

Tracing Different Types of Local Economic Benefits of RIs: The Case Study of LHC



Leslie Alix and Johannes Gutleber

Abstract CERN is operating the world's largest particle accelerator complex in the world. The interconnection of versatile particle accelerators working with different particle beams at different intensities and energies continue to attract scientists and engineers from all over the world. The socio-economic effects generated by the presence of in the region are manifold. They include, but are not limited to consumer spending, real-estate investments and local business and services activities, investments in education, leisure activities and tourism, urban development and tax contributions. This chapter traces different local socio-economic effects of concentrating a large number of people around a research infrastructure.

Keywords Territorial benefits · Consumer spending · Local services · Research infrastructure · Socio-economic effects

1 Introduction

CERN is operating the world's largest particle accelerator complex in the world. The interconnection of versatile particle accelerators working with different particle beams at different intensities and energies continue to attract scientists and engineers from all over the world. While a large part of the scientific analysis is carried out by the researchers at their home institutes, scientists and engineers involved in the research programmes spend significant time at CERN, both to advance the scientific capabilities of the infrastructures and to learn about the possibilities that this infrastructure can offer to them. The presence of these people in the region

L. Alix (✉) · J. Gutleber
The European Organization for Nuclear Research (CERN), Geneva, Switzerland
e-mail: leslie.alix@cern.ch

L. Alix
French National Centre for Scientific Research (CNRS), Paris, France
Laboratoire d'Annecy de Physique des Particules (LAPP), Annecy, France

leads to significant consumer spending over sustained periods of time. The socio-economic effects generated by the presence of staff and project associated scientists, engineers, technicians, and early-stage researchers that “legally reside” in France or Switzerland, where the infrastructure is located, perform professional activities for typically one to three years in the region are manifold. They include, but are not limited to consumer spending, real-estate investments and local business and services activities, investments in education, leisure activities and tourism and tax contributions. However, these effects are not truly socio-economic impacts that the research infrastructure generates as compared to the capital and operation expenditures. Such consumer spending would occur with or without CERN, but without CERN they would occur in other regions and countries, where people reside and work, and would not necessarily be concentrated. Hence, the type of nationally, regionally and locally perceived benefits of the research infrastructure associated consumer spending is rather an economic transfer. This transfer eventually contributes to society’s wealth increase. This effect is, however, not the primary concern of this contribution.

In the first part, I will present the contribution of a large research infrastructure, such as the current Large Hadron Collider (LHC), to the local economy through consumer spending. In the second part, I will show examples of what socio-economic effects can be catalysed at local level by the concentration of personnel participating in a large research infrastructure.

2 The Contribution of a Large Research Infrastructure to the Local Economy: The Value of Consumer Spending

2.1 Background Data

First of all, it is important to define what we mean by consumer spending. The method used to estimate local consumption expenditure attributable to CERN’s research programmes is based on data from the national institute of statistics and economic studies (INSEE) for France and the federal statistical office for Switzerland (OFS), in particular on the so called “spending per consumption unit” [7] for persons living alone and the “household consumption spending” [5] for persons who do not live alone. We also consider data on the value of annual household expenditure for different income categories. Indeed, depending on income, the structure of consumer spending varies, creating disparities between consumer products [6, 8]. The categories of household expenditure considered here are as follows: food and non-alcoholic beverages, alcoholic beverages and tobacco, housing, water, gas, electricity and other fuels, furniture, household goods and routine maintenance of the home, health, Transport, Communications, Leisure and culture, Education, restaurants and hotels. As some expenditure is tradable goods and services (clothing and

shoes, miscellaneous goods and services), we deduct this amount from the household expenditure figures used in our estimates, as this chapter focuses on the national economic effects of consumer spending.

The annual reports on CERN’s personnel statistics [3] provide us with the basic data for estimating the effects of the value of consumer spending.

In total, in 2019, out of 14,000 active members at CERN, more than 8000 people live in France and in Switzerland. Due to the higher cost of living in Switzerland, 63% of them live in France and 37% in Switzerland. They usually live in the surroundings of the research infrastructure (most of them within a 40 km radius) leading to a concentration of expenditure at local level. Moreover, 39% of them are employed member of personnel by CERN and 61% are associated members, employed by their home institutes but living in the territory for a better proximity with the research infrastructure. We also have data on household composition (single-person or multi-person household), and income enabling us to estimate the spending according to the standard of living quintiles (Fig. 1).

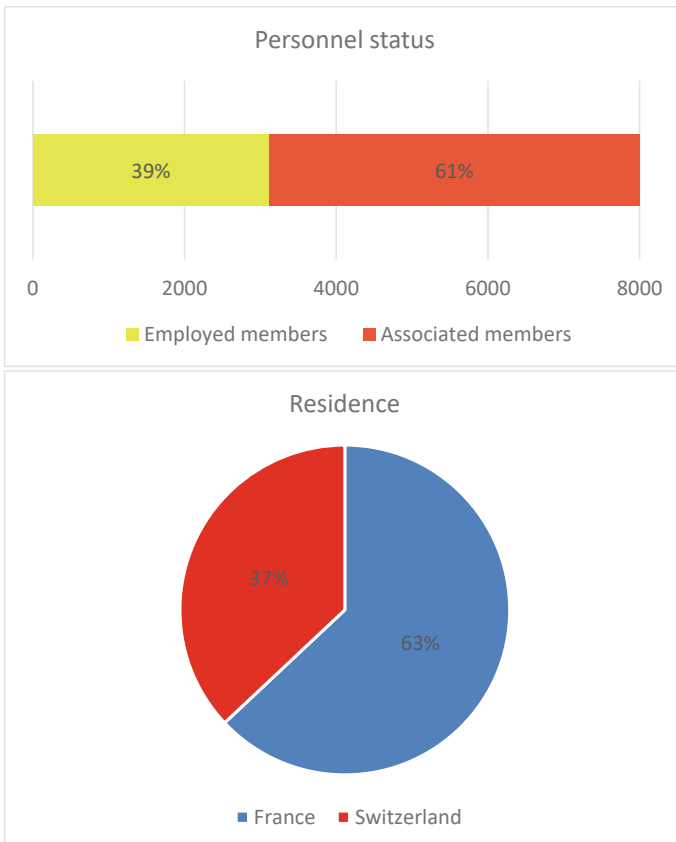


Fig. 1 Personnel status and geographical distribution of residence. Credits L. Alix

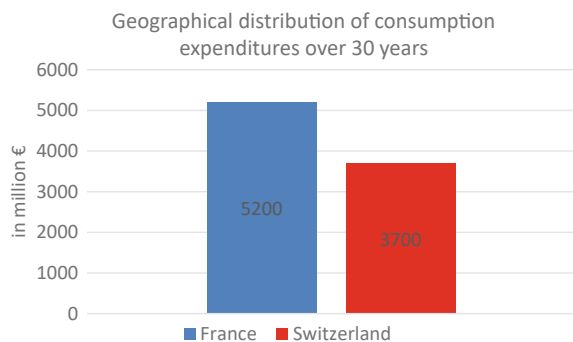
2.2 *Economic Effect of Consumer Spending Due to CERN and Its Main Research Infrastructure*

The reference period covers the LHC/HL-LHC programme with an operational timescale of about 30 years. This means that the 8000 people live in the territory and spend money during these 30 years. In the report on the contribution of the Future Circular Collider to the local economy [1], we have estimated that 8.9 billion euro (not discounted and price evolution adjusted) are spent in the local territory through the consumption expenditures of residents, which represents almost 300 million euro per year. As there are more residents living in France than in Switzerland, the spending amount is higher in France, but the difference is not too important given the much higher cost of living in Switzerland (see Fig. 2).

CERN has several scientific research programmes. Its flagship research programme with different experiments is based on the Large Hadron Collider (LHC). About 80% of CERN's total personnel are involved in its flagship programmes (the LHC and HL-LHC particle colliders). Indeed, not all members of staff work 100% on the particle colliders and their experiments, but they do ensure the smooth running of a platform for several programmes. Thus, staff working on particle accelerators generally ensure the operation and maintenance of all particle accelerators and technical infrastructures, including the particle collider and the entire chain of injectors needed to operate the collider. As an example, according to CERN's internal data, 20% of the staff work for experiments that are not linked to the main research programme, 24% work in sectors that ensure the smooth running of all the research infrastructures, including the particle collider, and 56% are attached to the particle collider experiments. This gives us 80% of people who are considered to be active in the infrastructures and experiments linked to the particle collider.

These 8000 residents are members of personnel participating in all CERN's research activities. To know the impact of a large research infrastructure such as LHC, one needs to consider the people only working for it, so 80% of them, which is

Fig. 2 Personnel status and geographical distribution of consumption expenditures.
Credit L. Alix



around 6400 persons. Therefore, on the 8.9 billion euro spent consumption expenditures, 7.2 billion euro are directly allocated to the LHC/HL-LHC research programme and the other to CERN in general.

This report only considers the amount of personnel spending, but the local economy is also fueled by the large amount of tourist spending coming to the region to visit CERN. It also does not consider the expenses of people working at CERN on a subcontracting basis.

3 Effects of Concentrating People Around a Large Research Infrastructure

As stated above, the concentration of people linked to a large research infrastructure produces multiple quantitative and qualitative socio-economic effects at local level, whether directly linked to consumer spending or not. I will list a few significant examples, but this list is of course not exhaustive.

3.1 Effects on Cultural Activities

An organisation hosting such a large number of people has a personnel association to represent them and facilitate the link with the territory. One of the most significant examples is the possibility to join organisation-internal or local clubs. Indeed, clubs offer sports, leisure and cultural activities, thus enhancing non-professional relations between CERN staff members and facilitating integration of them and their families into the local area. These clubs are also frequently used by non-CERN members which is a real benefit for the territory to offer cultural activities. The Staff Association is also in contact with local artists and offers both artists from CERN and from the local area the possibility to showcase their works at CERN. The concentration of people within a research infrastructure from different backgrounds makes it possible to organise conferences in a wide range of fields, benefiting both CERN staff and the local public.

3.2 Effects on Local Stores and Services

For the daily life of the people onsite, local services such as cafeteria and restaurant, accommodation, shop, bank, mobility offer, etc. are required. These services can be proposed directly in the campus or in the local area through subcontracting or partnerships.

As an example, there are three restaurants within the two CERN sites. Interviews with the restaurant staff allow to estimate an average of 2700 meals a day during the week and an average of 14 euro spent per meal. Then, around 650,000 meals are for sure provided a year with a turnover of 9 million euro per year for the local economy, just to meet the day-to-day needs of the personnel.

Another example is the accommodation offer. There are 3 hotels within CERN site, with a total of 423 rooms, an occupancy rate of 71% and an average price of 49 euro per room, open all year, it is assured a turnover of 5.4 million euro per year thanks to the concentration of the people within an area. These hotels are operated by sub contractors, but there exists also a residence located in Saint-Genis-Pouilly, a neighbouring commune in France, which has a partnership with CERN to reserve 151 on 260 rooms for CERN associated visitors. With an occupancy rate of 80%, this assures a minimum of turnover for the residence per year.

We can also mention the 12 fully furnished and equipped apartments, subleased by CERN, located in Meyrin and Grand-Saconnex in Switzerland. Moreover, a CERN website has been created where local landlords can post their accommodation offer. The concentration of the population and its housing needs have the effect of sustaining the local housing market including seasonal rental.

3.3 Effects on Local Public Transportation

The daily needs of people working at CERN are diverse. One is related to mobility, mainly commuting which requires an adapted local transport offer. Today, it is possible to go to CERN by bus and tramway which are linked to neighbouring French and Swiss communes. A survey launched in 2018 [2] has shown that 10% of the 4300 respondents use the public transport to commute every day, which represents at least 430 persons. 13% of them come by bicycle, i.e., 560 persons. These numbers are low estimates as many people working at CERN did not respond to the survey. The improvement of the local mobility offer, passing through CERN, is indeed a local actors' objective and the important number of people using the public transportation or environmentally friendly transport for commuting contribute to justify the improvement of the public transportation offer.

3.4 Effects on Public Services

Another socio-economic effect that we do not think of immediately is the improvement of local emergency services through CERN. Such a huge infrastructure concentrating a large number of people requires public services for the people onsite. A tripartite agreement between CERN, France and Switzerland on mutual assistance was officially signed in 2016 [4].

In the event of an incident in the area surrounding CERN or on CERN property, and if a request for back-up is required, CERN or the French or Swiss services can intervene mutually to help the services that need it. This is mutually beneficial, firstly in the event of an emergency, but also because on one hand, CERN and its fire brigades have very specific skills and equipment that local services do not necessarily have, and on another hand, because local services have more staff than CERN. For example, if there is a need for intervention related to radiation protection at Geneva airport, it is common for CERN to intervene at the airport, as it has all the necessary equipment.

In addition to interventions, this collaboration enables each party to benefit from the other's specific expertise through training. CERN, which specialises in chemical and radiological risks, has been able to train firefighters from Geneva and the Ain department in France, and the latter have shared their own skills with further fire fighting services. Other examples show that, thanks to the size of the CERN campus, large-scale training courses have been carried out on its premises, whereas it is usually difficult to find a suitable location for such courses.

CERN's emergency services employ 60 people, including 48 contract firefighters. As well as acquiring very specific technical skills, the international context of CERN also enables them to improve their mastery of foreign languages. Today, in the Pays de Gex in France, close to CERN, professional firefighters who have already worked at CERN stand out for their skills.

The tripartite agreement (one of the few in existence), has benefited both CERN and the region in terms of operations, training and career opportunities. This was made possible and relevant by the sheer size of the research infrastructure and the large number of people grouped together on the same area.

The list of local socio-economic benefits mentioned in this article is not exhaustive. CERN has also partnerships with local companies, local sport facilities and local cultural centres. We can also think about the needs for doctors, personal services, financial and legal services, or the local companies that have been created related to CERN's presence in the area. The presence of an important number of persons in a research facility contribute to increase and develop the residential economy, in terms of added value and employment added to an overall positive social effect.

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