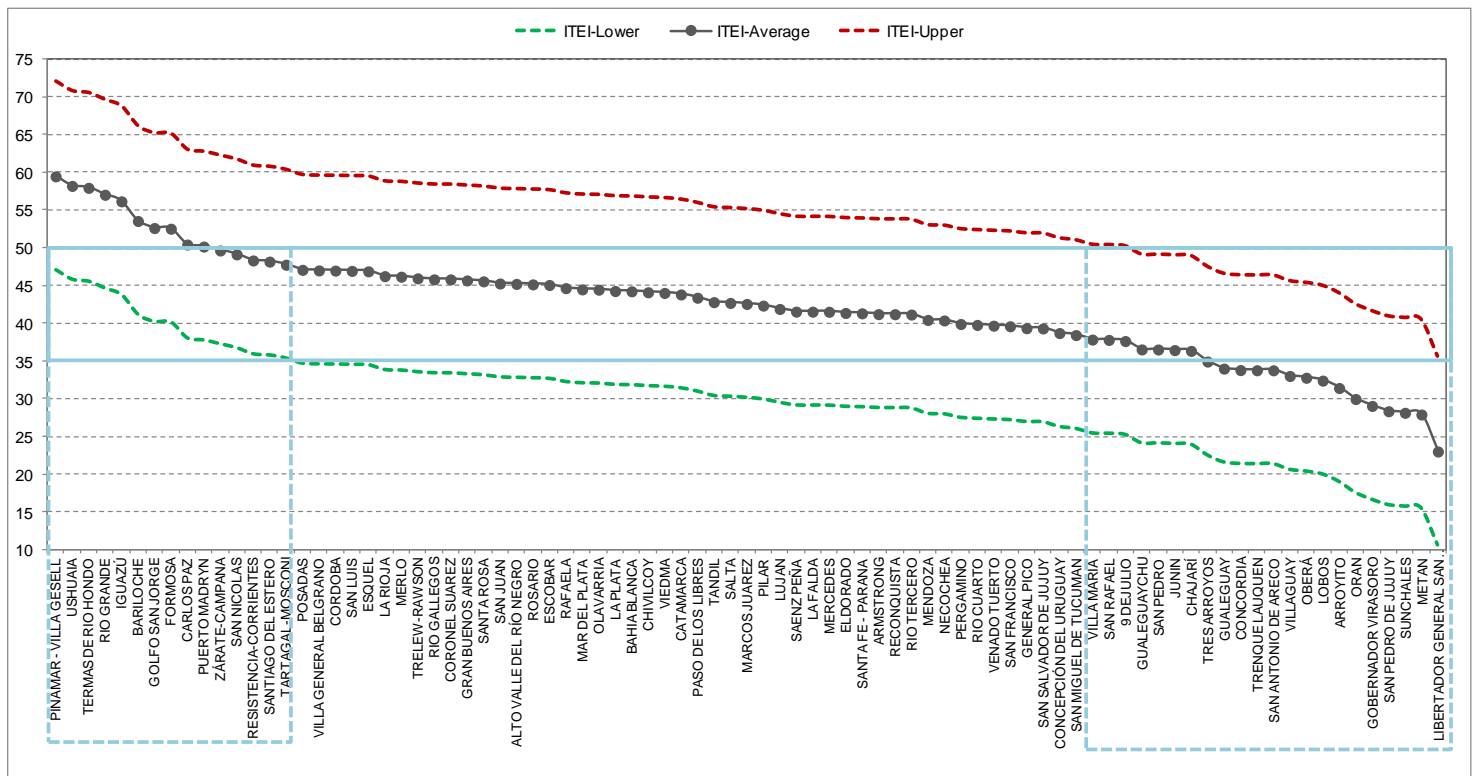
4. Results according to the different geographical units of analysis

4.1. ITEI-COVID results for the main 85 Local Labor Markets

Figure 3 shows the average, lower, and upper value of the index for the main 85 LLMs of the country. In a simple robustness analysis, we observe that the main results at the extremes of the distribution do not change even if, on the one hand, we bring the operational level closer to its maximum hypothesis for the most affected LLMs, and on the other hand, we bring the operational hypothesis towards the minimum for the least affected LLMs. The *ITEI-Lower* for the 8 most affected LLMs is on average 43.5, while the *ITEI-Upper* for the 10 least affected LLMs is on average 42.2.

³ For example, one of the main contributions of this program was paying up to 50% of the salaries of formal workers, depending on the type of company, its economic situation, and salary levels.

Figure 3. ITEI for LLMs: average, upper, and lower limits



Source: Own elaboration.

Table 1 groups the LLMs according to the economic impact they face (the most affected ones are shown in shades of red and the least affected ones in shades of green) and their type of production pattern (or type of specialization), based on the typology elaborated by Niembro et al. (2020). Among the most affected regions, predictably, we observe LLMs specialized in tourism -like Campos-Vazquez and Esquivel (2020) for Mexican regions- and in some industries that were highly restricted (non-operational) in the first stage of the quarantine. Some of these LLMs are also specialized in the extraction or exploitation of natural resources, such as oil and minerals, activities that have been limited both by the pandemic and by the sectoral crisis in the case of hydrocarbons. At the other extreme, among the most intense greens, we note that specialization in agricultural and food sectors has been essential to minimize the impacts of the pandemic and ASPO. In general, the production pattern of the most and least affected LLMs shows relatively low levels of diversification, with a type of specialization that leans towards more and less affected (non-operational) sectors, respectively.

Table 1. LLMs according to ITEI and type of specialization

| AEL | ITEI-Lower | ITEI-Average | ITEI-Upper | Ranking | Typology 2016-2018 (Niembro <i>et al.</i> , 2020) | |
|-------------------------------|------------|--------------|------------|---------|--|--|
| USHUAIA | 45.8 | 58.3 | 70.8 | 2 | Radio-TV and other activities | |
| RIO GRANDE | 44.6 | 57.1 | 69.6 | 4 | | |
| GOLFO SAN JORGE | 40.2 | 52.7 | 65.2 | 7 | Specialization in extractive activities | |
| PUERTO MADRYN | 37.7 | 50.2 | 62.7 | 10 | Specialization in metallurgical industry | |
| ZARATE-CAMPANA | 37.2 | 49.7 | 62.2 | 11 | | |
| SAN NICOLAS | 36.7 | 49.2 | 61.7 | 12 | | |
| PINAMAR - VILLA GESELL | 47.0 | 59.5 | 72.0 | 1 | | |
| TERMAS DE RIO HONDO | 45.5 | 58.0 | 70.5 | 3 | Specialization in tourism | |
| IGUAZU | 43.7 | 56.2 | 68.7 | 5 | | |
| BARILOCHE | 41.1 | 53.6 | 66.1 | 6 | | |
| CARLOS PAZ | 38.0 | 50.5 | 63.0 | 9 | | |
| SANTIAGO DEL ESTERO | 35.7 | 48.2 | 60.7 | 14 | Textile industry and various activities | |
| FORMOSA | 40.1 | 52.6 | 65.1 | 8 | Urban and related services | |
| RESISTENCIA-CORRIENTES | 35.9 | 48.4 | 60.9 | 13 | | |
| TARTAGAL-MOSCONI | 35.3 | 47.8 | 60.3 | 15 | | |
| SAN LUIS | 34.5 | 47.0 | 59.5 | 19 | Heavy industry, light industry and services | |
| CORONEL SUAREZ | 33.4 | 45.9 | 58.4 | 25 | High specialization in light industry | |
| CORDOBA | 34.5 | 47.0 | 59.5 | 18 | KIS and heavy industry | |
| GRAN BUENOS AIRES | 33.2 | 45.7 | 58.2 | 26 | | |
| ROSARIO | 32.7 | 45.2 | 57.7 | 30 | | |
| VILLA GENERAL BELGRANO | 34.6 | 47.1 | 59.6 | 17 | | |
| MERLO | 33.7 | 46.2 | 58.7 | 22 | Specialization in tourism | |
| LA RIOJA | 33.8 | 46.3 | 58.8 | 21 | Textile industry and various activities | |
| SAN JUAN | 32.8 | 45.3 | 57.8 | 28 | | |
| POSADAS | 34.7 | 47.2 | 59.7 | 16 | Urban and related services | |
| ESQUEL | 34.4 | 46.9 | 59.4 | 20 | | |
| TRELEW-RAWSON | 33.5 | 46.0 | 58.5 | 23 | | |
| RIO GALLEGOS | 33.4 | 45.9 | 58.4 | 24 | | |
| SANTA ROSA | 33.1 | 45.6 | 58.1 | 27 | | |
| ALTO VALLE DEL RIO NEGRO | 32.8 | 45.3 | 57.8 | 29 | | |
| RAFAELA | 32.2 | 44.7 | 57.2 | 32 | Agriculture, support industries and urban services | |
| CHIVILCOY | 31.7 | 44.2 | 56.7 | 37 | | |
| MARCOS JUAREZ | 30.1 | 42.6 | 55.1 | 43 | | |
| RIO TERCERO | 28.7 | 41.2 | 53.7 | 53 | | |
| NECOCHEA | 27.9 | 40.4 | 52.9 | 55 | Heavy industry, light industry and services | |
| ESCOBAR | 32.6 | 45.1 | 57.6 | 31 | | |
| PILAR | 29.9 | 42.4 | 54.9 | 44 | High specialization in light industry | |
| ELDORADO | 28.9 | 41.4 | 53.9 | 49 | | |
| ARMSTRONG | 28.8 | 41.3 | 53.8 | 51 | High specialization in machinery | |
| MAR DEL PLATA | 32.1 | 44.6 | 57.1 | 33 | KIS and heavy industry | |
| LA PLATA | 31.8 | 44.3 | 56.8 | 35 | | |
| BAHIA BLANCA | 31.8 | 44.3 | 56.8 | 36 | | |
| TANDIL | 30.4 | 42.9 | 55.4 | 41 | | |
| SANTA FE - PARANA | 28.9 | 41.4 | 53.9 | 50 | | |
| OLAVARRIA | 32.0 | 44.5 | 57.0 | 34 | | Specialization in extractive activities |
| PASO DE LOS LIBRES | 31.0 | 43.5 | 56.0 | 40 | Specialization in tourism | |
| LA FALDA | 29.1 | 41.6 | 54.1 | 47 | | |
| CATAMARCA | 31.4 | 43.9 | 56.4 | 39 | Textile industry and various activities | |
| LUJAN | 29.5 | 42.0 | 54.5 | 45 | | |
| SAENZ PENA | 29.1 | 41.6 | 54.1 | 46 | | |
| MERCEDES | 29.1 | 41.6 | 54.1 | 48 | | |
| RECONQUISTA | 28.8 | 41.3 | 53.8 | 52 | Urban and related services | |
| VIEDMA | 31.6 | 44.1 | 56.6 | 38 | | |
| SALTA | 30.3 | 42.8 | 55.3 | 42 | | |
| MENDOZA | 28.0 | 40.5 | 53.0 | 54 | | |
| RIO CUARTO | 27.3 | 39.8 | 52.3 | 57 | | Agriculture, support industries and urban services |
| VENADO TUERTO | 27.3 | 39.8 | 52.3 | 58 | | |
| SAN FRANCISCO | 27.2 | 39.7 | 52.2 | 59 | | |
| GENERAL PICO | 26.9 | 39.4 | 51.9 | 60 | | |
| VILLA MARIA | 25.4 | 37.9 | 50.4 | 64 | | |
| 9 DE JULIO | 25.2 | 37.7 | 50.2 | 66 | | |
| JUNIN | 24.0 | 36.5 | 49.0 | 69 | Specialization in agri-food | |
| CONCEPCION DEL URUGUAY | 26.3 | 38.8 | 51.3 | 62 | | |
| SAN RAFAEL | 25.4 | 37.9 | 50.4 | 65 | | |
| GUALEGUAYCHU | 24.1 | 36.6 | 49.1 | 67 | | |
| CHAJARI | 23.9 | 36.4 | 48.9 | 70 | Textile industry and various activities | |
| PERGAMINO | 27.5 | 40.0 | 52.5 | 56 | | |
| SAN PEDRO | 24.1 | 36.6 | 49.1 | 68 | Urban and related services | |
| SAN SALVADOR DE JUJUY | 26.9 | 39.4 | 51.9 | 61 | | |
| SAN MIGUEL DE TUCUMAN | 26.0 | 38.5 | 51.0 | 63 | | |
| TRES ARROYOS | 22.5 | 35.0 | 47.5 | 71 | | Agriculture, support industries and urban services |
| SUNCHALES | 15.7 | 28.2 | 40.7 | 83 | | |
| ARROYITO | 19.0 | 31.5 | 44.0 | 79 | High specialization in machinery | |
| GUALEGUAY | 21.6 | 34.1 | 46.6 | 72 | Specialization in agri-food | |
| CONCORDIA | 21.4 | 33.9 | 46.4 | 73 | | |
| TRENQUE LAUQUEN | 21.3 | 33.8 | 46.3 | 74 | | |
| VILLAGUAY | 20.6 | 33.1 | 45.6 | 76 | | |
| OBERA | 20.3 | 32.8 | 45.3 | 77 | | |
| LOBOS | 20.0 | 32.5 | 45.0 | 78 | | |
| ORAN | 17.5 | 30.0 | 42.5 | 80 | | |
| GOBERNADOR VIRASORO | 16.6 | 29.1 | 41.6 | 81 | | |
| SAN PEDRO DE JUJUY | 15.9 | 28.4 | 40.9 | 82 | | |
| METAN | 15.5 | 28.0 | 40.5 | 84 | | |
| LIBERTADOR GENERAL SAN MARTIN | 10.6 | 23.1 | 35.6 | 85 | | |
| SAN ANTONIO DE ARECO | 21.3 | 33.8 | 46.3 | 75 | Textile industry and various activities | |

Source: Authors' calculation.

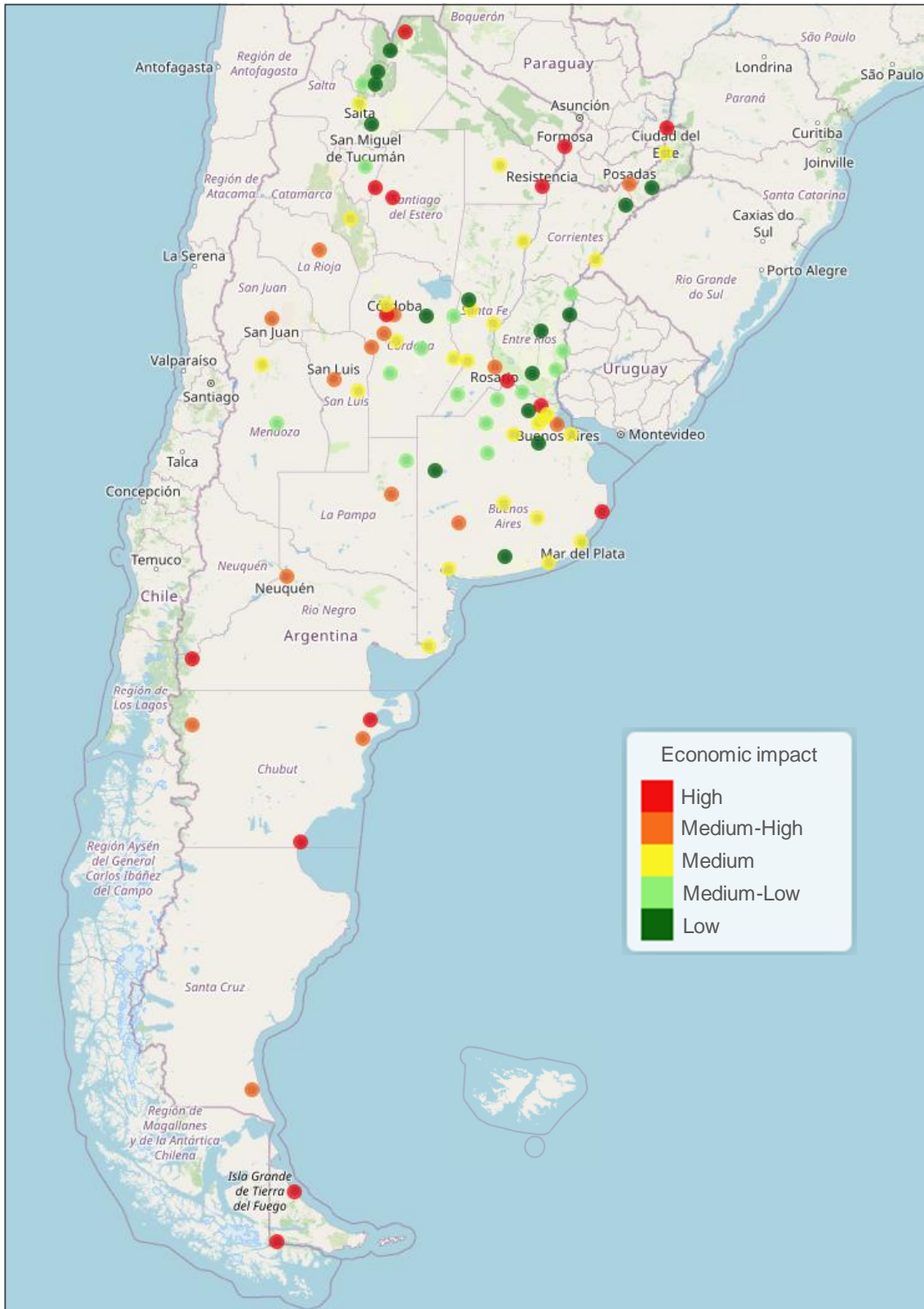
On the other hand, those LLMs with more diversified production patterns are generally located in intermediate positions, leaning towards one side or the other of the distribution depending on the relative weight of more and less affected activities. It seems that productive diversity may have diversified the risk of negative economic impacts among more activities, and thus, it reduced the chances of falling into the most unfavorable scenarios. For example, in the middle of the table (yellow color), we find some LLMs with diversified production patterns, where the pandemic and ASPO probably impacted in some sectors but not in others.

Figure 4 shows the different LLMs, throughout the Argentine provinces, according to the initial impact of the pandemic and ASPO. We observe that the economic impact was relatively low in the LLMs of some provinces, such as Jujuy and Entre Ríos, while the Patagonian (Southern) LLMs are usually among the most affected ones. The heterogeneity within provinces such as Buenos Aires, Córdoba, or Misiones is also clearly appreciated. The latter invites to relativize, to some extent, the provincial results that are presented in the following section.

4.2. ITEI-COVID results for Argentine provinces

One of the limitations that we are not able to overcome with the LLM database (average of the years 2016-2018) is the possible seasonality of some activities, such as those related to tourism. Probably, in some tourist cities where the economic activity and employment have maximum peaks in very specific months (such as the summer season in Pinamar and Villa Gesell), the use of annualized data implies a certain degree of overestimation of the impact of the ASPO during the mid-low season (end of March and April). Obviously, this restriction is more limited for destinations that receive a more stable flow of tourists throughout the year (such as Iguazú) or that have different seasons (winter and summer, such as Bariloche), since the winter season is lost. However, it is expected that the impact of COVID-19 will be much longer and sustained on tourism (e.g. there is uncertainty about the next summer season), even when other activities are gradually returning to a new normality.

Figure 4. LLMs according to ITEI



Source: Authors. Note: the map shows the location of the central city or node of each LLM, but not all its geographical scope.

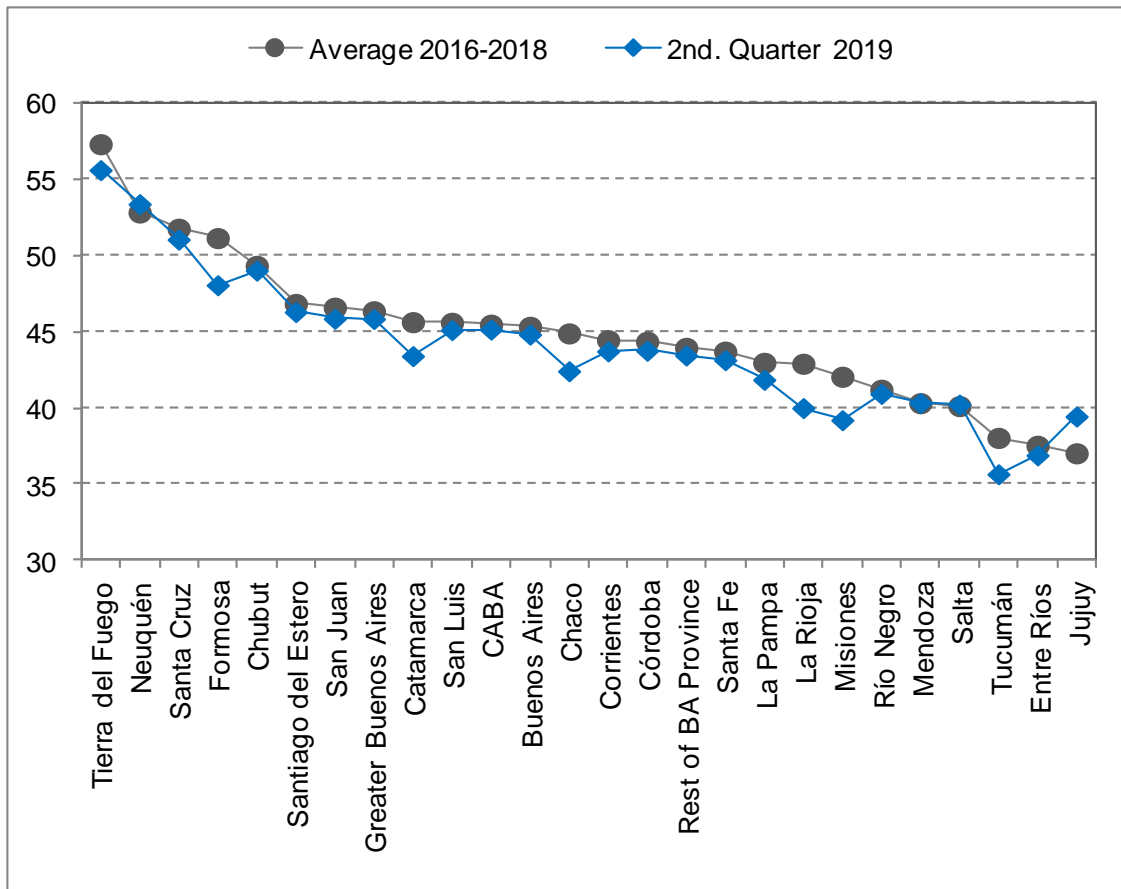
Based on the data published by EBDO on formal salaried employment in the private sector at the provincial level⁷, we calculate the ITEI for Argentine provinces both for the 2016-2018 period and the second quarter of 2019. Thus, we can also account for the impact of the pandemic and ASPO by considering a production structure that could be more similar in terms of seasonality (same period of the previous year).

Figure 5 shows the ITEI by province. Firstly, we see that most of the Patagonian provinces (Tierra del Fuego, Neuquén, Santa Cruz and Chubut) are among the most affected ones, while agrifood-based provinces (such as Tucumán, Entre Ríos, and Jujuy) are the least affected. Precisely, the exception in Patagonia is Río Negro, the province in the region with the highest agri-food profile and the lowest weight of hydrocarbons. The strongest impact among Patagonian provinces has been pointed out in other studies (Day, 2020; FOP, 2020b), due to the relative weight of hydrocarbon production and tourism -and we should add the initial restrictions in electronic production in Tierra del Fuego-.

Secondly, it can be seen that ITEI values are very similar if we use annual data (2016-2018) or data from the second quarter of 2019. The changes in the ranking of provinces are also very limited (Table 2). In other words, the effect of seasonality on the regional production structure does not seem to be very relevant, at least at the provincial level, which to some extent supports the use of data from the 2016-2018 period for the case of LLMs. Except for Jujuy, the effect of seasonality, when observed, seems to decrease the impact of the pandemic and ASPO at the provincial level, especially in the cases of Formosa, Catamarca, Chaco, La Rioja, Misiones, and Tucumán.

⁷ In this database, Buenos Aires province is divided into two parts (Greater Buenos Aires and the rest of the province). Therefore, besides calculating the provincial aggregate, we show the ITEI results for both divisions.

Figure 5. ITEI for Argentine provinces: sectoral weights according to 2016-2018 average or second quarter of 2019



Source: Authors' calculation.

Results at the level of LLMs and provinces are complementary and can help to understand some particularities behind both territorial units. Although the LLMs usually allow us to distinguish different situations within the same province, the analysis of the provincial database published by EBDO also allows us to identify some LLMs with special characteristics. For example, we can see that the LLM that includes both the autonomous city of Buenos Aires (CABA in Spanish) and Greater Buenos Aires municipalities encompasses heterogeneous realities within it. Greater Buenos Aires (which is part of Buenos Aires province) seems to be more affected by the pandemic and ASPO than the city of Buenos Aires, according to these data. The rest of Buenos Aires province appears below, in a better relative position. On the other hand, the LLM called *Alto Valle del Río Negro* includes several cities of Río Negro province with an agricultural profile (and therefore less affected), as well as the capital city and other cities of Neuquén province that are much more specialized in hydrocarbon production (and therefore more affected).

Table 2. Comparison between rankings of provinces

| | Average 2016-2018 | | 2nd. Quarter 2019 | |
|-----------------------------|-------------------|---------|-------------------|---------|
| | ITEI-Average | Ranking | ITEI-Average | Ranking |
| Tierra del Fuego | 57.31 | 1 | 55.61 | 1 |
| Neuquén | 52.84 | 2 | 53.38 | 2 |
| Santa Cruz | 51.77 | 3 | 51.06 | 3 |
| Formosa | 51.16 | 4 | 48.07 | 5 |
| Chubut | 49.34 | 5 | 49.02 | 4 |
| Santiago del Estero | 46.84 | 6 | 46.31 | 6 |
| San Juan | 46.59 | 7 | 45.87 | 7 |
| <i>Greater Buenos Aires</i> | 46.36 | | 45.85 | |
| Catamarca | 45.64 | 8 | 43.42 | 13 |
| San Luis | 45.60 | 9 | 45.12 | 9 |
| CABA | 45.48 | 10 | 45.16 | 8 |
| Buenos Aires | 45.34 | 11 | 44.83 | 10 |
| Chaco | 44.91 | 12 | 42.42 | 15 |
| Corrientes | 44.46 | 13 | 43.73 | 12 |
| Córdoba | 44.36 | 14 | 43.77 | 11 |
| <i>Rest of BA Province</i> | 43.96 | | 43.46 | |
| Santa Fe | 43.71 | 15 | 43.15 | 14 |
| La Pampa | 42.97 | 16 | 41.86 | 16 |
| La Rioja | 42.92 | 17 | 40.01 | 20 |
| Misiones | 42.06 | 18 | 39.21 | 22 |
| Río Negro | 41.21 | 19 | 40.94 | 17 |
| Mendoza | 40.33 | 20 | 40.34 | 18 |
| Salta | 40.14 | 21 | 40.24 | 19 |
| Tucumán | 38.05 | 22 | 35.67 | 24 |
| Entre Ríos | 37.53 | 23 | 36.91 | 23 |
| Jujuy | 37.04 | 24 | 39.45 | 21 |

Source: Own elaboration.

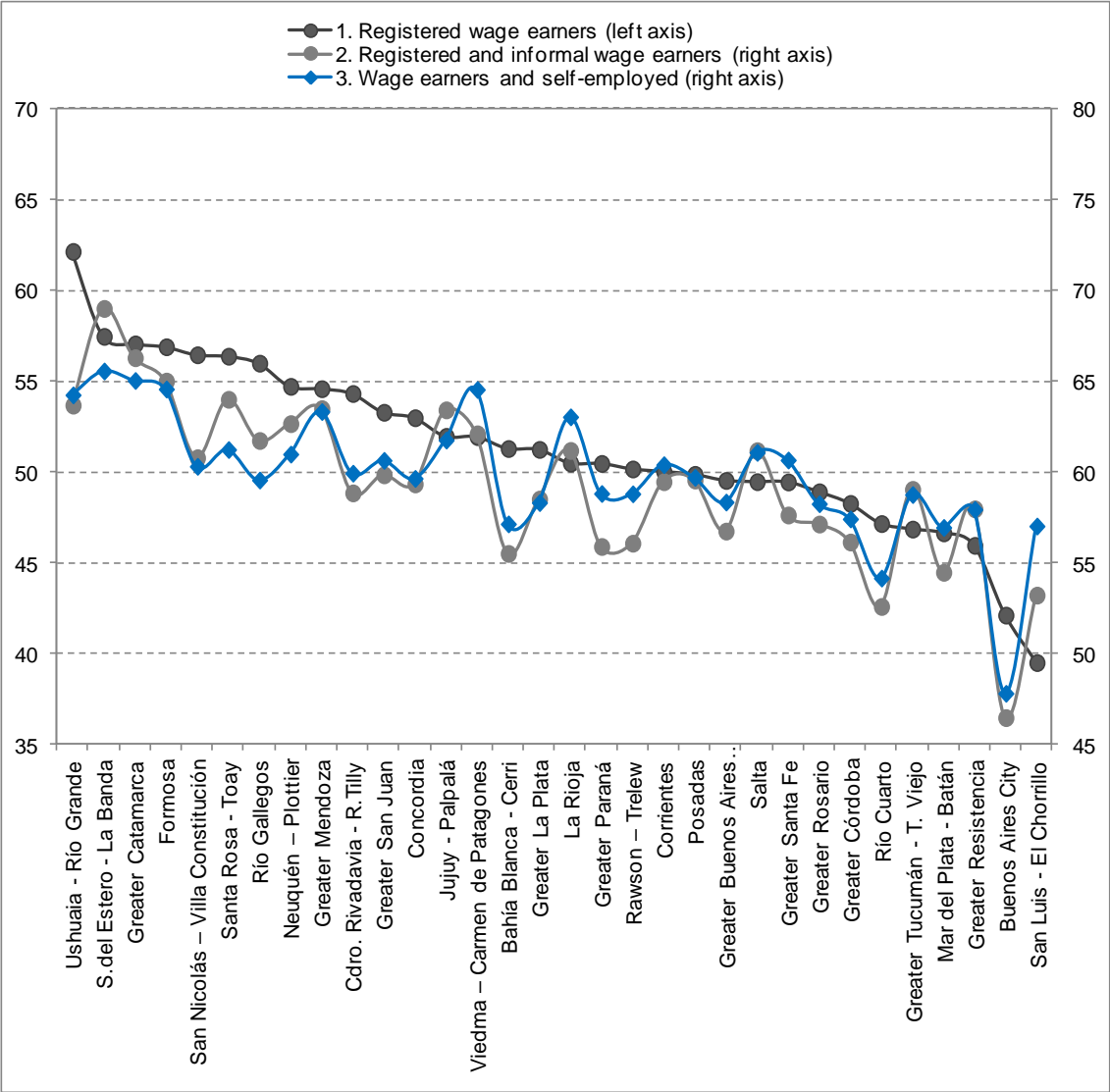
4.3. A look at the Urban Agglomerates in Argentina

So far, we have described the regional (private) production structure based on data of formal salaried employment. As it could be a limitation, we repeat the analysis at the level of urban agglomerates by using data from the NHS corresponding to the second quarter of 2019. In this way, we can compare the results of the ITEI when adding the informal wage earners and self-employed in the definition of the sectoral weights (S_{ij}). Annex 2 presents the list of the sectors considered (CAES at 2 digits), together with the hypotheses of minimum and maximum operational level.

Although some modifications occur when incorporating informality and self-employment, the most notable aspect in both Figure 6 and Table 3 is that the territorial patterns remain quite

similar. In general, the results for urban agglomerates are consistent with previous sections, but we can also suggest that the economic impact of the pandemic and ASPO could be greater when adding informality and self-employment (note the change in scale between the axes). However, the ITEI for urban agglomerates should only be taken as indicative, since the NHS only surveys a sample of the population of these agglomerates and the degree of detail requested to the data (formal, informal, and independent workers in sectors at 2 digits) may lead to high margins of statistical error.

Figure 6. ITEI for urban agglomerates: sectoral weights according to the type of occupational category



Source: Own elaboration.

Table 3. Comparison between ITEI rankings of urban agglomerates according to the type of occupational category

| | Registered wage earners | Registered and informal wage earners | Wage earners and self-employed |
|---------------------------------------|-------------------------|--------------------------------------|--------------------------------|
| Ushuaia - Río Grande | 1 | 5 | 5 |
| S.del Estero - La Banda | 2 | 1 | 1 |
| Greater Catamarca | 3 | 2 | 2 |
| Formosa | 4 | 3 | 3 |
| San Nicolás – Villa Constitución | 5 | 13 | 15 |
| Santa Rosa - Toay | 6 | 4 | 9 |
| Río Gallegos | 7 | 10 | 19 |
| Neuquén – Plottier | 8 | 8 | 11 |
| Greater Mendoza | 9 | 6 | 6 |
| Cdro. Rivadavia - R.Tilly | 10 | 19 | 16 |
| Greater San Juan | 11 | 14 | 13 |
| Concordia | 12 | 17 | 18 |
| Jujuy - Palpalá | 13 | 7 | 8 |
| Viedma – Carmen de Patagones | 14 | 9 | 4 |
| Bahía Blanca - Cerri | 15 | 28 | 28 |
| Greater La Plata | 16 | 20 | 24 |
| La Rioja | 17 | 11 | 7 |
| Greater Paraná | 18 | 27 | 20 |
| Rawson – Trelew | 19 | 26 | 21 |
| Corrientes | 20 | 16 | 14 |
| Posadas | 21 | 15 | 17 |
| Greater Buenos Aires (Municipalities) | 22 | 24 | 23 |
| Salta | 23 | 12 | 10 |
| Greater Santa Fe | 24 | 22 | 12 |
| Greater Rosario | 25 | 23 | 25 |
| Greater Córdoba | 26 | 25 | 27 |
| Río Cuarto | 27 | 31 | 31 |
| Greater Tucumán - T. Viejo | 28 | 18 | 22 |
| Mar del Plata - Batán | 29 | 29 | 30 |
| Greater Resistencia | 30 | 21 | 26 |
| Buenos Aires City | 31 | 32 | 32 |
| San Luis - El Chorrillo | 32 | 30 | 29 |

Source: Own elaboration.

5. Final comments

Throughout this article, we have explored the heterogeneous impact on the economic private activity that the COVID-19 pandemic and lockdown measures in Argentina may have had in territorial terms. We have particularly focused on the first stage of the quarantine (last weeks

of March and April), the period of greatest economic impact, when restrictions were mainly raised at the sectoral level, without taking into account any regional criteria. We conclude that results are relatively stable and robust when comparing different geographical units of analysis, when changing the period chosen to define the regional production structure (2016-2018 average or second quarter of 2019), or when considering the informality and self-employment in addition to formal salaried employment. the salaried registered employment, as well as the informality and self-employment.

Regarding the results, in line with other recent studies, we observe that most of the Patagonian provinces and LLMs have been among the most affected regions, while in other provinces, such as Jujuy, Entre Ríos, or Tucumán, the initial impact of the quarantine would have been substantially smaller. Additionally, the greater analytical richness of studying the national territory at the level of LLMs allows us to highlight the heterogeneity within large and diverse provinces, such as Buenos Aires and Córdoba, and even in smaller ones such as Misiones.

Finally, it is worth noting that, like other recent studies that measure the regional economic impact of COVID-19, in this article we have calculated a relatively simple index. In further studies, we will try to propose more complex methodologies, taking into account that, from May onwards, there have been different dynamics of flexibilization of the quarantine at the sectoral level but also at the territorial level. This implies the need to consider the regional production structure, as well as other characteristics of the regions, such as their size, population density, quantity, frequency and speed of cases, mobility indexes and isolation compliance, among others. Other issues that could be relevant for future analysis are the role of productive diversity and the degree and type of commercial orientation (domestic versus foreign market) in regional recovery after the crisis.

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Annex 1. Sectoral operational hypotheses applied to EBDO data (ISIC)

| Classification of economic activities used by EBDO (ISIC) | | Operational hypothesis | | Based on statistics, surveys or reports from chambers, centers or organizations: |
|---|--|------------------------|---------|---|
| 2 digit | Activities | Minimum | Maximum | |
| 1 | Agriculture, livestock farming, hunting and related service activities | 75 | 100 | INDEC-ICA; CONINAGRO; Fund. Observ. PYME (FOP); CENE-UB |
| 2 | Forestry, wood extraction and related service activities | 50 | 75 | AFOA; ASORA; FAIMA |
| 5 | Fishing and fishing-related activities | 50 | 75 | INDEC-ICA; Subsecr. de Pesca y Acuicultura; Intercámaras de la Ind. Pesquera |
| 11 | Extraction of crude oil and natural gas; activities related to oil and gas extraction, except prospecting activities. | 25 | 50 | Secr. de Energía; CEPH; CEIPA; Ecolatina; Revista Trama |
| 13 | Extraction of metalliferous minerals | 25 | 50 | INDEC-ICA; CAEM |
| 14 | Exploitation of other mines and quarries | 25 | 50 | INDEC-ICA; CAEM |
| 15 | Foods | 75 | 100 | INDEC-IPIM; CAME; FIEL; FOP; UIA |
| 16 | Tobacco | 25 | 50 | INDEC-IPIM; CIT; FIEL; UIA |
| 17 | Textile products | 25 | 50 | INDEC-IPIM; CAME; FIEL; UIA |
| 18 | Confections | 0 | 25 | INDEC-IPIM; CAME; CIA; FIEL; UIA |
| 19 | Leather | 0 | 25 | INDEC-IPIM; CAME; FIEL; UIA |
| 20 | Wood | 50 | 75 | INDEC-IPIM; AFOA; ASORA; FAIMA |
| 21 | Paper | 75 | 100 | INDEC-IPIM; FIEL; UIA |
| 22 | Edition | 75 | 100 | INDEC-IPIM; UIA |
| 23 | Petroleum products | 50 | 75 | INDEC-IPIM; FIEL; UIA |
| 24 | Chemical products | 75 | 100 | INDEC-IPIM; CAME; FIEL; UIA |
| 25 | Rubber and plastic products | 50 | 75 | INDEC-IPIM; CAME; UIA |
| 26 | Other non-metallic minerals | 25 | 50 | INDEC-IPIM; INDEC-ISAC; FIEL; UIA |
| 27 | Common metals | 25 | 50 | INDEC-IPIM; CAA; FIEL; UIA |
| 28 | Other metal products | 25 | 50 | INDEC-IPIM; ADIMRA; FIEL; UIA |
| 29 | Machinery and equipment | 50 | 75 | INDEC-IPIM; ADIMRA; FIEL; UIA |
| 30 | Office machinery | 0 | 25 | INDEC-IPIM; CAME; UIA |
| 31 | Electric appliances | 0 | 25 | INDEC-IPIM; CAME; UIA |
| 32 | Radio and television | 0 | 25 | INDEC-IPIM; CAME; UIA |
| 33 | Medical instruments | 50 | 75 | INDEC-IPIM; ADIMRA; UIA |
| 34 | Automotive | 0 | 25 | INDEC-IPIM; ADEFA; FIEL; UIA |
| 35 | Other transport equipment | 0 | 25 | INDEC-IPIM; UIA |
| 36 | Furniture | 25 | 50 | INDEC-IPIM; ASORA; CAME; FAIMA |
| 37 | Waste and scrap recycling | 50 | 75 | INDEC-IPIM |
| 40 | Electricity, gas and water | 75 | 100 | Secr. de Energía; ENARGAS; CMMESA; Revista Trama |
| 41 | Collection, purification and distribution of water | 75 | 100 | INDEC-ISSP; Ecolatina |
| 45 | Building | 0 | 25 | INDEC-ISAC; CAMARCO; FOP |
| 50 | Sale, maintenance and repair of motor vehicles and their parts, pieces and accessories. sale, maintenance and repair of motorcycles and their parts, pieces and accessories. retail sale of fuel for motor vehicles and motorcycles. | 25 | 50 | ACARA; CECHA |
| 51 | Wholesale trade | 25 | 50 | CAC; CADAM |
| 52 | Retail trade and repair of personal and household goods | 25 | 50 | CAC; CACE; FOP |
| 55 | Hotel and restaurant services | 0 | 25 | INDEC-EOH; INDEC-ETI; FEHGRA; INPROTUR |
| 60 | Rail, automotive and pipeline transportation service | 50 | 75 | INDEC-ISSP; CNRT; FADEEAC |
| 61 | Sea and river transport service | 50 | 75 | CADYM |
| 62 | Air transport service for cargo and passengers | 0 | 25 | ANAC |
| 63 | Cargo handling, storage and warehousing services. complementary services for transportation. travel agency services and other complementary tourist support activities. management and logistics services for the transport of goods | 50 | 75 | INDEC-ISSP |
| 64 | Postal and telecommunications services | 75 | 100 | INDEC-ISSP; Ecolatina; Lódola & Picón (2020) |
| 65 | Financial intermediation and other financial services | 75 | 100 | ADEBA; Albrieu (2020); Bonavida Foschiatti & Gasparini (2020); Lódola & Picón (2020) |
| 66 | Insurance services. retirement and pension fund management services | 75 | 100 | CENE-UB; Albrieu (2020); Bonavida Foschiatti & Gasparini (2020); Lódola & Picón (2020) |
| 67 | Auxiliary services to financial activity, except insurance and pension fund management services | 75 | 100 | CENE-UB; Albrieu (2020); Bonavida Foschiatti & Gasparini (2020); Lódola & Picón (2020) |
| 70 | Real estate services | 0 | 25 | CECBA; CIA; Reporte Inmobiliario; Lódola & Picón (2020) |
| 71 | Rental of transport equipment and machinery and equipment n.c.p. rental of personal and household goods n.c.p. | 0 | 25 | CENE-UB; Lódola & Picón (2020) |
| 72 | Computer activities. Consultant services. data processing. maintenance and repair of office, accounting and computer machinery | 50 | 75 | CAC; CESSI; CENE-UB; FOP; Albrieu (2020); Bonavida Foschiatti & Gasparini (2020) |
| 73 | Research and experimental development in the field of engineering and of the exact and natural sciences and of the social sciences and humanities | 75 | 100 | CAC; CENE-UB; FOP; Albrieu (2020); Bonavida Foschiatti & Gasparini (2020) |
| 74 | Legal and accounting, bookkeeping and auditing services; tax advice; market research and public opinion polls; business and management advice. architectural and engineering services and technical services n.c.p. advertising services. business services n.e.c. | 50 | 75 | CAC; CENE-UB; FOP; Albrieu (2020); Bonavida Foschiatti & Gasparini (2020) |
| 75 | Temporary employment agencies | 0 | 25 | CENE-UB |
| 80 | Teaching. initial, primary, secondary, higher and postgraduate training. adult education and educational services n.e.c. | 75 | 100 | Ecolatina; FOP; Albrieu (2020); Bonavida Foschiatti & Gasparini (2020); Lódola & Picón (2020) |
| 85 | Social and Health Services | 75 | 100 | Lódola & Picón (2020) |
| 90 | Waste and sewage disposal, sanitation and similar services | 75 | 100 | INDEC-ISSP |
| 91 | Services of business, professional and employers organizations. union services. association services n.c.p. | 75 | 100 | CAC; CENE-UB; FOP; Bonavida Foschiatti & Gasparini (2020) |
| 92 | Cinematography, radio and television services and entertainment and artistic entertainment services n.e.c. news agency services. library, archive and museum services and cultural services n.c.p. services for sports and entertainment practice n.e.c. | 0 | 25 | SICA; CENE-UB |
| 93 | Services n.c.p. | 0 | 25 | CENE-UB; Bonavida Foschiatti & Gasparini (2020) |

Annex 2. Sectoral operational hypotheses applied to NHS data (CAES)

| Classification of economic activities used by NHS-INDEC (CAES) | | Operational hypothesis | |
|--|---|------------------------|---------|
| 2 digit | Activities | Minimum | Maximum |
| 1 | Agriculture, Livestock farming, Hunting and Support Activities | 75 | 100 |
| 2 | Forestry, Wood Extraction and Support Activities | 50 | 75 |
| 3 | Fishing, Aquaculture and Support Activities | 50 | 75 |
| 5 | Coal and Lignite Extraction | 25 | 50 |
| 6 | Crude Oil and Natural Gas Extraction | 25 | 50 |
| 7 | Metalliferous Minerals Extraction | 25 | 50 |
| 8 | Exploitation of other Mines and Quarries | 25 | 50 |
| 9 | Support Activities for Mining and Quarrying | 25 | 50 |
| 10 | Preparation of Food Products | 75 | 100 |
| 11 | Preparation of Beverages | 75 | 100 |
| 12 | Manufacture of Tobacco Products | 25 | 50 |
| 13 | Manufacture of Textile Products, except Garments | 25 | 50 |
| 14 | Manufacture of Garments, Finishing and Dyeing of Fur | 0 | 25 |
| 15 | Manufacture of Leather and Related Products | 0 | 25 |
| 16 | Production of Wood and Wood and Cork Products, except Furniture; Straw Articles and Braiding Materials | 50 | 75 |
| 17 | Manufacturing of Paper and Paper Products | 75 | 100 |
| 18 | Printing Activities and Support Services; Playback of Recordings | 75 | 100 |
| 19 | Manufacture of coke and petroleum refining products | 50 | 75 |
| 20 | Manufacture of Chemical Substances and Products | 75 | 100 |
| 21 | Manufacture of Pharmaceutical Products, Medicinal Chemical Substances and Botanical Products | 75 | 100 |
| 22 | Manufacture of Rubber and Plastic Products | 50 | 75 |
| 23 | Non-Metallic Mineral Product Manufacturing | 25 | 50 |
| 24 | Metal Manufacturing | 25 | 50 |
| 25 | Manufacture of Fabricated Metal Products and Metalworking Services, except Machinery and Equipment | 25 | 50 |
| 26 | Manufacture of Computer, Electronic and Optical Equipment | 0 | 25 |
| 27 | Manufacture of Machinery and Electrical Equipment | 25 | 50 |
| 28 | Manufacture of Machinery and Equipment n.c.p. | 50 | 75 |
| 29 | Manufacture of Motor Vehicles, Trailers and Semi-trailers | 0 | 25 |
| 30 | Manufacture of Other Transportation Equipment n.c.p. | 0 | 25 |
| 31 | Furniture and Mattress Manufacturing | 25 | 50 |
| 32 | Manufacturing Industries n.c.p. | 0 | 25 |
| 33 | Maintenance, Repair and Installation of Machines and Equipment | 0 | 25 |
| 35 | Electricity, Gas, Steam and Air Conditioning | 75 | 100 |
| 36 | Water Collection, Treatment and Supply | 75 | 100 |
| 37 | Sewerage | 75 | 100 |
| 38 | Collection, Treatment and Disposal of Waste; Recovery of Materials | 75 | 100 |
| 39 | Sanitation Activities and other Waste Management Services | 75 | 100 |
| 40 | Building | 0 | 25 |
| 45 | Trade and Repair of Motor Vehicles and Motorcycles | 0 | 25 |
| 48 | Trade, Except Motor Vehicles and Motorcycles | 25 | 50 |
| 49 | Land and Pipeline Transportation | 50 | 75 |
| 50 | Transportation by Waterway | 50 | 75 |
| 51 | Air Transport | 0 | 25 |
| 52 | Storage and Auxiliary Transport Activities | 50 | 75 |
| 53 | Mail and Messaging Services | 75 | 100 |
| 55 | Accommodation Services in Hotels, Camps and other types of Temporary Accommodation | 0 | 25 |
| 56 | Food and Beverage Services | 0 | 25 |
| 58 | Publishing of Books, Newspapers and other Publications, even integrated to Printing | 50 | 75 |
| 59 | Cinematographic Activities; Production of Videos and Television Programs; Sound Recording and Music Editing | 25 | 50 |
| 60 | Radio and Television Programming and Broadcasting Activities | 75 | 100 |
| 61 | Telecommunications | 75 | 100 |
| 62 | Computer Programming and Consulting Activities and other Related Activities | 50 | 75 |
| 63 | Information Services Activities | 50 | 75 |
| 64 | Financial Intermediation and Other Financial Services, except Insurance and Retirement and Pension Funds | 75 | 100 |
| 65 | Insurance, Reinsurance and Pension Funds, except Compulsory Membership Social Security Plans | 75 | 100 |
| 66 | Auxiliary Activities to Financial Services and Insurance | 75 | 100 |
| 68 | Real estate activities | 0 | 25 |
| 69 | Legal and Accounting Activities | 50 | 75 |
| 70 | Business Management Consulting Service Activities | 50 | 75 |
| 71 | Architecture and Engineering Services; Technical Tests and Analysis | 50 | 75 |
| 72 | Investigation and development | 75 | 100 |
| 73 | Advertising and Market Research | 50 | 75 |
| 74 | Other Professional, Scientific and Technical Activities | 50 | 75 |
| 75 | Veterinary Activities | 25 | 50 |
| 77 | Rental and Leasing Activities, except Real Estate, and Management of Non-Financial Intangible Assets | 0 | 25 |
| 78 | Activities Related to the Supply of Employment | 0 | 25 |
| 79 | Travel Agencies, Tour Operators and Related Activities | 0 | 25 |
| 80 | Investigation and Security Activities | 25 | 50 |
| 81 | Building Support Services and Cleaning Activities in General; Landscaping and Gardening Services | 50 | 75 |
| 82 | Administrative Activities of Offices and other Auxiliary Activities of Companies | 75 | 100 |
| 84 | Public Administration and Defense; Mandatory Social Security Plans | 75 | 100 |
| 85 | Teaching | 75 | 100 |
| 86 | Human Health Care Activities | 75 | 100 |
| 87 | Social Assistance Related to Health Care | 75 | 100 |
| 88 | Social Services without Accommodation | 50 | 75 |
| 90 | Artistic and Show Activities | 0 | 25 |
| 91 | Libraries, archives, museums and other cultural activities | 0 | 25 |
| 92 | Gambling and betting Activities | 0 | 25 |
| 93 | Sports and Entertainment Activities | 0 | 25 |
| 94 | Association Activities | 75 | 100 |
| 95 | Computer and Communication Equipment Repair; Effects of personal and domestic use | 0 | 25 |
| 96 | Other Personal Service Activities | 0 | 25 |
| 97 | Household Activities as Employers of Domestic Personnel | 0 | 25 |
| 99 | Activities of Extraterritorial Organizations and Agencies | 50 | 75 |