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The Distance of Inclusion

Evaluating Education Policy Responses to the Covid-19 Crisis in Italy

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Chapter 1 - Introduction

1.1. Abstract

Lacks of professional training, ICT infrastructure, and digital assets: the provision of Public Education in Italy was profoundly challenged by the shift to Distance Learning prompted by lockdowns and school closures to face Covid-19. The substitution of in-presence attendance with virtual classes crippled schools' capacity to effectively supply instructional time, and imposed high participation barriers on students. A substantial amount of learning time was lost, looming disproportionately on disadvantaged students who lacked critical resources to access Distance Learning. Education sector's response to the first pandemic wave generated winners and losers, deepening educational inequalities and jeopardizing the inclusiveness of public schooling. Seeking to ameliorate this issue, the central government sponsored the distribution of digital goods to students in need through Decree Cura Italia*, although to little avail. This study operationalizes the combined effect of these elements on educational attainment, singling out the loss of instructional time linked to school closures, Distance Learning, and exclusion, and evaluating the effectiveness of contextual education policy's remedies between March and June 2020.*

1.2. The Distance of Inclusion: Evaluating Education Policy Responses to the Covid-19 Crisis in Italy

The ongoing pandemic of SARS Cov-19 marks a catastrophic event of unprecedented proportions in recent history, infecting and killing millions worldwide. The virus has shaken the everyday life of all countries, and its unrelenting advancement since early 2020 has forced governments to adopt lockdown and social-distancing measures with enormous exertions on all public sectors. Education suffered immensely from the health crisis: the imposition of lockdowns and quarantines has forced schools and universities to remain closed for nearly eight weeks in at least forty developed countries, keeping millions of students away from their classrooms and critically unsettling access to learning opportunities. To offset these processes, a globally shared policy strategy saw the activation of remote distance learning arrangements mainly hosted on ICT channels, mass medias, and communication networks (OECD 2020b). However, this was easier said than done in implementational terms. As the first western country hit by the pandemic in the European continent, Italy and its public education system were affected with particular intensity; the first week of March 2020, when infection clusters in the densely populated Northern regions began to increase exponentially, all schools on national territory were closed until the scientific committee called to manage the crisis could ascertain the safety of all involved actors before reopening educational facilities; in the meantime, the Central

Government ordered by means of Presidential Decrees the adoption of alternative forms of teaching provisions, thus introducing *Didattica a Distanza*, or *DaD*, (hereon translated and referred to as Distance Learning or abbreviated in *DL*), a form of remote learning which primarily hinged on virtual classes held through web-based platforms (PCM 2020a; 2020b; MIUR 2020b). The experience was entirely new, with little to no contextual preparation for both providers and recipients available beforehand; students and teachers had to hastily adapt to an unknown educational environment, with its own sets of practices, methodologies, and requirements. Inevitably, DL proved an extremely challenging effort for both educational providers and recipients throughout its deployment, and its haphazard implementation enticed a substantial and diffused loss of competences and skills' development for students. The paradigm of Educational Losses related to Covid-19 in Italy has yet to be exhaustively explored, despite constituting a key resource for the development of future school reforms aimed at recovering it.

It is argued that an inevitable consequence of DL was shifting the burden of access to educational opportunities on students' households. However, as individual endowments of children and their families mediated such opportunities, the effectiveness of teaching and learning, societal reach of educational provision, and equitable access to schooling services were critically harmed. In light of this consideration, the presumed effect of school closures and DL affected everyone, although not with the same intensity: for those excluded by remote learning arrangements, substantially greater losses are to be expected. Pedagogic and Sociologic literature underscores the importance of school attendance and direct students' engagement with learning activities (Lavy 2015; Gromada & Shewbridge 2016), and the sacrifice of such opportunities in emergency responses to Covid-19 anticipates an ominous prospect of foregone developments of valuable skills, knowledge, and competences pivotal to future economic and social stability.

Limitations in DL's effectiveness were driven by few key-issues undermining its adoption. The lack of previous preparation was a fundamental aspect: first, teachers had limited familiarity with the new teaching tools at their disposal, which severely hampered their effectiveness in putting the available platforms to use; in combination with delayed or missing guidance coming from the Ministry of Education, the initial approach with DL saw teachers struggling with digital devices and connections, the adoption new methodologies that did not merely replicate teaching practices conventionally used in in-presence learning, the configuration of new programs harmonized between colleagues and intended curricula, and the satisfactorily insurance of students' involvement and motivation in DL. On the opposite end, central governments' adoption of DL did not consider the availability of tools to access it; in the following days from the designation of remote-learning modalities, it became clear

that many students from disadvantaged areas and social strata lacked the fundamental digital assets to partake in virtual classes, with trade unions, pedagogists and families pointing out a profound digital divide across the country (FLC CISL et al. 2020)). Reportedly more than a tenth of students in compulsory education did not have a PC or tablet at home to follow lectures or complete assigned homework; and about 57% of those who had them had to share with other family components engaging in smart working or siblings in DL (ISTAT 2020a). Because of this, the deployment of DL challenged the system and created educational losses, especially for those from disadvantaged households whose lack of necessary digital assets materially prevented engagement with remedial educational opportunities.

The government did not stand idle to this reality, and as part of a broader policy response to the pandemic hardships, in Law Decree *Cura Italia* (DL 18/2020) it directed €85 Million to distribute across the school system, urging individual institutes to provide digital devices and connections to less endowed students. By means of gratuitous leases, students in a condition of deprivation could avail of said assets for the duration of DL. While later it is argued that the effectiveness of this distributive measure was limited in terms of the satisfied demand vis-à-vis the quantities emerging from needs assessment analysis, DL 18 was the last direct measure targeting schoolyear 2019-2020 since following interventions prioritized the reopening of schools in September 2020. As such, it is possible to evaluate the collective package of enacted policies in support of the education system at the onset of the pandemic crisis and verify the nominal substitutive capacity of DL on conventional schooling.

The following analysis advances two fundamental inquiries. A first hypothesis holds that the activation of DL in the first pandemic wave inadvertently generated winners and losers in the demand-side of education, and that specific groups in terms of geography, social status, and position across educational paths have suffered relatively larger losses; while policy efforts and advocacy from interest groups confirms the preposition, it would be more useful to understand the intensity of such phenomenon on educational development. In theory, a reliable picture of the observed effects on students' performance will emerge with the oncoming publication of standardized surveys on educational attainments as carried out by the competent national authority in this respect, the National Institute for the Evaluation of the Educational System of Instruction and Training (INVALSI). Nevertheless, the impossibility to conduct countrywide tests during school year 2019-2020 prevents a precise analysis capable of singling out the first pandemic period, that is between March and June 2020, and the efficacy of Education systems' early-response measures to the crisis. To accommodate this critical lack of data, a different approach is hereby proposed. If there is no manner of observing

educational losses through performative gaps, which are usually the policy outcomes sought by international studies on educational achievement (OECD 2020b), shifting the focus on what the education system could provide, and by extent what it could not, is a viable option: after all, the main historical, practical, and effective channels of schooling and transmission of knowledge is the delivery of teachings in a formal class context (OECD 2004). As more than a century of pedagogic and sociological literature underlines, time spent in education and more specifically in direct reception of knowledge and contextualized skill-development opportunities strongly relates to human capital development and societal cohesion (Scheerens 2014; Rocque et al. 2017), prerogatives that for centuries have pertained to school systems and to governmental apparatuses overseeing their administration. Observing the disruption of educational delivery caused by Covid-19 and the limited substitutive capacity embodied by DL in the continued provision of Instructional Time allows to estimate how much of the school year has been lost, and who was affected with most intensity. Availing of statistics and studies on the pre-pandemic digital endowments of Italian households, it is possible to gauge how many students were excluded by DL and their geographic location, then confront these findings with the regions at highest educational risk before the pandemic to assess how much educational inequality originates from policy responses to it. Second, in light of the net loss of instructional time linked to the combined effect of supply-side reduction of class times and by demand-side lack of access to the assets required by DL, it would be particularly useful to gauge the effectiveness of Decree Law *Cura Italia* in assisting families in need and its capacity to mitigate losses in instructional time throughout DL in the first pandemic wave.

The designated methodological approach thus combines normative sources at both central and regional level for the quantification of Instructional Time planned for every school year, in every region and educational level, and according with the number of students pertaining to that territory and position in the school system; this estimation represents the baseline scenario for the quantity of educational goods that would have been provided, in theory, had the pandemic crisis not emerged. Then, using quantitative and qualitative sources on teaching practices and methodologies adopted in DL, an approximation of delivered Instructional Time is then confronted with the baseline scenario, where the difference between the two measures represents the net educational loss attributed to school closures. Moreover, through the available data on pre-existing digital divides in Italy an estimate of students in digital deprivation is drawn; calculating the distribution of such students in each region and type of school enrolment, the absolute number of lost hours is then subtracted to the Instructional Time delivered. The final outcomes of this process portray on the one hand the entity of educational losses experienced by the system in spite of DL, and on the other quantify in equal terms the intrinsic consequences of shifting responsibility over access to education opportunities on family endowments,

social status, and geography. Results indicate that the disruption of the school year's program hovers around the threshold of 25% in nearly all Italian territories and educational levels, and that the fruition of DL arrangements was severely unequal across regions, with a large portion of students in Southern regions being outright excluded from remedial education policies due to a lack of fundamental information and communication technology (ICT) assets.

Building on the same datasets and later technical reports of Decree *Cura Italia*, it is then possible to appraise the effects of the distributive policy in granting access to DL to those who would have been otherwise excluded, and the consequent reduction of net educational losses. Combining results from *ex-ante* needs assessments and *ex-post* policy evaluation, the intervention has worked, yet managed to cater only to a minor part of the projected demand. Issues in terms of procedures for the allotment of funds emerged, although other relevant obstacles were posed by the limited resources deployed at the start combined with short timeframes for intervention and not equally rapid implementation times. It is evidenced here that despite the limited factual impact of central governments' measures, the enactment of distributive policies is extremely challenging due to shortcomings in preparatory arrangements; when looking at policy efforts aimed at the reopening of schools in the following schoolyear, the approach was substantially more intense.

The quantitative analysis proposed, for one, relies on data available almost exclusively before the Covid-19 pandemic, showing that an *ex-post* evidence-based approach would have, to an extent, anticipated the nature and intensity of the challenges that surfaced, and inform either pre-emptive, additional, or alternative courses of action. In parallel, the study avails of an extraordinary policymaking context to test new methodological designs for the appraisal of educational losses. With the substantial shift of educational access's burden on families that stemmed from DL, it is more than ever crucial to ask what the education system does to offset latent inequalities when the levelling ground played by schooling environments is thwarted, and how to maintain the analytical focus on common institutions rather than individual capability prospects. The ambition is then to contribute to ongoing literature's discussion on Instructional Time as a proximate measure for both educational inputs and outputs on the supply-side and verify in the long run whether inputs originating from the education system act as equalizers of life opportunities. Finally, an enticing prospect at the core of the object of study was filling vast information gaps with regards to Distance Learning in the first pandemic wave. A broad network of governmental organizations and interest groups have conducted studies before, during, and after the first pandemic wave to individually understand the interconnective elements that influenced the realized deployment of virtual learning: studies on Digital Divides (ISTAT 2019; 2020a), educational attainment differentials (INVALSI 2019),

teaching practices in DL (INDIRE 2020a; 2020b), rates of exclusion from it (CENSIS 2020), as well as qualitative interviews on students', parents', and teachers' experiences (AlmaDiploma 2020; CNEL 2020; Scuola.net 2020) have been conducted. Nevertheless, few attempts to combine such fragmentation of information in an extensive policy context have yet emerged. As such, the introduction of datasets capable of harmonizing these elements is essential to grasp a cohesive picture of what happened in the education sector and how the emerging issues have been dealt with.

The study is structured as follows; after this introduction, Chapter Two is split in three subsections: first, a theoretical framework overlooks the historical and sociological importance of Education and schooling in societies, underlining its role as both a functional precondition for societal cohesion and a public good that societies ought to produce, briefly taking consideration on the effects of education as a driver of individual and collective development. The discussion then moves on schooling, and more specifically on attendance, as a determinant component of educational attainment; here is advanced the preposition that school closures due to Covid-19 have exerted an negative effect on the development of skills and competences, using foregoing literature on the effects of summer breaks on individual attainments as a theoretical proximate of closures. A brief overview of the institutional actors and practices involved in the quantification of educational losses is proposed, which facilitates a transition to the formal definition and logical implications of the measure that is used throughout the study: Instructional Time. The second subsections instead contextualized the pre-existing context of the Italian Education system and its population's characteristics with regards to their capacity to embrace DL; the organization of the Italian decentralized administrative system in education is addressed first, followed by an overview of the organizational structure of public schooling and its reality in the national context. The issue of digital divides and their relative intensity in the country is also introduced as to provide a complete framework of pre-pandemic conditions directly related to the adoption of DL. The Third subsection encompasses the eruption of Covid-19, the emergency response that led to the activation of DL, an overlook of the systemic difficulties in enacting it, and finally the introduction of remedies through Law Decree 18. After the contextualization of the policy environment setting the policy background of DL and *Cura Italia*, the Methodology for the calculation of their combined effects is presented in Chapter Three; this section explains the formulas used for the estimation of Instructional time, the main variable adopted for the operationalization of educational losses, and the most relevant methodologic shortcomings linked to data selection procedures and interpolation of variables. Subsequently, the outcome of these processes is presented in Chapter Four, where Results of data elaboration report the main quantitative findings of the study in terms of delivered, foregone, and safeguarded instructional time through Decree Law *Cura Italia*; these observations are then

discussed in Chapter Five, where they are crossed with other qualitative datasets from several sources seeking to shed further and more focused light on the substance and validity of the findings; also, alternative policy paths are briefly addressed in the second part of the chapter, drawing on the strategies adopted in the Netherlands for Covid-19's education policy. Finally, conclusive policy suggestions and considerations are advanced in order to contribute to further discussions on sectorial interventions.

Chapter 2 - Theoretical Framework

2.1.1 Historical and Theoretical Foundations of National Education Systems

Education plays an essential function in all states and societies; across the entirety of history nearly all economic, political, and social actors capable of exerting an influence on state-societies pursued the introduction of methods of popular acculturation and learning; this process, from an institutional perspective, culminated in the 19th and early 20th centuries when modern states managed to establish articulated and far-reaching administrative institutions and fully take helm over the provision of essential social services in the new-born concept of welfare states and systems (Mundy et al. 2016). Along many other sectors, such as pensions systems, security nets for the disadvantaged and public healthcare, education was a fundamental element in the organization of societies, and the instatement of schooling and compulsory education became an infrastructural staple that Western states extended to their colonies around the world. Two main streams of argumentation have underlined why education is important and its provision as a public good desirable, one focusing on its socializing function and the other the economic benefits originating from the development of human capital.

From an historical perspective, education is a fundamental channel for the transmission of core societal values across generations. In the famous formulation of the AGIL paradigm, sociologist Talcott Parsons identified Latency, that is the deliberate mediation of constitutive values, ideas, and determinants of social identity and citizenship as necessary tasks that societies need to perform in order to ensure their intergenerational survival (1951). There broadly two arenas in which this process takes place in practice: on the one hand, the private dimension of the family nucleus simulates an inner court of society in which ascribed roles of authority and individual functions necessary to the running of the household constitute a microenvironment through which information and identity trickles down from parental figures to the offspring; and indeed, in the times before open and democratic societies education was historically a prerogative curtailed within the family, which provided notions of socialization and hierarchical structures in an inertial society with extremely rigid roles and positions (Parsons 2008). With the opening of societies and the creation of state administered school systems, central governments could counterbalance the primacy of domestic education with the provision of teachings delivered and mediated by centrally regulated institutions, which determined the moral, cultural, and political development of the nation (Durkheim 1922); through this channel, the state could finally construct identities of citizenship, from *"the responsible citizen, the diligent worker, the willing taxpayer, the reliable juror, the conscientious parent, the dutiful wife, the patriotic soldier, and the dependable or deferential voter"* (Green 1994, 10). A

fundamental contribution of comparable logic lies in the critical theory of "cultural reproduction" advanced by Bordieu, in which education serves as an instrument to guarantee that patterns of social domination within societies persist through time; a dominant culture embodied by the class in power is imposed on the lower strata of society, and education serves to conveys the implicit notion that belonging to that culture is preferable. This creates disadvantages for any part of society that must adapt vis-à-vis those who are born into it, and perpetrates inequalities in life opportunities and social destinations between dominant and dominated classes (Bordieu et al. 1977).

Bordieu's theory antagonizes a second traditional argument concerning the development rationale for systems of public education: that is its historical interpretation as a driver of economic development. The notion that in practice the first providers of education aimed to prepare the available workforce for the increasingly technically driven product line of the second industrial revolution is hardly contestable. With the sophistication of productive technology followed higher technical skills and knowledge to operate capital machinery and face rapidly growing rates of market competition. In fact, when countries achieved relatively stable societal cohesion, especially in the context of the globalized world of the second half of the 20th century, the focus of education policy shifted to the enhancement of competitiveness in international markets (Carnoy et al. 1999). Access to education and other forms of professionalization has for long been considered, oftentimes controversially, a pivotal mechanism driving life opportunities in terms of wage, income, and social destination, and a critical meritocratic infrastructure to counteract social inertia related to family and parental background (Brown et al. 2013). With the advent of a highly competitive world economy the configuration of education policy became a domain of supranational interest, and highly influential institutions such as the Organization for Economic Cooperation and Development (OECD), The World Bank, The European Union (EU) and the World Trade Organization (WTO) amongst others, entered the stage to support and inform central governments in pursuing policies aimed at increasing the productivity and specialization of liberal countries' students in sight of their entrance in a challenging world labor market (Mundy et al. 2016). By no means does this imply that legislative competences over education policy now lie outside of central governments' remit; for instance, in Italy the administration of the national curricula and organizational structure of the schooling systems is an exclusive central-government domain to which even the strongly autonomous regional administrations subside. Nevertheless, the influence of international actors has pushed education reform in specific directions: the standardization of the evaluation system, the rationalization of education spending through administrative deregulation, and a gradual curricular shift towards the development of skills demanded by international markets, are just few examples of the economic relevance played by the sector, and by extent by its respective policy domain (Landri 2014).

Since education is so central to both the socialization of a nation and for the development of its human capital and life opportunities, it is necessary to identify the constitutive channels through which its delivery is carried out. If education is to be understood in terms of goods created by a public institution, it is crucial that the intended recipients are there to receive it. For this reason, exposure to learning opportunities and environments not only is a necessary element of educational development, but it is also the most important (OECD 2004). For centuries, schools and universities have physically embodied the notion that education has a space and time, and that learning ought to take place in conducive contexts, where professional authorities with ascribed roles create and distribute educational goods. This process of delivery of teachings on educators' side and learning on students' is conventionally understood as the main asset of education, and foregoing literature consistently and positively relates exposure to such instances to students' achievement, skills development, and overall learning (Bonal & Gonzales 2020). Parallel sociological research on students' educational attainments demonstrate that attendance exerts substantially stronger positive effects with respects to other variables such as school environment and teacher behavior (Scheerens 2014).

Conversely, foregoing school attendance and exposure to learning opportunities negatively affects pupils' capacity in a variety of domains. First, the development of cognitive skills, knowledge and competences is impinged with school absenteeism, which will in turn associate to a lack of qualifications in the labor market and by extent worse employment opportunities (Salzer & Heine 2017). Second, this effect is even larger in terms of behavioral development, as research consistently demonstrate that young absentees develop poorer risk-orientations in lifestyle choices, manifesting greater rates of early-age delinquency, drugs abuse, sexual behaviors, and unemployment in later life (Henry & Huizinga 2007; Rocque et al. 2017); this is also intrinsically reflected through the fact that with higher truancy rates come higher propensities to abandon the educational career, with the consequences underlined in the first point. Finally, the socializing function exerted by school environments allows students to assimilate fundamental societal values, norms, habits, customs, and other understandings of the relational mechanics at the core of ordered social life, which lack thereof negatively affects the probability of successful insertion in socioeconomic dynamics.

Attendance, and more specifically participation in the learning opportunities offered by the education system, is crucial to both individual and collective social development. With Covid-19, lockdowns, and school closures the typical contexts for the enactment of such processes have been discontinued, and conditions of learning therefore changed and diminished. This presumes that a measurable loss of educational opportunities has occurred, in the sense that the interruption of classes and the disruption of conventional learning environments have halted a process of cognitive, social, and skill-

development that would have been otherwise observed in previous schoolyears. It is thus necessary to grasp the effects of periodical interruptions of schooling on students' educational development.

2.1.2 From Summer Slides to *Ex-Post* Assessments: outlining approaches to Educational Loss

A prosper tradition of studies on the educational losses deriving by prolonged absence from school environments has been established by sociologists of education and pedagogists. In fact, the systematic alternation between educational and resting periods when students stop attending classes has received much attention and developed in the fundamental concept of the *Summer Slide*, that is students' loss of academic achievement and learning during summer vacations (Alexander et al. 2014). The nature of this proposition had been advanced as early as the beginning of the 20th century (Garfinkel 1919), although thorough exploration across the following decades opened the path for the study of seasonal effects on learning. Simply put, the fundamental idea is that educational achievement typically slows or declines in concomitance of summer months, when school attendance is subject to long hauled interruptions; that declines tend to affect more strongly mathematical skills rather than literacy; and that the proportional entity of losses becomes more significant in upper school grades (Kuhfeld & Tarasawa 2020). While there is general agreement on the existence of this phenomenon, efforts to quantify the entity of losses in educational attainment have elicited mixed results; attempts at comparative research indicated that declines may constitute up to a one-month net loss at equivalent grade level, although their intensity varied greatly according to vast array of variables, among which students' characteristics, length of summer vacations, school environments, and performance of non-curricular activities related to educational skills during holidays (Cooper et al. 1996; Quinn et al. 2016). For the moment, the main takeaway is that the interruption of schooling activities elicits a negative effect on students' abilities, that the entity of such decline becomes generally more pronounced with longer vacation periods, and that decades of empirical research corroborate the validity of these findings.

Another fundamental contribution comes from the discipline of Sociology of Education, which further analyzed the social mechanisms directly and indirectly addressed by school systems; more specifically, a great degree of attention has been directed at the possible equalizing effect that education can exert on heterogenous and plural societies, often understood in terms of private property endowments, ethnic origins, religion, gender, and a variety of other characteristics linking identity to social status; following a pioneering study by Downey and Von Hippel, the preposition that schools constitute society's "Great Equalizer" has become a cornerstone of sociology of education's literature; through the analysis of seasonal dynamics of school attainment, it emerged that

school attendance and activities effectively reduces the horizon of educational inequalities related to social background (Downey et al. 2004). Building on the theoretical phenomenon of the Summer Slide, the study observed variance in school tests' performance during schooling periods and holidays, confirming that total performative gaps between students of different social origins widen when away from class and reduce when attending lectures. Although the entity of the reduction can occasionally prove negligible, it is crucial to point out that the equalizing function of schools lies in their overall effectiveness in mitigating the rate at which disparities would grow when outside of school. In 2016's replication of the study the conclusions of the first iteration were confirmed, although it also emerged that the compensatory effects of schools seem to attenuate in later years and that mathematical skills are more strongly affected (von Hippel et al. 2018). A general tendency to advocate for decline-mitigating educational programs to be held in summer emerges across studies on seasonal learning (Cooper et al. 1996; von Hippel et al. 2018); provided that attendance rates are consistent, organization is effective, and teaching personnel is adequately qualified, a partial prevention of the summer slide ought to be reasonably expected. This does not necessarily imply that the intensity of the decline for disadvantaged students would be more significant were they not to partake in summer programs; nevertheless, such initiatives constitute viable opportunities to pursue efforts at levelling educational differentials through the prevention of low-achievers' susceptibility to the summer slide.

The saliency of this preposition is evident when considering the aggregate impact of Covid-19's first wave on school closures: if Italian students are to be considered effectively withdrawn from formal educational opportunities from the beginning of the pandemic with no interruptions to the beginning of the following school year, it can be advanced that the duration of the summer slide doubled. Arguably, the adoption of DL prevented this preposition from becoming a factual reality, although some considerations in this regard are of concern; on the one hand, it is still difficult to estimate the degree to which the delivery of learning in unprecedented and unfamiliar educational contexts compares with more traditional methods. While the general premises of DL are far from a recent educational practice, the diffusion of relative teaching practices was critically side-lined before the crisis, especially at lower grades (Stringher et al. 2020). As such, it is difficult to quantify the extent to which the lack of Italian teachers' previous training has affected the transmission of knowledge at a qualitative level equivalent to in-presence classes. By extent, understanding how and to what extent DL ameliorated educational losses due to foregone educational opportunities becomes an arduous endeavor. The same hardships do not apply for those who did not participate to DL at all, as for them exposure to learning environments ceased with the first Presidential Decrees in early March and did not reoccur until the beginning of the new school year.

A valid counterpoint to this preposition is that most likely, DL attendance did not cease abruptly, but resulted from a compound of unavailable resources, motivational variables, and lack of clarity as to if, when, and how in-presence learning would resume. Whereas official figures for those excluded by DL are not available, results from a wide array of studies and surveys allow to estimate the size of the population that either lacked the necessary instruments to access DL. Assuming that these individuals did not abandon school permanently, but simply found themselves unable to cope with pure DL in the context of the first wave, they re-entered educational opportunities in the wake of schoolyear 2020-2021 in September. In that case, however, the Summer Slide effect spanned over double the normal period foreseen by the Italian education system. Employing the same models presented by the aforementioned literature, a study by the Northwest Evaluation Association (NWEA) estimated the effect of mid-March to September school closures on US students; pupils from grade 3 to 8 (thus between 8 and 14 years old) are expected to preserve about 70% of the learning gains in reading. However, less than 50% of mathematical skills matured during the 2019-2020 school year would endure until September's reopening, with even more intense effects on students at higher grades (Kuhfeld and Tarasawa 2020). Nevertheless, these projections need to be approached cautiously; on the one hand, the study lies on the assumption that schools did not provide any form of remedial instructional activities to be conducted during the physical closure of schools. As such, the results presented depict an absolute worst-case scenario in which the possibility of mitigating factors is completely excluded; the reality observed in Italy and other European countries, however, show that through the activation of DL and proximate education policies an effort was put in place irrespectively of its alleged efficacy (Bonal and Gonzalez 2020; OECD 2020b). On the other, it would be useful to recall that the study covers exclusively the US schooling context, which curricula, administrative structure, pedagogic practices, and characteristics of the students' population may differ significantly from Italian, or even European parameters.

While NWEA's study is a relevant resource to grasp the potential effects on those marginalized by DL, other research attempts focusing on European contexts may result more representative of the Italian experience. Recent research in the Netherlands, for example, has already proved successful in appraising the effects of school closures due to the first pandemic wave, as well as keeping due account of the implementation of DL. The Dutch government ordered the closure of all school on March 16th, irrespectively of grade or territory (Rijksoverheid 2020). After eight weeks of partial lockdown, primary students returned to classes by mid-May, whereas secondaries did so at the beginning of June; in effect, closures lasted 8 and 10 weeks for each educational level, respectively (Hoekman et al. 2020). In the meantime, school activities continued through the activation of DL arrangements until in-presence activities could be resumed. The sampled students' population

covered children aged between 8 and 11, representing the later years of primary education (OECD 2019a). From the measurement of their achievements in the post-DL period, it emerged that pupils were subject to an overall educational loss of 3% compared to the baseline scenario from previous schoolyears unaffected by unforeseen closures. The entity of the loss, however, notably increased for students pertaining to lower socioeconomic strata, with a slide of up to 6% (Engzell et al. 2021). There is an evident mismatch between the projections of NWEA's estimates and the results registered in the Netherlands; again, this can be attributed to the very different conditions analyzed by the studies, as the enactment of remedial educational policies, different organizational structure of school systems between the countries, and most importantly, substantially longer times of foregone educational exposure projected by the NWEA evidently played an important role in determining final results. A valuable contribution from research in the Netherlands lies in the estimation of DL efficiency in acting as a substitute for conventional in-presence classes, as the study reports that virtual learning environments operated at about 50% efficiency compared with learning in presence.

It is important to consider that the pandemic and educational circumstances of one country will not necessarily reflect another's, and contextualizing the Dutch experience is a necessary step before drawing conclusions scalable to the education system in Italy. First and foremost, the time and duration of school closures in the two countries is not directly comparable, as policy approaches to pandemic containment differed greatly. The Italian central government opted for two months of national lockdown before the easing of containment measures and encompassed extremely restrictive interventions through closure of all non-essential businesses, public spaces, and event venues, as well as the prohibition of all movement outside of one's domicile if not motivated by absolute and certifiable necessity (PCM 2020b). While similar overall measures were adopted nationally in the Netherlands, a more lenient approach was preferred, allowing family visits and unrestricted walks outside under the condition of thorough respect of social distancing (Rijksoverheid, 2020). Furthermore, a critical difference lies in the fact that whereas in Italy schools closed in early March and did not reopen afterwards, the Dutch system of education readmitted students from primaries on May 11th and from secondaries on June 1st until the end of the school year, typically occurring between the first and the third week of July in accordance with regional arrangements (Hoekman et al. 2020); by consequence, students managed to attend six weeks of in-presence classes after the national lockdown, which increase to eight in the case of the population sampled by the study. Conversely, due to the fact that Italian students begin their holidays by mid-June, no mitigating resumption of learning in presence was enacted (European Commission/EACEA/Eurydice 2018). In short, not only are Italian pupils comparatively more affected by Summer Slides under normal conditions than their Dutch counterparts, but the effects of school closures tied to the pandemic

emergency were exacerbated by the lack of reopening days before the end of the school year. It is reasonable to expect that a study adopting such an approach to the Italian context would inevitably demonstrate a larger loss of educational abilities than in the Netherlands. Secondly, as both countries resorted to DL arrangements during lockdowns, their respective capacities in adopting and adapting to remote learning environments are of critical import. According to EU surveys, the Netherlands are among the top performers in diffusion of broadband internet connection, availability of devices at home, and accessible virtual-learning environments provided by school institutions; conversely, the dissemination of digital platforms and devices in Italy ranks in the lower-middle group of European countries (Gromada & Shewbridge 2020). While these variables will be discussed at length in subsection 2 and 3 of this chapter, it is sufficient to point out that Italy and Netherlands started from very different endowments in digital infrastructures, and that adaptation to DL in the latter country plausibly resulted less problematic than in the former. By no means does this discredit the validity of the findings of the study, or its design; once official data on educational attainments after the first pandemic wave will be available, replicating the study on the Italian context will allow to exhaustively portray the effects of national school closures on students' performance, as well as provide figures of the operative efficiency of the DL policies adopted. The situation proves however direly complicated in this regard.

As such initiatives require the extraction of vast datasets, the prerogative of measuring educational attainments, and by contrast, educational loss, usually falls within the institutional capacity of national agencies, international NGOs, think-tanks, and other organizations of comparable scope. In Italy, the previously mentioned INVALSI is the designated public authority tasked by the Ministry of Education with the assessment of the schooling system: students' educational attainments and dropout rates, the administrative efficiency of institutes, their capacity to generate added value, as well as the assessment of their headmasters all fall under the scrutinizing authority of the organization (Landri 2014). Furthermore, INVALSI is the direct referent institution curating the country's participation in international studies on education, typically conducted under the sponsorship of the OECD or European Institutions. Although the prerogatives of the institute are multiple, its chief activity lies in the yearly measurement of the learning outcomes of Italian students through standardized tests to be held for all classes attending either 2nd, 5th, 8th, 10^{th,} and 13th grade (INVALSI 2020b). INVALSI tests cover pupils' skills and aptitude in three subjects: Italian language, Mathematics, and English language, which partly coincide with the competence areas of interest covered by the OECD's PISA (OECD 2019a). Tests are administered to every institute's classes, feature identical contents for each grade at national level, and most importantly, are not considered part of the curricular evaluation regime, meaning that students do not receive a curricular mark, corrections, or any form of feedback

on their performance. Tests are also anonymized, and do not constitute formal evaluative stakes for students. Unfortunately, administering the tests has rarely been an uncontroversial process due to the antagonisms of teachers, headmasters, and trade unions, who identify in the notion of standardization and regulatory objectivity a subversion of the broader educational mission to the whims of capitalist markets, a gradual impingement of professional autonomy, subservience to external actors, or even an instrument to deepen social and educational inequalities through the creation of a reward system for better performing schools (Landri 2014). This unrelenting opposition has led to countless demonstrations against the institute and the tests over the course of the years, as well as outright boycotts of the administered examination through the purposeful invalidation of data (Millozzi 2014; Pagani 2016).

The significance of the data registered by the Institute cannot be stressed enough. At the simplest level, test results allow to regularly monitor the state of the educational system in terms of its capacity to provide the intended outcomes, or as evocatively stated by the organization, "*offer (...) objective elements to evaluate the health conditions of the educational system*" (INVALSI 2010, 9); it is evident that the standardization plays a fundamental role in ensuring reliability of the information extracted. By consequence, examination outcomes permit the understanding of the progression of knowledge and skills across school years, territories, and individual institutes, singling out problematic realities on national territory and providing invaluable information for the formulation of appropriate targeted intervention. By the same token, virtuous schools emerge from the analysis of evidence, allowing for the identification of best practices and the diffusion of innovative educational or managerial strategies. In the context of the Covid-19 pandemic, INVALSI tests would be the ideal tool to capture with precision the effects of the national lockdown on the educational system, in similar fashion to the Dutch study mentioned above. Unfortunately, this was not a possibility for the school year affected by the first pandemic wave; the adoption of national-level restrictions in fact took place in the very days of the scheduled administration of the examination (INVALSIOpen 2019; PCM 2020a). Only a minimal portion of the 13^{th} grade, that is the last year of upper secondary, managed to participate in the test, as the other grades observed by the INVALSI are usually examined later in April and May; even so, most sampled upper secondaries remained unable to proceed before the beginning of the national lockdown, and the successive adoption of DL. Despite initial attempts from the Institute and the MIUR to postpone the dates of tests' administration to the reopening of schools, this was not the case as students never returned to their classes (INVALSI 2020a; MIUR 2020e). Eventually, INVALSI measurements for schoolyear 2019-2020 were dropped entirely (Stringher et al. 2021).

The institute auspiciously managed to organize a round of evaluations for school year 2020-2021, which will effectively allow the appraisal of the aggregate effects on educational achievement for the two pandemic years affected by the disruption of traditional schooling practices. To a secondary degree, it could also help assessing the effectiveness of pure DL, or even the hybrid Digital Learning integrated with in presence school attendance vis-à-vis traditional in-presence learning. The publication of the report will allegedly occur between July and September 2021, and finally deliver long anticipated information on the status of the system. Nevertheless, while this effort will be the first official publication from an institution with direct competence on the matter, the implicit aggregation of schoolyears 2019-2020 and 2020-2021 will prevent a detailed *ad-hoc* analysis of the intensity of measures adopted in significantly different pandemic scenarios. Broadly speaking, the disentanglement of DL from Digital Integrated Learning, pertaining to the first and second pandemic waves respectively, together with the discontinuities of school closures and openings in the multitiered system of regional pandemic emergency, are unlikely to be captured in full by INVALSI measurements. Ultimately, obtaining data relevant to the particular framework of the present study, that is school year 2019-2020 and the first wave, will not be possible simply because they were never gathered in an isolated framework.

2.1.3 Instructional Time: An operative definition and study applicability assessment

Given the circumstance, all pertinent research lacks the extremes to quantify the effect school closures on education, at least in terms of conventionally used variables measuring students' test scores. However, an alternative emerges when considering literature on loss of education attributed to discontinuities in instructional time. For instance, Lavy compared variations in PISA scores between schools and students to estimate its effects on performance, confirming that the time that students spend in class does exert a positive and significant impact on test scores (2015). Analogous conclusions were likewise reached by Rivkin and Schiman, who also advanced that the organizational characteristics of institutes and educational environments affect returns to additional instructional time (2015). Whereas most of the research mentioned before hinged on PISA scores to estimate the effects of external variables, it can be surmised that the reverse approach can be proposed, to some extent. A blossoming wave of international research efforts by scholars of policy education points towards this direction (Hanushek & Woessmann 2020; Kuhfield & Tarasawa 2020). When observing educational processes rather than the outcomes they intend to deliver, a quantifiable element of analysis lies in the inputs, that is the resources, that are injected in the schooling system in order to deliver knowledge, skills, and competences; the most important of those is time spent on learning,

and more specifically, that which takes place within the formal institutional context of a classroom (OECD 2004).

The International Bureau of Education (IBE) defines Instructional time as:

> *"The amount of time during which learners receive instruction from a classroom teacher in a school or a virtual context. Instructional time does not include holidays or teacher professional development days when learners are not expected to be in school; breaks during the school day; or time spent on learning outside of school (e.g. homework, tutoring)"* (UNESCO-IBE 2013, 31)

Multiple observations can be derived by this definition. First, that the transmission of knowledge and competences exists within a relationship with ascribed roles, where the teaching educator linearly and unilaterally imparts knowledge to the receiving student. Second, that the spatial dimension associated to this relation is institutionally contextualized, meaning that the environment constitutes a fundamental element with a precise and perceived meaning. Third and consequently, that not every moment spent in said institutional context effectively encompasses the reception of instructions; in fact, all activities that do not coincide in location, virtual or physical, and simultaneity to the prescribed educational occasion cannot be formally considered instructional time. Even activities that pertain to the domain of education, such as extracurricular courses or private tutoring hours, or even tied to the very same educational context, such as assigned homework for a curricular subject that is regularly taught in class, do not strictly fit this definition.

The exclusion of homework from the consideration instructional time has been a recurring feature in most international research on the topic, possibly due to the inherent difficulties in measuring the quality of study time spent outside of teachers' supervision (Gromada & Shewbridge 2016). This specification results particularly useful, because it implicitly considers asynchrony as a sufficient condition to exclude an observed educational opportunity from its qualification as instructional time. As will be discussed at length in subsection 3 of this Chapter, asynchronous assignments are among the most broadly adopted teaching practices that were introduced by Italian educators during the first pandemic wave (INDIRE 2020a); the implication is that, if IBE's definition is to be followed with rigor, a significant portion of students' activities in DL cannot be counted towards formal instructional time. However, a degree of ambiguity still denotes this third point, as in implementational terms there is no fixed nor unanimous agreement on the constitutive elements of instructional time. For instance, the OECD adds to instructional time delivered in class also extra-curricular activities and additional after-school programs (Gromada & Shewbridge 2016); this is in stark contrast with the definition above provided by the IBE, which operates under the authority of the UNESCO. It is of methodological caution to remember the constitutive features that empirical research assigns to

instructional time, as in the case of OECD's formulation, instructional time does not pertain exclusively to the activities carried out by official school institutes; on the contrary, there is a large degree of dependence on the opportunities that students can pursue outside formal educational environments. These opportunities, however, are more strongly related to the endowments of the students' household and other indicators of socioeconomic status (White & Gager 2007). While such an approach confers appropriate and greater precision to the study of instructional time's overall effect on the educational attainment students, it can thwart the efforts of education systems' analysis through the insertion of external variables to the observed policy environment. Recourse to IBE's more restrictive definition seems most appropriate to the study in question, even if the suspension of all non-essential activities due to lockdown measures likely arrested most forms of extracurricular activities offered by the private sector. In addition, the motivational characteristics of each student individually influence the entity of efforts and resources they decide to allocate for studying activities and the pursuit of knowledge and skills. In the context of DL however, along with the general pandemic context and the disruption of the sense of normality that characterized daily life beforehand, motivation is affected in return by the change sudden adoption of atypical learning practices (Balan et al. 2020).

IBE's and OECD's interpretations of instructional time coincide, however, in the differentiation between intended and realized strategies; in fact, the former's definition follows with the perceptive observation that:

> *"Intended instructional time is usually specified in school or education policies or regulations. Note that the intended instructional time may be very different from the actual instructional time learners receive."* (UNESCO-IBE 2013, 32)

Understanding that statutory instructional times by no means imply an equivalent reception by learners is a fundamental requisite of any study concerned with this variable. A school may consider a curricular offer encompassing an indetermined amount of weekly class hours, but if a natural calamity occurs disrupting either students or the institute's capacity to hold those classes, also with an impossibility of recovering them by the end of the year, there is no doubt that a mismatch between intended and delivered instructional time will surface in the aftermath (Gromada & Shewbridge 2016). Such has been the case with the Italian Education System's adaptation to the Covid-19 emergency, and this issue ties well with the process of setting criteria for the selection of relevant variables for this study.

If one is to deal with the necessity of calculating instructional time, two broad options emerge, each with its own caveats and limitations. One is to consider the measure of instructional time at the source,

that is relying on the amount of teaching hours delivered by educational institutions to their respective students' populations. Then, standing by the specifications of IBE's definition, one ought to distinguish between delivered instructional time and enacted instructional time. In the former case, it is necessary to microscopically analyze the formative offer of each individual school and verify the extent of the amount of instructional time effectively delivered; this means subtracting each school hour or day which delivery was impeded by unforeseen school closures, teachers taking days of illness-leave or maternity leave, natural calamities, bad weather and so on. In practical terms, having such precise grasp of instructional delivery is hardly feasible. In the former case, it is sufficient to evaluate the amount of teaching hours stated in formative offers' normative documentation; for example, national, regional, or individual schools' curricula are sources that generally contain or make at least partial reference to planned thresholds of class hours for the school year: that is the case for the Italian school system, as normative documentation by both the central Ministry of Education and the Formative Offer Plans of educational institutes specifies such details (L 107/2015). Otherwise, it is possible to account for the instructional time directly experienced on the receiving end of the demand side, that is the amount that students receive in a specified frame of time. This approach, however, suffers the same limitations of any quantification based on enacted delivery rather than intended, most importantly the necessity of extracting a significant amount of microscopic data for each unit of observation.

In addition to mere notions of pragmatic character, the purpose of the study is another suggestive element for the discernment of the most appropriate measure of analysis. For instance, foregoing research on school absenteeism and truancy tended to emphasize individual students' levels of attended instructional time, or lack thereof, rather than focusing on their institutions' statutory programs (Buscha & Conte 2014). And indeed, an individual-based research approach reflects well on a study that hinges on students as unit of analysis. Such is the case for many international surveys conducted by the OECD, such as PISA and ICCS, which measure different students' academic performance to isolate the impact of socioeconomic variables on educational attainment, for instance; INVALSI's research activities on the Italian educational system share such designs (INVALSI 2018). Furthermore, by virtue of institutional significance and the public character of their activities, organizations of OECD or INVALSI's ilk usually feature extensive staff, budget, and technical resources to sustain the efforts of individual based survey studies, and to proceed with the elaboration of enormous volumes of information in yearly publications. Despite that not being evidently the case here, resort to normative documentation ought to prove appropriate to the identification of the strategies adopted and their capacity to fulfil the objectives set. For one, recurring to the official class times prescribed by educational authorities avoids the possibility that students, teachers, or

headmasters provide misreported evidence. Given the very significant differences among institutes and professionals in their ability to deploy DL in a timely, satisfactory, and effective manner, relying on normative intended thresholds allows to control for potential biases (Cattaneo et al. 2016). Secondly, instructional time is a variable with an ambivalent character, capturing at the same time an educational input originating from the supply-side, and a delivered output measure for the demand-side to receive; this is useful because the difference between what goods are provided and what are in fact received captures the effectiveness of the system's production capacity and its distribution. Considering policy inputs per se is insufficient to verify their presumed effect on the target population, and Instructional Time appropriately lies between the two realms.

Once again, a noteworthy degree of approximation is required in this regard; determining with accuracy and precision what thresholds of Instructional Time are delivered, or even intended, is a taxing process ridden with variations of difficult appraisal. For one, while the date of school closures for both lockdown restrictions and the end of the year were fixed and immediately dependent on the official directives of political authorities, institutes' capacity to comply was strongly fragmented. Each school had to face its own challenges to roll out DL, with the consequence that some had sufficient capacity to adapt relatively quickly, whereas limited structural endowments acted as barriers for poorly equipped schools. Also, the degree of uncertainty on the situation and the unrealized prospect of returning to class sometime before the end of the year may have relented the urgency to commit to the effort of DL. Secondly, teachers had very heterogeneous levels of preparation with regards to digital skills and specific competences for the development of knowledge through digital channels; a conspicuous degree of variation in time required to adapt to DL at individual level seems a reasonable expectation. Furthermore, there is no normative nor observed guarantee that teachers adopted perfectly equivalent strategies in the structure of DL classes; Ministerial directives provided guidance on mandatory thresholds of weekly class hours for DL only in October 2020, several months the end of the school year and once DL had already evolved in Integrated Digital Learning (MIUR 2020f). INDIRE's surveys on teaching practices and techniques adopted during DL suggests a variety of approaches that amended the traditional allotment of instructional time, most importantly a diffused tendency not to maintain the conventional duration of classes, in accordance with the previously recalled indications on DL modalities offered in Ministerial Note 388.

2.2.1 The Italian Education System: Administrative Structure, Educational Paths and Regional Inequalities

The public administration of the Italian Republic features a strongly decentralized structure. In fact, Regional governments and the administrations of metropolitan cities, provinces and communes have direct competences on all administrative tasks, with the exception of those that are expressly prerogative of the central state; the legislative competence to designate general norms for the catering of publicly guaranteed services, as well as the according definition of essential levels of provision, for instance, is exclusive to the central state, whereas the provision of financial contributions to non-state schools only depends on the regional government. Before the 1970s governance arrangements for the welfare system in Italy were still quite centralized, and most competences for the designation of essential services provision, such as schooling, healthcare, and social protection lied firmly in the remits of the central government (Adorni & Magagnoli 2005). However, due to a variety of intertwining internal and external factors, such as the effects of successive global financial crises and systemic inefficiencies in guaranteeing welfare services, a clear necessity to optimize and rationalize the system emerged, also supported by political pressures advocating for greater levels of administrative autonomy, particularly in northern constituencies (Del Pino & Pavolini 2015).

Across the 1980s legislative proposals gradually shifted competences in the provision of social services to decentralized territorial authorities, where regional governments could act as second-level regulators and local institutions as service providers; a process that ultimately was completed by means of the Constitutional Reform of 2001, where legislative powers where explicitly redistributed across governance levels and split between exclusive and shared domains of competences for each tier of authority (LC 3/2001). Crucially, powers pertaining to regions are formulated in a residual definition, meaning that regional governments exercise their legislative authority on all subject areas not expressly and exclusively pertinent to central governments' competences; part of regulatory powers on the education system are in fact included in this central state-exclusive area. In practice, this means that there are only a few areas in which regions cannot operate autonomously, which in turn underlines the strongly decentralized character of the Italian administrative system. Despite these developments have reshaped the entire welfare structure and consequently affected the Education system as well, schooling provision saw a comparatively lesser administrative amendment if compared with social provision, or even more so for public healthcare; in the latter's case, almost the entirety of public spending flows through regional channels, whereas in the public education sector about 75% of the budget remains firmly in the governments' and Ministry of Education's authority (Del Pino & Pavolini 2015).

2.2.2 Administrative Structure of the Education System

Overall legislative competences in education are shared between the regional and central level, although each exerts uncontested authorities in specific areas; at central level, these prerogatives have been carried out through the Ministry of Education and Research (formerly known as MIUR). Due to the ambivalent function that the name suggests, the MIUR was often dubbed the "*dicastery*" to distinguish between the two administrative compartments that oversee different institutional infrastructures. While the Ministry of Education manages the running of the compulsory education system for the central state, from kindergarten to upper secondary education, including vocational and professional formation activities, the Ministry of University and Research is concerned with the administration of higher, tertiary education and research activities pursued in such institutes. Each side operated with relative autonomy in both financial management, monitoring activities, and delivery of services. While the two heads of the ministry traditionally remained unified under the same formal institution, the Conte government decoupled the MIUR in favor of two separate ministries in early 2020; now formally independent from one another, the Ministry of Education (MI) and the Ministry of University and Research (MUR) maintain their former prerogatives in the overall management of the Education system (DL 12/2020). In fact, the MI keeps dealing with the overall organization of schooling services, their structure, and the network through which it operates (Eurydice 2021a); this also includes the distribution of financial resources across a decentralized network of educational facilities. The designation of the general objectives of educational processes, considering specificities for every level and branch of the system is another fundamental task, covering the establishment of a national curriculum which encompasses general school programs and compulsory subject for every school year. As the managing institution for the provision of an essential social service, the MI is tasked with guaranteeing that the delivery of educational goods is sufficient, appropriate and homogeneous: as such, it draws measures aimed at creating standard levels of educational delivery across sparse territories with different characteristics and endowments, as well as overseeing, structuring, and certifying the working conditions and qualifications of the human resources involved, such as teachers, teaching assistants, administrative personnel and headmasters.

Related to the issue of uniformity in service provision, the MI needs to monitor the effectiveness of the educational system by means of standardized evaluation of its multiple sectors of activity: most crucially, this encompasses the establishment of a system of evaluation for students that can be upscaled countrywide. As such, there are two official, although independent agencies that assist the centralized ministry: one is the INVALSI, which deals with the systematic measurement of the education system's outputs and effectiveness, and the other is the National Institute for Educational

Documentation, Innovation and Research (INDIRE) which studies educational practices, ranging from specific didactic approaches to the assimilation of ICT tools in teaching approaches (Landri 2014; INDIRE 2017). Research activities conducted by these entities is of pivotal importance to grasp the impact of education policies on students, their effectiveness, and their system-wide scalability. By means of their direct competence and authority for what concerns the observation of educational practices, most official studies on the adoption of DL have fallen under the remit of these organizations, which publications providing invaluable insights on the best-practices, criticalities, and policymaking contributions emerged during the pandemic response.

Outside of the pandemic context, the careful oversight of the educational system is a fundamental task to keep in check the operations of a fragmented implementational context: while the prerogatives of central institutions encompass the general administrative and organizational structure of the system, most of the day-to-day operational aspects of schooling fall within the remit of school autonomies. As such, an essential intermediation function between central and local level authorities is played by Regional Schooling Offices (RSOs); RSOs act as multiple extremities of the MI and are located in nearly all Italian regional and provincial territories to monitor and ensure compliance with ministerial directives. Due to their displacement in strategic locations outside of the effective reach of the ministry, RSOs avail of their territorial and sociodemographic knowledge of the local context to drive the application of central guidelines, filling gaps of information between centralized policymakers and peripheral providers. In effect, their administrative functions match those of the MI, which helps, on the one hand, to facilitate bottom-up access to central resources, such as consultancy, organizational assistance and financial management, and on the other, the top-down capacity of the ministry to monitor the local application of directives, and the tailoring of policy arrangements that account for the specific characteristics of the local students' population and institutes. RSOs are in turn articulated in multiple provincial offices to extend institutional reach: these are called *Ambiti Territoriali*, although the internal character of these authorities falls entirely within the competences of the pertinent RSO, meaning that their operational autonomy is factually negligible.

Ultimately, the effective organization of the educational offer that students receive is in the hands of individual institutes: from early childhood to upper secondary education, schools enjoy autonomy in terms of teachings, organization, and developmental experimentation (DPR 275/1999). For instance, and pertinent to the study in question, the allocation of weekly school hours can be flexible, as institutes are free to adopt either five days school weeks or include classes on Saturdays, or establishing different hours' duration for specific days of the week; the adoption of rotating classes

arrangements, in which students navigate the school to reach subject-specific classrooms in place of permanently attending lectures in the same room all year long; Or the activation of course initiatives that temporarily blend students from different classrooms in dedicated learning units which empower peer-to-peer networking and spillovers outside of the fixed class population. These are just few examples of the substantial degree of variation in terms of the educational experiences that different institutes offer, both in terms of subject-specific instructional contents and organization of schooling spaces and times. To these ends, the *Piano Triennale dell' Offerta Formativa* (PTOF) is the main normative source that constitutes the cultural and projectual identity of each specific school; the plan is drawn every three years and establishes the core objectives and initiatives pursued through schooling operations to deliver educational goods capable to appropriately satisfy context-specific demands (Eurydice 2021b). Naturally, these objectives need to be fully harmonized with central requirements on the designation of curricula, and constitute to these ends the main instrument of programmatic accountability to the Ministry and to students' families; for the sake of transparency, the plan is openly available on each institute's website after it is collectively drafted and approved by the school's headmaster and council of teachers.

The organization of time and the school calendar is a fundamental component of administrative autonomy that directly affects the delivery of instructional time. In light of the multilevel governance adopted for the administration of the school system, the school-year calendar is drawn across multiple levels of authority; through Ministerial Ordinances, the MIUR publishes the proposed school calendar at the beginning of each year, providing guidelines on the day of openings, closures, and national holidays; however, the document is not necessarily binding, allowing regional governments and individual institutes to autonomously establish the specific dates of beginning, end, and temporary interruptions of schooling activities (DL 112/1998, Art. 138, 1d). Such has been the case even in the context of September's beginning of schoolyear 2020-2021, when for the first time since the start of the pandemic pupils returned to their classrooms. As the Ministry established schools to officially start classes on 14th September, the region of Trentino reopened schools a week in advance, on 7th, whereas most others complied to the indicated date and only a handful of southern regions opened on the 24th at the latest, likely to accommodate the possibility of late-season tourism and mitigate the economic impact of public health restrictions reintroduced in the second half of August. The immediate consequence is that a degree of variation across territories and institutes can be observed, although their impact is strongly mitigated by the fact that national indications curtail beginning and end dates: in effect, the school year must start between the 1st and the 3rd week of September, and finish between the 1st and the 3rd week of June (European Commission/EACEA/Eurydice 2018). In broad terms, to be considered valid a school year ought to encompass at least 200 days of school,

distributed across approximately 33 weeks (DLL 297/1994). From a statutory standpoint, Italian School years are among the longest in Europe. Legislative Decree 297, the paramount piece of organizational legislation of the Education system, establishes 200 school days as the minimum threshold that institutes ought to guarantee as to effectively validate the year; this applies to all levels of education. Only Denmark shares the 200-days threshold in the European region, as most countries roughly average at about 180 days: France requires 144 days for primary education and up to 180 for secondary, German landers have 188, England and Wales count 190, and Spain sets a minimum of 175 (Kamette 2011). Albania marks the shortest year of the group with only 156 days, almost a quarter less than the Italian and Danish school year (European Commission/EACEA/Eurydice 2018). Moreover, as is the case for Spain and Denmark, the Italy's Legislative Decree 297 specifies a minimum threshold, but not a ceiling; school years can thus encompass more school days, depending on regional and individual institute's arrangements.

The designation of schooldays as measures of instructional time is a traditional element of central normative that merely simplifies a substantially more complex regime. In effect, while days represent the overall duration of a schoolyear, instructional time is ultimately dependent on annual school hours. The consideration of school attendance at central authority's level consolidates this point. First and foremost, the mandatory yearly quota of teaching hours for educators and learning hours for students exclusively considers those occurring within the hosting institution at the scheduled times. No formal nor direct consideration is otherwise given to curricular activities outside of school hours for pupils, much in agreement with the boundaries established by three core characteristics of Instructional Time analyzed in the definition. Secondly and accordingly, students must meet a threshold of attended days of school in order to validate the year and be promoted to the next class; therefore, the general consensus lies on the proposition that presence-learning and time spent physically within the educational context are the strongest proxies of attendance and exposure to instructional time. And yet, attendance calculated in terms of school days is misleading, as it is the total amount of hours of class attended by the student as registered by the teacher that officially determines presence or absence to class (DPR 122/2009).

So far, the discussion on the multilevel administrative arrangement of the education system has covered exclusively those schools that fall under the direct authority of the state, although it is worth mentioning that it is not necessarily the case; schools can in fact operate under three different regimes: *state schools*, which have been addressed, are by all means public schools financed and controlled by public state authorities, and enroll the vastest majority of the students' population. *Parity schools* are financially independent, and their main function is to compensate for state's absence in the provision

of schooling before age of compulsion; since they cater to this essential public service, they enjoy equal standing in the state- system of education and fall under MIUR's authority. On the other hand, *private schools* are independently financed and administered, having their own educational curricula, teachers, and award diplomas not officially recognized by the state; while administrative arrangements exist for the harmonization of certifications conferred by private schools, they mainly cater to a niche market for alternative and specific education that would not be available in the public sector. The ratio of enrolments per school regime reflects this, as only 5% of national students in primary and secondary education attends private schools; by contrast, 95% enrolments in the public sector underline a substantial preference for state-administered education (MIUR 2019b).

2.2.3 - Curricular Structure of the Italian Students' career in compulsory Education

The curricular structure of compulsory education encompasses three main stages: five years of primary school, widely referred to as *Elementary School*, for kids aged between 6 and 11 (ISCED Level 1); three years of lower-secondary school, or *Middle School*, follow for kids aged between 11 and 14 (ISCED Level 2). After that, students access upper-secondary education, which splinters in multiple vocational segments until the age of 18 or 19 (ISCED Level 3) (OECD 2021a). A representation of the school system's structure by age is presented below in Figure 1. In general, students seeking to further their formal education may continue on the path set by High Schools; they can choose between an array of specialization branches encompassing distinct fields and subjects. The types of selectable orientations are standardized, which means that institutes providing the same curricular specialization will also feature the same subjects and teaching practices. Individual high schools enjoy a degree of autonomy in the formulation of educational offers and can structure the contents of their curricular programs according to local users' demands; this has allowed the emergence of more nuanced specialization paths. For instance, a recent trend has seen the introduction of paths more oriented towards the development of English language skills even in mathematics, or humanities high schools that traditionally sideline the study of foreign languages, to some extent. Despite such degree of customization in individual institutes' proposal of curricular offers, the branching of high schools chiefly maintains traditional orientations as designated by the MIUR; the most relevant are mathematics and science (Sciences High Schools), classical literature and humanities (Classical Studies High Schools), linguistics and foreign languages (Foreign Languages High Schools), plastic and figurative arts (Arts High Schools), music and dancing (Dancing and Music High Schools), psychology, humanities and educational sciences (Humanities High Schools). A further degree of cohesiveness between curricula is guaranteed by the Maturity Exams, which

modalities may differ between specialization paths but remain unchanged for high schools and classes of the same typology; furthermore, the exams are drawn at national level simultaneously, thus ensuring that each orientation track faces the same test in contents, modalities, and evaluation. Upon successful passing of the exam, students receive the high-school diploma required for enrolment in universities or other providers of higher-education.

Alternatively, upper secondary education offers study paths more explicitly oriented towards technical and scientific professionalization for immediate access to the workforce by means of Technical Institutes and Professional Institutes; both curricular paths can be grouped under the Vocational Education and Training (VET) regime, with formative offers that rely on an ample spectrum of skill-intensive laboratorial activities in which students familiarize with the professional practices of their preferred occupation from an early age; as such, a significant portion of instructional time is carried out in specialized laboratories outside of the formal context of classes. In similar fashion to High Schools, at the end of the five years of schooling they must partake in the final state-exam, which provides them with a diploma that allows enrolment in tertiary education. Technical Institutes are divided in two macro-branches: one deals with formation in the economic sector, whereas the other in that of technologies. In the former branch, students can opt for Administration, Finance and Marketing or Tourism; the latter instead offers more diversified paths, which range from Mechanics and Engineering, Transports and Logistics, ICT and Chemistry to Telecommunications, Fashion, and Agriculture (MIUR 2018c). Professional Institutes feature an additional layer of job-orientation, linking professional formation to local enterprises operating in the manufacturing and services sector. With a substantially diversified approach to teaching methods, the purpose of these facilities in ambivalent: on one hand, they offer enrolled students immediate and concrete employment opportunities during and after completion of the educational path, whereas on the other, they allow for the research and innovation of VET methodologies by means of dedicated laboratories run in collaboration with enterprises and contextual technical learning (DLL 61/2017). There are eleven paths of specialization which cover occupational preparation for assisting healthcare personnel, social services, cultural and entertainment services, artisanship, and rural development, among others. Due to their educational offers' proximity to the local economic sector's demands, there is a notable degree of heterogeneity in the designation of activities and programs.

The range of teaching contents and activities offered by the educational sector is extensive, and most upper-secondary paths differentiate between theory-heavy, study-oriented activities with operative and technical laboratorial activities: this latter case is especially salient for VET tracks and their respective courses, where a significant amount of instructional time is spent in the performance of

technical, output-driven tasks. As a consequence, it is crucial to point out that the adoption of DL can have exerted a stronger impact on students engaging with laboratorial activities on a daily basis, considering that specific class environments, capital equipment and learn-by-doing arrangements are not easily suited to be translated into remote learning practices.

Table 1: Structure of the Italian Schooling System by Age. Source: MIUR 2018d

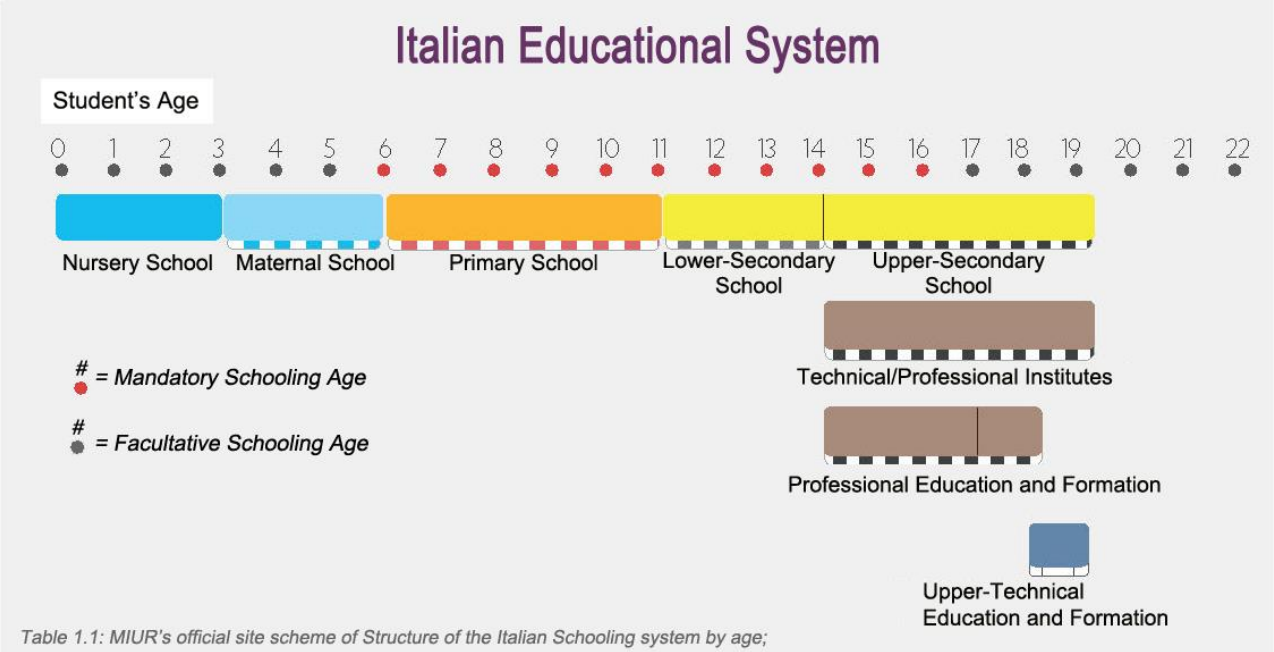


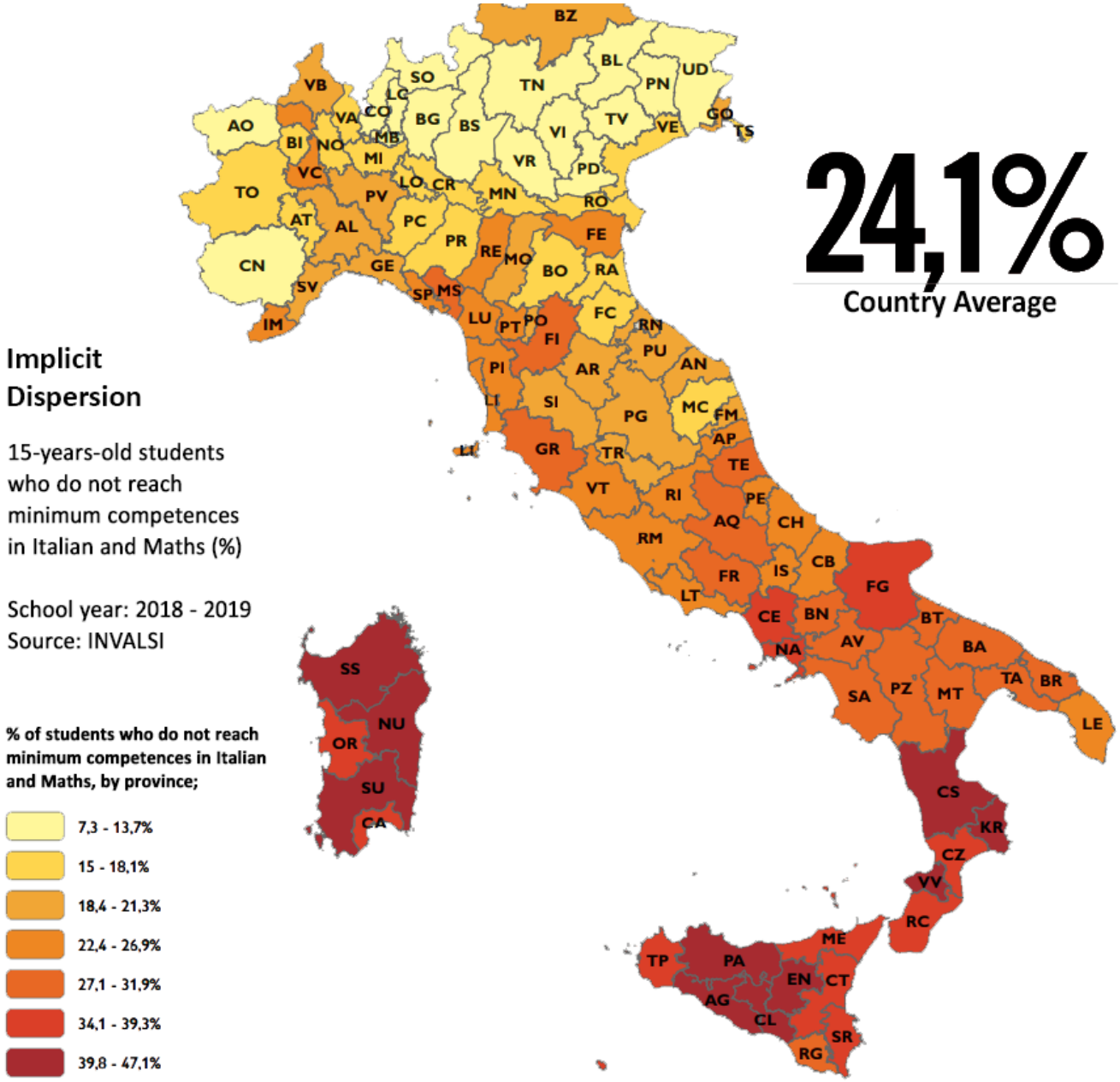
Table 1.1: MIUR's official site scheme of Structure of the Italian Schooling system by age;

Compulsion in Education is limited to the age of 16, through the imposition of a minimum of ten years spent in formal schooling. Young students however cannot immediately transfer to the workforce, as the same provisions establish that including schooling, students ought to have conducted at least 10 years of formation; this implies that young students dropping out of school, presumably at the age of 16, still must partake in formalized professional training paths outside of schools. Therefore, strictly speaking in terms of schooling qualifications the middle-school diploma is the last mandatory level to be achieved, although for underaged students there is an obligation to continue formation through professional or vocational paths until completion and with the acquisition of a formal certificate (MIUR 2010). In any case, either condition loses applicability after the 18th year of age, with the acquisition of full citizenship rights and legal autonomy of the individual (DL 75/2005). As a general trend, completion of school or formative cycles in Italy is the norm, and dropout rates for both professional training and schooling have been steadily decreasing. As of 2020, only 10,3% of the population aged between 18 and 24 has abandoned the education and formation system prematurely, confirming a steady decline in dropout rates across the last 10 years. (ISTAT 2020b).

2.2.4 Educational Inequalities in Italy: A Fragmented paradigm

An important consideration ought to be advanced with regards to the effects of school autonomy and the concurrent fragmentation of the educational system across the country, that is the preposition that diversification of the curriculum implies trade-offs in educational outcomes. On one side, the very rationale at the basis of school autonomy was to enhance individual institute's capacity to provide differentiated, rich, and customized educational offers to citizens; Article 9 of DPR 275 explicitly states that for the purposes of broadening and enriching curricula, schools ought to develop their formative plans in accordance with *"the demands of the cultural, social, and economic context of local realities"* (DPR 275/1999). While this would allow schools to create value added, gratify them with autonomy, and capitalize on the human capital at their disposal, supporting diversification of curricula also avoids the reduction of complexity and the impression of a centralized domination that "dehumanizes" schools (Landri 2014, 26). The core idea is that the production of uniformity damages the moral and substantial quality of learning, and that schools ought to receive incentives to deliver more than the bare minimum required. On the other, an inevitable consequence is that allowing a great degree of penetration of local contexts in the designation of individual formative offers leaves institutions from disadvantaged socioeconomic contexts more vulnerable to the reproduction of these social outcomes. In other terms, it is likely that schools located in disadvantaged areas will be unable to provide teachings on par to those dwelling in relatively well-off contexts. While this fact underlines the importance of the monitoring activities conducted by the INVALSI institute, the perpetration of intense differentials in educational outcomes in Italy should be of concern to education policymakers. From recent surveys and examination data from INVALSI, the NGO Save the Children has drawn a map of risks of educational inadequacy at provincial level, using data from the pre-pandemic school year; the map, presented below in Figure 1, represents the diffusion of a phenomenon called Implicit Dispersion, which observes the portion of students who do not reach the minimum level of fundamental educational competences, such as the proficient usage and comprehension of the Italian language and mathematical literacy (Save the Children 2020).

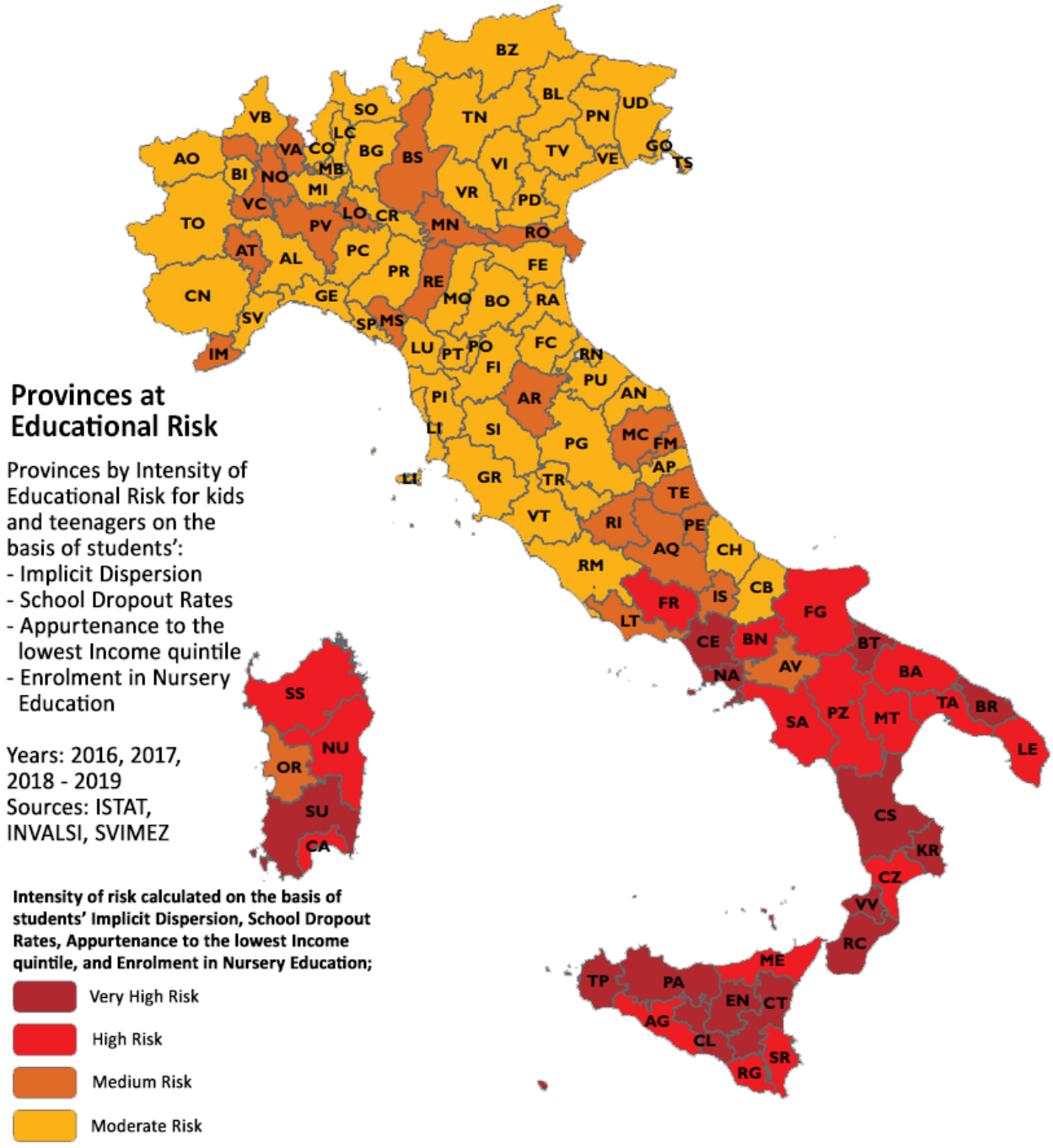
Figure 1: Map of Implicit Dispersion for each Italian province. Source: Save the Children 2020.



The map underscores a clear pattern: implicit dispersion increases almost linearly from northern regions, where dispersion extends to about a fifth of students, to Southern regions where deficiencies in these competences are observable in more than 25% of the students' population nearly everywhere. The situation is particularly dire in Sardinia, where more than a third of students in all provinces reports shortcomings in attainments, and in Sicily, where in the best performing province by a margin, Ragusa, Implicit Dispersion still ranges between 27% and 32%. While variables explaining these results can be reconducted to the specificity of local cultural contexts or lower incomes, the assumption that school closures and DL may have further deepened inequalities in educational

attainment does not seem farfetched. Similar conclusions can be drawn from Figure 2, which represents the aggregate impact of Implicit Dispersion, rates of school dropouts, proportion of students pertaining to the lowest income quintile, and kids' early enrolment in nursery education.

Figure 2: Map of Educational Risk for each Italian Province. Source: Save the Children 2020.



2.2.5 Digital Divide: Theory and Italian Context

An evident role of primacy is played by information and communication technologies (ICT); being part of the daily lives of modern societies' citizens, their introduction and diffusion in the last decades has exerted momentous changes in the standards of life and productivity of individuals worldwide. Directly and indirectly, all fundamental parts of society, from world population, life expectancy, governance, entertainment, human relationships, culture, and many others have been revolutionized by these hyper-connective and information-intensive technologies that lie at the core of the digital revolution (Last 2017). Their impact as General-Purpose Technologies puts them historically on a par with electrification and are now widely considered key assets that continue influencing societies and economies (Elena-Bucea et al. 2020); for instance, the fact that the immediate policy solution to school closures revolved around the employment of presumably available ICT infrastructure and devices through DL cements the pervasive and significant role that these instruments play in our daily public and private lives. However, the process of ICT digitalization is far from concluded: despite its momentum grew at the very turn of the millennium, it is throughout the last decade that devices and connectivity became integral part of the daily lives of modern societies' citizens, with a constantly and exponentially growing rate of ICT usage across recent years (World Bank 2016). As part of an ongoing process, universal access to such technologies is far from guaranteed: high costs, supporting infrastructure, and the technical knowledge required to operate these instruments constitute relevant barriers that hamper their dissemination and access to the life opportunities that come with it, as is argued here with the case of DL in Italy (Elena-Bucea et al. 2020).

The idea that there are gaps in material capacity of individual citizens, households, businesses or public institutions pertaining to different geographic areas or socio-economic levels, with regards to their opportunities to either access ICT and to use them for a wide variety of activities, has been customarily incapsulated in the notion of Digital Divide (OECD 2001). As the capillary penetration of ICT devices in world societies has become a key developmental objective intensely pursued in all levels of policymaking, fighting the barriers that Digital Divides represent constitutes a strategic starting point: for one, the UN has moved towards the objective of making ICT universally accessible and affordable (UN 2016). Similarly, in 2010 the European Commission has structured the objectives of Europe 2020's agenda around the strategic development of knowledge based and innovation driven technologies, placing smart growth as the founding pillar of the Union's development together with sustainability and inclusivity; "A digital agenda for Europe" is one of the flagship initiatives pursued in Europe 2020, which allocates a substantial portion of the yearly European Structural Funds' budget to the pursuit of an increasingly connected and technologically advanced society (EC 2014). An

obvious, first-order issue comes from the possession of ICT devices; in this regard, disposing of adequately sophisticated technologic instruments and having direct or indirect access to infrastructures capable of supporting their functions is an evident necessary condition. Although inherently relative to a question of personal availability of instruments required to access life opportunities, Digital Divides cannot be reduced to a simple dichotomy between those who dispose of ICT technologies and those who do not; it is also fundamental to understand how and to what effect they are been exploited by their users. Importantly, this second order divide concerns capabilities and abilities linked to fundamental skills that allow to discern the entire spectrum of opportunities that digital infrastructures and hyperconnectivity offer (Robinson & Williams 2015). Both aspects are strongly related to individual capacities of potential users, which by extent implies that personal sociodemographic characteristics act as fundamental drivers of divides in ICT access and proficiency (van Deursen et al. 2015).

For the purposes of representing the Italian paradigm of Digital Divides, it is useful to briefly address their main drivers as evidenced by foregoing literature: age, income, and education (Elena-Bucea et al. 2020). The relation between age and digital appropriation ought to be evident and contextually logical: whereas new generations approach a world where technology is already broadly circulating, their adaptation to these tools comes as relatively inexpensive in terms of cognitive strain; conversely, older generations saw the digital revolution unravel, and had to bear the costly processes of setting aside previously conventional practices in exchange for those offered by unfamiliar tools and settings (Ballano et al. 2014). Facing different opportunity trade-offs and prospects of life, older social cohorts exhibit exponentially growing marginal degrees of reluctance towards ICT for every additional year of age after 70 (Friemel 2016). Again, the apparent shortcomings in terms of disposition or motivation to digitalize originate from actual cognitive hardships and high entry barriers in terms of required knowledge, rather than the stereotypical technophobia associated to these groups (Elena-Bucea et al. 2020). The relatively advanced age of the Italian population poses a significant element of structural hindrance to the diffusion and adoption of ICT technologies; the issue extends to teachers, as their age is exceptionally high vis-à-vis other OECD countries: for primary schools, 57,8% is over 50 against the OECD average of 32,4%, while in secondary grades these figures reach 59,6% against an average of 36%. Conversely, the proportion of young teachers, that is below 30 years of age, is among the lowest, constituting only 1% of primary educators, and 2% for both lower and upper secondaries; averages among OECD countries approach 12%, 10% and 8% per educational cycle (OECD 2021b).

Income constitutes a second critical driver, with substantial direct implications on first-order divides: simply put, constantly advancing digital assets come with relatively high costs, allowing wealthy

individuals to easily acquire such goods and preventing disadvantaged ones from doing the same; these financial barriers have been indicated as the most relevant component of digital disparities (World Bank 2016), both at individual and international scope; a study conducted by Cruz-Jesus reached the conclusion that non-linear relationships in countries' GDPs could explain 82,7% of variation in digital development (2017). For this reason, the term Digital Deprivation is used throughout the study to denote a specific condition of inability to acquire ICT goods linked to income differentials.

Another pivotal variable is education: multiple studies indicate it as a predictor for the kind of functions that users perform when engaging in online activities, and that attainment in education are strongly associated with ICT usage and explains most differentials in digital skills for developing and developed countries alike (van Deursen et al. 2015; Nishijima et al. 2017, p. 15). Another element bundling together education and internet proficiency is mediated by a linguistic barrier: English is the language employed by 25,7% of global internet users, greatly surpassing Chinese (19,7%) and Spanish (7,9%) in spite of a significantly smaller native-speaking population (Internet World Stats 2020). When looking at individual websites adjusted to avoid repetitions through subdomains and spamming, the web coverage of English rises to 61,3%, whereas Italian constitutes only about 0,7% (W3Techs.com 2021). As such, English enjoys the status of *lingua franca* on the internet, and the inability to effectively interpret it precludes access to a substantial portion of openly available digital resources; likewise, low-educated individuals are less likely to display proficient use of the language and will face higher barriers throughout their digital experience (Elena-Bucea et al. 2020). In international comparative perspective, Italy performs poorly in terms of English language proficiency, ranking third-to last (followed only by Spain and France) in overall population's proficiency in the European Union (Klazz 2019). It is evident that education exerts a relevant impact on second-order digital devices, with a determinant effect on users abilities to seek life opportunities through ICT access. It appears also useful recalling that education and income have often been considered interdependent variables between themselves: positive relations in international studies indicate that just as much higher incomes can explain greater degrees of education, the achievement of highly specialized qualifications is conducive to larger remuneration in the long run (Rodríguez-Pose & Tselios 2009). As such, even in the case of Digital Divides these variables interact with a potentially multiplicative effect on the capacity to access ICT technologies for what concerns the two dimensions.

An useful tool to grasp the overall intensity of the Digital Divide in Italy comes from data gathered by the European Commission through the Digital Economy and Society Index (DESI); this indicator

aggregates relevant indicators on the digital performance of European countries as well as the development of digital competitiveness within member states; in terms of the indexed aggregate of performance in connectivity, human capital, use of internet services, integration of digital technology and digitalized public services, only Romania, Greece and Bulgaria perform worse than Italy (EC, 2020). However, even more alarming is the development of basic digital skills, area in which Italy ranks the lowest: individuals aged 16 to 64 score 13,8 points over a hundred, lower than Union's average of 19,4 points, Spain (19,1), France (19,1), and Germany (23,4).

Since the activation of DL relied so intensely on digital platforms and technologies, it is obvious that their previous dissemination played a primary role in determining the effectiveness of the policy. The entity of the Digital Divides pre-dating the Covid-19 pandemic has indeed showed the limited capacity not only of the education system, but also of the population, to embrace the newness of forms of teaching dictated by the eruption of a crisis of unforeseeable magnitude. In the next chapters the study focuses on both first and second order of the Digital Divide in Italy, considering its repercussions and implications on the capacity to adopt DL in the first pandemic wave of Covid-19, although to different extents with respects to each. Whereas the latter is appraised on the basis of existing data to allow qualitative inference on the systems' effectiveness in delivering education, the former is operationalized and subjected to quantitative analysis for the estimation of material deprivation, as well as the evaluation of contextual measures adopted to mitigate its impact on educational loss.

2.3.1 Covid-19 Appears: a brief timeline and the disruption of Educational Services

The impact of Covid-19 in Italy is significant for a variety of factors. First and foremost, Italy was among the first countries in the world to face the spread of Covid-19, and was the first country in Europe to be afflicted by the virus. The general lack of knowledge on the properties of the virus, its symptomatology, and the conditions favorable to its diffusion could not adequately inform the government on necessary interventions to successfully face the ensuing crisis when it entered national confines. At the time, it was impossible to assess with relative certainty the significance of the health threat and coordinate according efforts within multiple institutional actors. As a matter of fact, the decentralized character of the Italian administrative system embeds substantial autonomy to regional governments, which manage independently the provision of essential services to their citizenry. As the virus quickly engulfed territories and mutually exclusive jurisdiction, the designation of a coordinated efforts among fragmented authorities proved challenging. Indeed, the overwhelmingly

fast rates of reproduction and diffusion of the virus far exceeded national and regional governments capacity to generate a compact, unequivocal strategy to halt it.

The first registered case of Covid-19 appeared in the beginning of 2020, when a couple of Chinese tourists from the province of Wuhan in visit to Rome were admitted to Hospital Lazzaro Spallanzani on January 30th; although at the time the threat appeared extremely marginal, the central government mobilized regional governments and health authorities, at least bureaucratically, to set the grounds for a coordinated response. Flights from and to China were banned in concomitance with the instatement of mandatory temperature measurements for incoming passengers (Ministero della Salute 2020a). Competences for the direct management of the crisis were assigned to the Department of Civil Protection following the governments' emanation of the state of emergency, valid for the following six months. Despite the enactment of these measures, the situation appeared under control; only few new cases were registered in the following month near Codogno, in the province of Lodi, leading many members of official health committee boards, scientists, and experts to deem the virus as unthreatening and controllable. However, the situation changed when in late February infection clusters started to intensify and spread to other densely populated regions in the North. In particular, ten municipalities close to the province of Bergamo in Lombardy showed signs of increasingly accelerating diffusion of the virus, urging the Ministry of Health and the competent regional authorities to adopt measures of containment by February 22nd. These localized efforts prescribed the closure of non-essential economic activities and public spaces, as well as prohibiting citizens' circulation outside of domiciles. All mobility from, to, and within these areas was interdicted. Moreover, this was the first instance in with school attendance was suspended until further notice, effectively confining students and workers to their homes.

Initially presumed to be only temporary measures, a new Presidential Decree extended enclosures to other municipalities in Veneto and Emilia Romagna, where new hubs of infections had begun to appear; at this time, active Covid-19 cases still numbered in the hundreds (Ministero della Salute 2020b). On March 4th, lockdowns were extended to the entirety of Lombardy, as well as other 14 provinces in Piedmont, Emilia-Romagna, Veneto, and Marche. These measures escalated at national level on March 8th, affecting the entirety of the Italian population. Through the three consecutive Presidential decrees of the 8th, 9th, and 11th of March, the government prescribed measures for the adoption of remote-working arrangements, urging distance-based resumption of all educational activities until the end of March. Despite initial hopes for the situation to stabilize in the weeks immediately after the national lockdown, the measures were extended and remained valid until May 4th, when restrictions to freedom of movement were relaxed and business activities gradually

resumed. However, the government opted for keeping schools of every grade and level closed, until the end of the year; the same measures were applied to universities and other providers of education. In effect, the schoolyear was concluded through DL modalities; only graduating students from the last year of High School were asked to sustain the final examination, which despite being held in presence, was amended as to encompass only one oral exam instead of the customary three foreseen by the law (DLL 62/2017; MIUR 2020e). All other students waited until September 2020 and the beginning of the new school year to return to their classes.

It was impossible to determine the duration of the crisis and of the subsequent lockdown when DPCMs were adopted. At that time, the approach was to set a date for the conclusion of quarantines, provided that an evident amelioration of the contagion was confirmed by competent authorities, or otherwise extending it until the threat diminished (Briscese et al. 2020). With such little knowledge of the virus spreading patterns, duration, and symptomatology, prescribing a less cautious course of action needed to be motivated by hard scientific evidence of the virus' retreat not to risk overloading the Healthcare system. The ratio of infections however remained above the systems' capacity line until the end of April, leading to a constant postponement of the date when restrictions were supposed to be lifted. This approach, which the public opinion condensed in the expression *"navigating by sight"*, subordinated targeted interventions to the acquisition of information necessary to render them effective, another element that severely questioned the appropriateness of the preparatory measures of the pandemic plans drawn for such occasions (Mattei & Del Pino 2021).

2.3.2 Distance Learning: Rationale, Definitions and Short-Term effects

The same logic was applied to the instatement of DL; the initial approach was to prioritize the halt of the contagion, so even before the DPCM of March 8th, the Ministry of Education had published a note urging authorities and institutes to organize as much as possible the delivery of educational services through distance arrangements (MIUR 2020d). However, there was no explicit obligations for schools to do so; the case was reiterated with the introduction of the national lockdown, as the DPCMs expresses solely the suspension of any forms of physical school attendance; Class councils, administrative meetings and all collegial activities normally held in presence were suspended and translated to virtual environments. Accordingly, institutes were advised to organize learning activities as long as they did so remotely and with utmost respect of social distancing measures (PCM 2020b). The following Presidential Decree of March 22nd underlined once again the suspension of any educational activity not delivered through distance-based modalities (PCM 2020c). At this stage Distance Learning was simply a form of derogation of the prohibition to conduct activities potentially

conducive to further infections; it was only on April 9th that DL became the official designated approach to the conduction of mandatory schooling (DL 22/2020). The fact that it took more than a month to reinstate public education institutions' prerogative to deliver essential services, from a strictly normative perspective, is worthy of note. By that time, a great portion of schools had put in place some degree of virtual classes, yet they had done so without any direct form of coercion from central institutions; the implication being that for those institutes where the delivery of alternatives forms of learning was not easily implementable, all activities had been halted for a month before the central government turned their reprisal mandatory (INDIRE 2020a). This was reflected in the premise of Ministerial Note 388 of March 17th, which offered operative guidance on the structuration of DL activities; the first paragraph underlined that recourse to DL, whereas a necessary remedy to ensure the preservation of public education' core mission, could not be hinged on a formal obligation. *"In a situation like this"* reads the note "*no mere formal requirement can be asked"*, urging actors in the system to "*return to the essential coordinates at the foundation of the school system outside of the logic of obligation and quantification"* (MIUR 2020b, 1). A clear recognition of the system's limited capacity to immediately face the crisis is evident, as the document further took due note of widely different assets to deliver DL between institutions.

Digital Learning was a rather unfamiliar concept at the eruption of the crisis. There is no previous documented circumstance in which adopting distance and virtual-based channels for the delivery of educational goods was the chief strategy countrywide. As such, the very concept of Digital Learning, as formalized with the term "*Didattica a Distanza*" (or "DAD") and enacted in the course of the Covid-19 crisis, lacked an exhaustive definition supported by according practices. From a pedagogic perspective, the fundamental issue lies in the fact that DL encompasses a hybrid array of teaching practices that overlap between in-presence traditional schooling, traditionally structured around frontal teaching, and the employment of software to act as the platform supporting the exchange of educational inputs and outputs between students and teachers. Furthermore, the lack of foregoing experiences and largely diffused best practices results in the constitutive elements of DL being part of an evolutionary process over the course of the crisis. Particularly during its onset, there was no diffused agreement as to which teaching strategies DL ought to encompass, and the homogenization of its definition and day to day strategies required a lengthy assimilation process, oftentimes mediated by trial and error, internal spillovers of knowledge between teaching co-workers and headmasters, and the activation of distance-based professional formation initiatives (INDIRE 2020a; Stringher et al. 2021).

Direct intervention from the Ministry of Education occurred eleven days after the beginning of lockdowns. Through Ministerial Note 388, on March 17th, MIUR published official and central based guidance on the adoption of DL, defining the concept, its constitutive elements, and suggested practices. Distance Learning is thereby defined as the set of activities that *"foresee the reasoned and streamlined construction of knowledge through the interaction between teachers and students"* occurring through "*direct or indirect, synchronous or asynchronous connections*" and "*videoconferences, video lectures and group chats*" (MIUR 2020b, 3). The note is not overly prescriptive of intended teaching practices, mentioning only a few yet not limiting the introduction of others; some considerations supported by later studies, however, can be inferred. It emerges that the first characterizing element of DL is the preservation of interaction between students and teachers at the core of the educational process, and that multiple approaches to exercise this relation exist. Educators' engagement with students can revolve around direct, personal interactions or mediated by the assignment of educational materials and elaborative tasks associated to them. These approaches are both manifest even under normal educational conditions: frontal lectures and explanations exemplifies the former case, while the assignment of homework, readings, and other materials not necessarily discussed in class constitutes an indirect form of educative interaction.

What is more atypical is the fact that teacher-based learning can take place at different moments. When introducing new contents, educators conventionally opt for theoretical lectures and discussions held in front of the class; this element of immediacy lies at the core of in-presence learning, and it should not be surprising that professors sought to repropose this method in the context of DL. In fact, at least 90% of teachers at all levels reported the adoption of frontal lectures held on videoconferencing platforms, cementing the notion of the established preference for synchronous teaching as the primary tool in the hands of educators (INDIRE 2020a). Nevertheless a fundamental consequence originates from the practice of videoconference lectures; the employment of softwares of current generation to support learning activities allows to record classes with relative ease, this in turn implies the creation of educational contents available even after the manifest context of their delivery, and educators are thus no longer limited by the window of time prescribed by teaching hours' schedules, but can create and circulate educational materials for immediate and permanent use. While this does not necessarily entail that the lecture will in fact be recorded, circulated for students' consumption, or made easily available for future reference, DL channels can constitute new tools in the hands of the system to deliver services with greater efficiency. Many teachers did in fact report that they recorded the lessons they held in front of the class and then circulated them among students for future reference (INDIRE 2020a). While this specific practice bridges between synchronous and asynchronous activities, a great deal of importance is assigned to non-immediate teaching strategies.

As the organization of teaching was strongly supported by openly accessible and participative digital platforms, the assignment of homework, exercises and course-specific tasks has been another key aspect of DL, emerging as another universally recurring practices (INDIRE 2020a; 2020b). In this sense, the note suggests the *"reasoned transmission of didactic materials through their upload*" on established platforms, which acquire a common spatial dimension where educational goods are located and easily reached. However, *"successive re-elaboration and discussion"* of these materials by teachers is the key requirement of asynchronous teaching. Educators' mediation of assigned materials is inextricably embedded in learning activities; this point is openly and carefully addressed in the note, as the "*mere assignment of homework or the delivery of materials*" does not constitute nor qualify as DL, if relative contents are not appropriately preceded by the teacher's explanation or followed by clarifications, feedbacks, or discussions. On the contrary, exclusive reliance on the substantive character of said materials "*lacks the possibility of stimulating students' learning"* and is thus explicitly excluded from the characterization of DL and removed from applicable learning strategies (MIUR 2020b, 3).

Digital Learning cannot be reduced to a set of practical tools to simply restructure the transmission of knowledge during a transition to digital educational environments; the importance of programming and organizing activities involving multiple actors is another crucial element of DL as an overarching strategy; the MI realized that simply translating customary approaches to learning to DL was not physically and cognitively sustainable for teachers, students, and for primary schools, even parents. Lack of previous experience with the material implications tied to the continuous usage of electronic devices, lack of physical contact and interaction, as well as few other activities effectively pursuable with acting restrictions led some teachers to strongly underestimate the dispositional toll of DL when applied with the same criteria of in-presence learning (CNEL 2020). Regarding instructional times, the five to six daily hours of classes normally held in everyday classes resulted hardly compatible with the individual capacity to maintain focus, engagement, and motivation in following lectures, when distanced synchronous arrangements were applied (Balan et al. 2020). By the same token, many teachers assigned hefty amounts of homework with little consideration of the compounding effect of the multitude of subjects that students were called to deal with (CNEL 2020).

Such situation fosters a couple of observations: on the one hand, coordination between headmasters, teachers, and assisting personnel is fundamental to deliver a cohesive and effective learning experience and make it sustainable for all sides involved; the most relevant consequence for the purposes of this study lies in the almost universal reduction of schooling hours delivered weekly, especially for more theory-intensive secondary education grades. Only a fraction of the intended class

hours could be administered on a daily basis, making learning time a scarce resource. On the other, that the organization of times and practices had to be remodeled in accordance with the characteristics of DL. To these purposes, the Ministry suggested the reconfiguration of day-to-day time schedules, lectures' configuration, and an overall revision of the curricular programs planned for the schoolyear. The suggested approach saw a bottom-up process which relied on the individual responsibility of the educator in the remodulation of contents, programs and strategies pertaining to the subject taught. While teachers were to exercise direct management of these didactic elements, they were to report them to headmasters, whom in turn have a role of supervision and coordination with and between the rest of the competent personnel, facilitating organicity in the multi-actor delivery of teaching and mitigating differences in skills and expertise related to DL (MIUR 2020b). This became a necessity because in each class multiple educators share teaching prerogatives that are distributed through fixed working times; when the scheduling of activities cannot follow any longer what was initially established at the beginning of the year, and when teaching hours become a scarce resource, a substantial degree of horizontal coordination becomes of essence to structure effective and complete curricular programs.

From the perspective of policy evaluation, the consequences of these processes are not easily dealt with: the lack of central guidance on this matter has generated a great degree of heterogeneity with respects to the hourly regime effectively adopted. Not only there was no uniformity at regional or provincial level, but the process of adoption of hour regimes fell upon individual institutes, class councils, and in practice, on individual teachers (MIUR 2020b; ANP 2020). Again, strong emphasis was put on the concept of "adaptation" based on contextual capabilities, which on the one hand avoided exercising unrelievable pressures on those institutes and families that were less equipped to comply with central requirements, and allowed administrations to better accommodate the specificity of local realities. Yet on the other, it brought further fragmentation between the policy strategies enacted to face the crisis. This lack of direction inevitably caused disorientation and haphazard improvisation in the selection of teaching practices and the organization of general didactic activities (Scuola.net 2020).

In light of the situation, a form horizontal professional networks intervened and attempted to provide a modicum of guidance; the National Association of Headmasters (Associazione Nazionale Presidi, ANP) circulated a bulletin among school administrations, which contained information and suggestions for the implementation of DL, and more specifically the configuration of virtual class-times to be held on digital platforms. The document suggested the reduction of class hours' duration to 40 minutes in place of the conventional 60, and specified weekly thresholds for instructional time

at each level of education; Primary schools were not to exceed ten weekly hours, Lower Secondaries fifteen, and Upper Secondaries twenty-five (ANP 2020). In spite of the lack of binding character of these document, the reputation of the publishing institution, the high intra-institutional level of the recipients, and the similarity of suggested practices with what was later designated for Integrated Digital Learning suggest that ANP's release captured feasible and resource-effective organizational arrangements that schools could easily implement.

2.3.3 Challenges on the Supply Side: analysing the Education System's Preparation for DL

In spite of the guidance offered by central authorities, the rolling out of DL was ridden with structural issues that could not be easily compensated for in the short amount of time offered by the pandemic. All actors involved in public education had to face the constraints caused by years of neglection of digital development for public institutions and individual citizens. As part of the larger Digital Growth Strategy (*Strategia di Crescita Digitale*), the Italian governments and the MIUR have been pursuing a substantial modernization of the education system at central level since 2008, supporting the introduction of digital devices and technologies in the daily lives of students and teachers. The provision of class *Digital Blackboards* have been a staple policy goal of 2008's *National Plan for a Digital School* (NPDS) project and at the center of modernizing reforms (PCM 2015). In addition, another significant contribution was the system-wide establishment of teachers' and schools' *E-Registries* pursued by the Monti government, which introduced digital platforms as substitutes for the paper-based document at the core of the organization of class activities, such as the registration of attendances, students' marks and evaluations, calendars of programs and subjects, or assigned homework (DL 95/2012); digitalization of this essential resource would lead to a facilitated interaction between teachers, students, and families, easily accessible functional information, and greater transparency to the conduction of learning in class. Throughout the last decade, implementation of these measures turned quite successful: as of today, the dissemination of these technologies and practices is well diffused across the system and Italian regions, since reports indicate that almost 87% of classrooms is equipped with a Digital Blackboard, and that the E-registry is extensively adopted in nearly 90% of state schools (MIUR 2015). Later additional efforts in this direction have been pursued through the hotly contested reform *Buona Scuola* ("the Good School") established by Matteo Renzi's government in 2015, which foresaw the development of digital infrastructures for educational facilities, the inclusion of technology in the daily administrative and educational management of institutes, and the strategic development of ICT skills as part of the students' curriculum through the years, among many other introductions prominently oriented at the

provision of educational opportunities able to create highly specialized skills on the labor market (DL 107/2015).

In light of numerous policy efforts to foster modernization and digitalization in the national School System, the supply-side still resulted critically underprepared for the adoption of DL. This can be partially explained with the fact that much of the policy measures fostering the digitalization of schools were explicitly adopted from a top-down perspective, with central governments distributing digital resources and organizing professional training activities accordingly (MIUR 2014); however, there has been long-standing tendency to marginalize the use of technology in teaching practices, chiefly due to personnel's lack of familiarity with these tools, overall predilection of conventional forms and methods of teaching, or outright unfavorable positions over the utility or appropriateness of ICT as didactic materials (CENSIS 2020). As such, it is possible that central directives were met with relatively high attritions, leading to a lower degree of implementation on teachers' part than what initially intended by the government; the orientation of the school system towards digitalization is a process that began more than 10 years ago, yet as 2018, only 50% of upper-secondary teachers owned sufficient digital skills to effectively integrate technology to their teaching methods, according to their headmasters in a survey by INVALSI (Palmerio & Caponera 2018). However, as the qualifications to access the teaching profession in higher school grades are more demanding, it is likely that mentoring personnel employed at primary and lower secondary level displays even lower degrees of aptitude with ICT (Stringher et al. 2021), a preposition partially confirmed by the characteristics of those who partook in such programs since the beginning of the pandemic lockdowns. In fact, of the 16% of teachers that did not follow DL-oriented courses during the first wave, the largest proportion was represented by upper secondary teachers that were confident on their previous preparation to effectively conduct teaching activities in DL. Conversely, a staggering 84% of teachers opted to enroll in dedicated professional training courses once the pandemic started, availing of additional tools to adapt their practices to the new environment. Of these, it is among primary education teachers that the largest degrees of involvement with dedicated formation emerge, with 87,8% partaking and 23,1% expressing a willingness to partake in additional initiatives of this ilk (INDIRE 2020a).

Perhaps, these outcomes relate to some extent to the haphazard efficacy of professional formation in digital teaching as conducted before the pandemic period: whereas more than half of teachers referred that the employment of ICT in teaching activities had been included as part of their professional formation several years before, only a third considered themselves to be adequately prepared to use them in practice in 2018; while teaching staffs' digital preparation is increasingly more diffused, as

in recent times nearly 70% of teachers reported attending ICT-specific professional development activities; the effectiveness of such efforts and their appropriateness for full-fledged approaches to DL, however, remains an element of question (Palmerio & Caponera 2020). The integration of digital materials, skills and practices in day-to-day classes from teachers also finds little support by relative professional incentives: slightly less than half of headmasters agrees with the idea that teachers have adequate incentives to involve technology in their teaching countrywide; while this seems more frequently the case in the Southern Regions (between 61% and 57%), in only about one in three Northern institutes organizational arrangements encouraging the adoption of digital resources are registered (Palmerio & Caponera 2018). Another cardinal challenge relates to the newness of the situation developed with the pandemic, which intensely lacked previous *ad-hoc* preparation of teaching personnel and infrastructures; never before had the public education system been translated entirely on the digital space at national scope. Central infrastructures were not remotely prepared to accommodate these new forms of teaching to such an extensive volume of users.

Even when private actors attempted to support public providers of education, teachers had little familiarity with these platforms and programs, as central authorities had not offered specific formation and training for their employment. It is in these areas that teachers most sought professional formation during the pandemic, as nearly two-thirds of teachers partaking in such initiatives aimed to familiarize with the necessary platforms (66%) and overall technologies required (63%) (INDIRE 2020a). In addition, most educators reported having little to no experience with the overall practices required by distance teaching, meaning that all those who could not follow specific courses of professional formation had to rely on their own versatility and capacity to deliver teachings; in fact, a concerning degree of improvisation characterized initial approaches to DL, with teachers' adaptability being a determinant aspect in the timely restoration of educational delivery since the beginning of the pandemic; one the one hand, this is reflected by the scarce prevalence of attendance for subject-specific ICT preparation courses (23%), also relatively poor for teaching methodologies (53%) (INDIRE 2020a). On the other, from the qualitative testimonies gathered by Scuola.net, it openly transpires that "*improvisation*" was a primary resort especially at the beginning of the crisis, with a few respondents contesting that it was not a sufficiently rigorous approach to induce learning (Scuola.net 2020).

2.3.4 Challenges on the Demand-side: Personal Skills, Digital Knowledge, Digital Assets

On the opposite side of demand, families and students had to deal with the fact that the reasoning underlying the deployment of DL hinged on the fundamental, structural assumption that also recipients would dispose of the necessary tools to access the new set of educational practices (FCL CISL et al., 2020). Advanced digital and hyper-connective devices, high-speed internet access, and personal dedicated spaces within households are indispensable material endowments which lack severely hampers, if not outrightly prevents, any access to DL. The relative paradigm of material digital deprivation in Italy is intense vis-à-vis other developed countries; a third of households (33,8%) has no desktop computer, laptop, or tablet available. Conversely, the proportion of families who own at least one device per component is 22,2%. In another 22,7% of cases, however, members who have access to a hard device, that is a PC, a laptop or a tablet, are less than half of the households' components. Obviously, the average age of the Italian population skews statistics on digital endowments towards a scenario of severe disadvantage: the fact that 70,6% of families composed only by elderly lack devices entirely supports this preposition. It is then fundamental to single out the situation for households with minors or children of students' age, which in fact decrease to 14,3% when considering those who do not have a computer or laptop at home. Before the pandemic, ISTAT had registered that 12,3% of children between 6 and 17 had no desktop computers, laptops or tablets at home, for a total of about 850.000 students (ISTAT 2020a). The report however specifies that figures of digital deprivation are relatively larger in the southern regions, where the proportion of families with students lacking a computer or laptop rises to 21,4%.

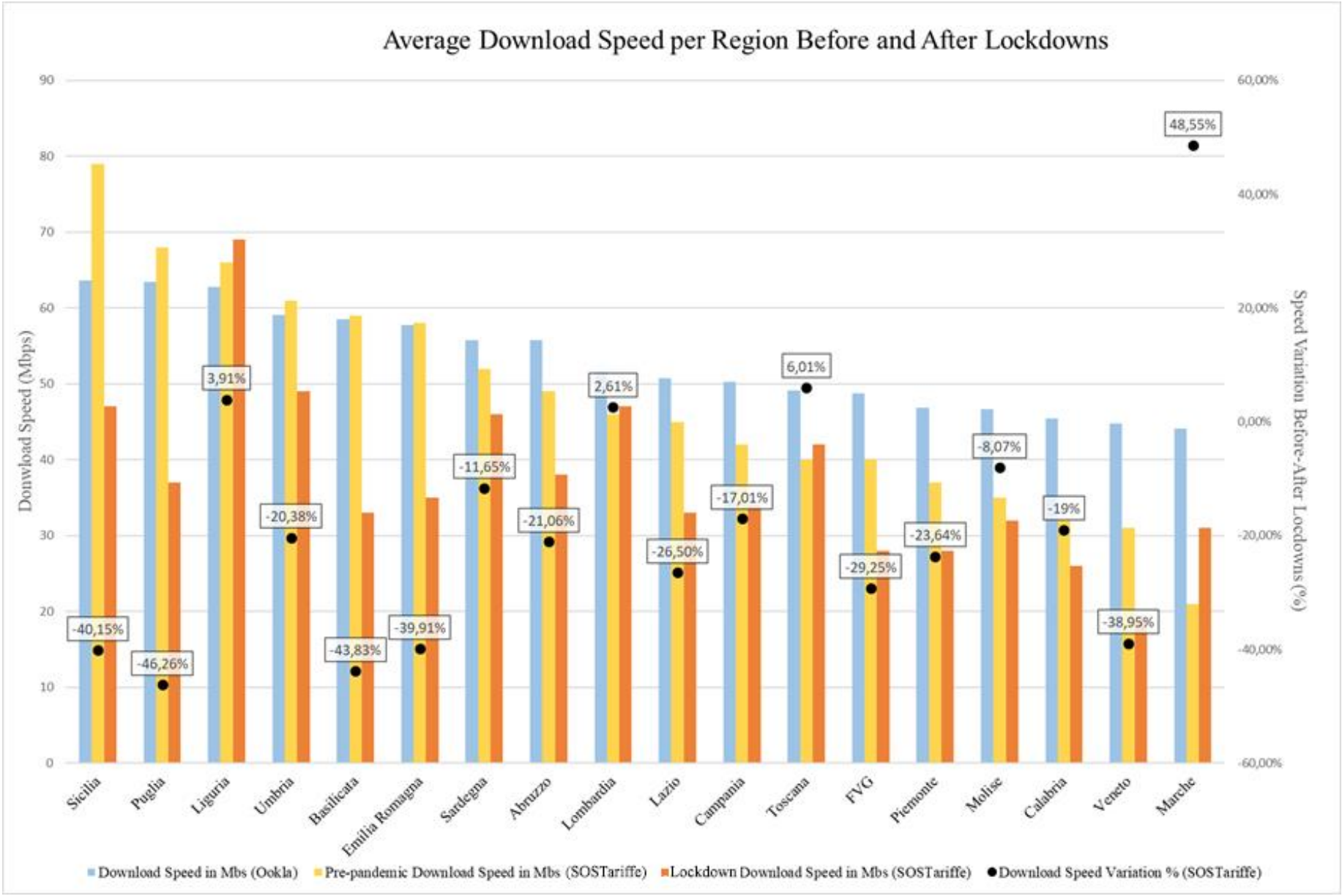
Nominally speaking, access to internet is almost universally diffused, as 96% of households with children disposes of an internet connection (ISTAT 2020a). However, it is a necessary but not sufficient condition to properly partake in DL; bandwidth capacity is another fundamental requirement, considering that synchronous video-lectures imply the simultaneous connection of teachers and up to twenty students, if one considers the average class size at upper secondary level. The volume of upstream data traffic to transmit and engage first-hand with the lecture, as well as that downstream to follow explanations and peers' interventions, is substantial. Depending on the program used, videoconferencing services can require between 200 Megabytes per hour to 2 Gigabytes, depending on the quality of the connection and the constant use of video-feed vis-à-vis keeping webcams off (Google.com 2021; Zoom.com 2021). In addition, connectivity requirements increase exponentially with the number of participating users in the same virtual room, making DL classes extremely taxing in terms of bandwidth consumption. Moreover, connections can be limited by the hardware capacity of broadband line being used, and when multiple users engage in

videoconferencing services, for instance students in DL and parents in Smart-working, the creation of broadband bottlenecks becomes a plausible risk. Because of this, infrastructure plays a fundamental role in sustaining the conduction of virtual activities, and their quality and dissemination on national territory is another element of digital inequality that in the context of DL is reflected on educational opportunities. Ookla, an international company dealing with the measurement of connection capacities, has recently mapped the capacity of internet connections across all Europe at provincial level, providing extremely precise results. Similarly, SOSTariffe, an independent web-based organization that researches the Italian telecommunication market, has surveyed average connections speeds (measured in Megabits per second, shortened in Mbs) before and after the lockdown started, in order to draw a picture of the infrastructural system's capacity to sustain the increase in demand for connectivity triggered by the restriction of personal movement. The aggregate results of these surveys are suggestive for both territorial and infrastructural analysis, and are presented below in Figure 3.

It is interesting to point out that both surveys seem to demonstrate that Southern regions and provinces report relatively high downstream data capacity in the pre-pandemic period, a preposition that strongly contradicts what emerges from the analysis of digital devices' possession; is it possible that in these territories, while the fundamental technologies are available and effective, the lack of human capital in digital formation constitutes the main barrier to the adoption of ICT? While the possibility exists, it is also fundamental to point out the plunge in download speed capacity following the activation of remote-based activities; the dip is particularly intense in Sicily, Puglia, and Basilicata, where almost half of the registered download speed is lost due to an increase in users demanding access. Nevertheless, these regions managed to average above the line of 30 Mbs even during the lockdown; it is however difficult to determine whether infrastructures held well or relatively higher figures of digital deprivation in terms of devices inversely reduced user-demand of internet connections. In this regard, even northern regions had to face a substantial reduction of connectivity outputs, as Emilia-Romagna and Veneto too were significantly hit with volume reductions of almost 40% of connective capacity. While the prospect that the sudden increase in requested connectivity took national infrastructures by surprise may not result particularly remarkable, the same cannot be advanced for policymakers' underestimation of the issue. Any measure relying on a specific platform ought to grasp its capacity to sustain the mandated volume of activities, a step that becomes even more essential when multiple interventions across policy sectors designate ICT as fundamental channels. In effect, differentials in the quality of ICT infrastructures became and additional dimension of possible educational access inequalities driven by geographic location of students. Overall, digital

infrastructures on Italian soil revealed notable vulnerabilities is sustaining the demands of remote working, learning, and other forms of private and public activities hosted on virtual channels.

Figure 3: Average Download Speed per region before and After Lockdowns. Source: Author's elaboration of SOSTariffe.it 2020 and OOKLA 2020.



The mere disposal of instrumental assets is a necessary condition, although not a sufficient one: a modicum of familiarity with digital tools is also required to operate digital assets and softwares used in DL. In these terms, student's population's capacity to receive the new set of practices and confidently navigate the new environment was critically fragmented across the country: in comparison with other members of the European Union, Italy consistently scores in the lowest group and well below Union's average in all indicators of digital development, as underlined by the previous analysis of DESI scores (Negreiro 2015). In recognition of these limitations, education workers' trade unions coalesced following the publication of Ministerial Note 388, which solicited institutes and teachers in the deployment of a digital-based educational offers and gave instructions to continue carrying out formal evaluations through tests and interrogations (MIUR 2020b). Trade Unions requested the revocation of the note, claiming that the Ministry failed to take account of both the exertion of the whole adaptation to the lockdown context on families, and the organizational, functional, and pedagogic limitations of the prescribed translation of conventional teaching practices to the digital space. In particular, the letter underlined the unfairness of demanding formal evaluation in a context were disparities in access to previously equitable educational opportunities were entirely born on families, and that requiring what students would perceive as high-stakes pressures would be motivationally detrimental (FCL CISL et al. 2020). The government was accused of taking for granted students' and families' capabilities to sustain the adoption of DL, where no explicit effort from official authorities to gauge the situation beforehand had preceded the intervention.

2.3.5 Decree *Cura Italia*: designing Demand-Side Remedies to ease access to DL

Therefore, it became evident that the governments' hasty activation of DL to substitute ordinary learning in-presence had not fully considered the endowments of the families called to use them. A provisional remedy to the issue was delivered through the emanation of Decree Law 18, also dubbed "*Cura Italia*"; the legislative provision was extensive in scope, setting up the organizational arrangements to empower the health response and prevention mechanisms of national healthcare authorities, early mechanisms to sustain all workers and enterprises directly affected by the consequences of the pandemic, measures of employment protection, financial aids to families and workers, and a vast array of dispositions for the reorganization of public services' provision (DL 18/2020). In this latter category, Article 120 ruled the "Sustainment Measures for Distance Learning Platforms", tasking the MIUR with the distribution of €85 Million to national educational institutions and the instatement of arrangements to assist students from less endowed households in accessing DL. As it stood within the context of the larger provision, Art. 120 only specified that said financial

aids would be directed, in the measure of 10, 70, and 5 Million respectively, to: a) the support of public institutes in the acquisition and immediate deployment of digital platforms and software necessary to the enactment of distance-based learning activities, b) the acquisition of necessary digital devices to be lent to less endowed students as to allow their fruition of the digital learning platforms mentioned in letter a, as well as the required internet connectivity, and c) for the professional training of teaching personnel and assisting staff on methodologies and practices relative to distance learning (DL 18/2020). This segment of the Decree Law alone attempted to provide the Ministry of Education resources to address three critical issues associated with the sudden adoption of DL: effective, operable, and accessible digital learning platforms for both teaching and learning users, guarantee students' access to the necessary hardware to engage with DL, and the development of teaching personnel's skills to employ digital resources effectively and being proficient in the provision of high-quality teaching.

Article 5 then proceeds to confer to the Ministry of Education responsibilities over the designation of the methodology for the distribution of the financial resources; in fact, through Ministerial Decree 187, MIUR detailed the criteria for the allocation of funds. For what concerns letter b, two variables of differing weight have determined in practice the distribution: each institute received number of resources calculated at 30% in accordance with enrolled students' population, as measured by the National Students' Registry Office (*Anagrafe Nazionale degli Studenti*), and at 70% by the socioeconomic status of students' families in the form of ESCS Index scoring as calculated by INVALSI in previous years. Otherwise, these two variables shared equal weights (50:50) in the allocation of resources under letter *a* and *c* (MIUR 2020g). As official part of the document, Attachment A of Ministerial Decree 187 lists the precise entity of allocated endowments to each state-administered educational facility on national soil, with the exception of the regions of Val D'Aosta and Trentino Alto Adige, which by force of their Special Statue Regime were excluded by the scope of Article 120. The mechanism of distribution considers a capillary down-streaming of finances, where schools become direct recipients of the individually calculated allocation as mentioned before; then, it stands to each schools' administration to divert funds to the acquisition of demanded devices and connections. This is done first through the publication of internal communications that are circulated among students and families, where the initiative is announced, and possible recipients are made aware of the mechanisms and conditions of the lease; they can then apply for the lease and provide evidence of compliance with whichever eligibility criteria the schooling administration has chosen for the assignment of acquired digital devices and connections. It is worth pointing out that aside from the hard distributive criteria adopted at ministerial level for each individual school, there is no explicit guidance on the sort of eligibility conditions that individual schools are to set in order

to filter requests for leases, possibly to allow each administration to tune said conditions to the specific characteristics of the institute 's population. A frequently observed approach is the establishment of a period where applications are received through the submission of a form published by the school. The compilation procedure encompasses the declaration of compliance with set eligibility criteria, requiring the provision of evidence with regards to yearly income thresholds, the number of family components of schooling age, and certificates of disability, among others. Priorities are set in order to determine which applicants are most suited to borrow the device and sign a contract of free lease of use, where the family takes full responsibility over the management of the school property and guarantees that the device will be returned in complete integrity and functionality. There is still a broad possible spectrum of variation among the criteria used for the selection of applications; in the case of upper secondaries, for instance, priority can be given to students enrolled in the last year, as to prioritize their preparation to the final exam and avoid forms of disadvantages in relatively high-stakes evaluative frameworks in education. However, this may not be necessarily the case, and lower income families may find primacy of access in borrowing digital devices.

No exhaustive accounts of the employment of these resources are available as of June 2021, so it difficult to grasp with precision funds' usage timeliness or even the overall depletion of the financial resources allocated. However, a useful indication of the enactment of the measure in terms of outputs emerges from the draft of Law Decree *Ristori* in September 2020, when a second large scale central intervention aimed at assisting the national economy and society in similar spirit to what was initially pursued with Decree *Cura Italia*. This new Law Decree, which amongst many other provisions of aids to enterprises, households, and public institutions, was setting the ground for the beginning of the new school year after the storm of the first pandemic wave envisioned a further allocation of €85 million for school and families to mitigate the digital divide in Article 21 (DL 137/2020). In nearly identical structure to Article 120 of DL *Cura Italia* and DM 187, this time the plan of financial aid was part of a significantly larger plan to support the reopening of schools in September, and usher in a clean transition to Integrated Digital Learning; First, DL 34/2020 of early May had increased the Fund for the Operation and Functioning of Schooling Institutions by €331 Million, mandating also direct financial assistance to disadvantaged households with students that had struggled to access DL in order to ensure their engagement with the incoming IDL. Second, Ministerial Decree 97 of early June 2020 directed part of the financial resources of the NPDS to the acquisition of instruments necessary to the conduction of IDL, for a total amount of €24 Million. An additional, final contribution was given in late October, when the Ministry of Education directed an additional €3,7 Million of the NPDS to the provision of Internet Connections for students in need. The magnitude of these interventions underlines a stern willingness to relaunch schools in the new school year,

guaranteeing equitable access and educational opportunities that the sudden eruption of the pandemic in the early months of 2020 had impinged. However, the impact of school closures at the end of schoolyear 2019-2020 was still extremely conspicuous, and the necessity to recover the educational losses endured by students arises from inadequacies in policy capacity in intervening at the crisis' onset. It is relevant to point out that the measures of DL 18 were the only active policies of assistance that intervened directly in the context of the first pandemic wave, which by extent means that no other comparable form of support sustained students during the DL period of schoolyear 2019-2020. Conversely, substantial provisions for the adjustment of the school system with regards to digital learning designed to target specifically the incoming schoolyear. To these ends, an official appraisal of the policy outputs of DL 18 was included in the draft of DL 137 to inform policymaking institutions of the necessary inputs to minimize demand-side shortcomings at the time of re-openings. In the Technical Report that accompanied DL 137, it is stated that the €85 Million allotted through DL *Cura Italia* were used by *"8.223 school institutes to acquire, and then borrow free of charge to less advantaged students"* a total of "*211.469 digital devices and provide connections for 117.727 students that did not have them"* (Camera dei Deputati & Senato della Repubblica 2020, 47-51). In addition, from the activation of a needs-assessment effort between August and September 2020 emerged a further demand for 283.461 personal computers and 336.252 connections. It is immediately evident that the €85 Millions of DL 18 had been successful in providing a large portion of necessary goods to support students' access to DL. However, by the end of the schoolyear and the approaching reopening of institutes, less than half of the demand had been satisfied according to the figures registered by RSOs and MI's appraisal; this turns particularly true for internet connections: if the sum of connections provided and needed is considered as the total demand to be satisfied, the intervention covered only about 26% of the requested amount. The allocation proved more substantial for digital devices, with about 42,7% of the registered demand being exhausted by the provision. Furthermore, the needs assessment was conducted after the end of schoolyear 2019-2020, so the quantities registered may not have captured the real needs experienced at the beginning of DL. According to ISTAT, in fact, the number of students in Digital Deprivation in terms of devices was almost double than the aggregate demand detected (ISTAT 2020a).

Where do all these theoretical, historical, and policy implications meet? Let us recap the main prepositions advanced in the chapter and relate them to the development of the crisis. The activation of DL inevitably originated from a critical necessity to guarantee a core service even when the fundamental network of providers and core operations was in disarray as a consequence of lockdown measures. At the same time, the implications of social distancing severely limited the number of plausible alternatives, which almost univocally verted towards digital spaces and ICT. Even the

economic sector halted despite playing a role of obvious cruciality in the stabilization of society, and where possible, the resumption of operations was pursued through recourse to digital arrangements and smart working. Again, as the lack of experience and little familiarity with distance-working determined an inherent difficulty in ensuring continuity in the national industry, so was the case for the National Healthcare System and the Public Education System. The arrangements selected for the continuation of schooling activities, however, did not necessarily match with either the infrastructural capacity of the system to enact them, or the end users' disposal of the necessary assets to join them.

The direct consequence of this mismatch resulted in the exclusion of several students in a condition of socioeconomic disadvantage or located in areas with relatively scare infrastructural capacity. The clearest effects of the exclusion are reflected on students' equal opportunities to access and receive education, competences, and skill development through attendance to remedial education opportunities. As school attendance strongly mediates exposure to fundamental instances of learning, and more specifically, instructional time acts as the main driver of educational attainment that lies in the hands of the supply side, represented by the Education System, failure in taking account of differentials in material assets caused an unintended form of discrimination in terms of reduced possibilities to avail of schools and public learning. To offset this selective process, the central government embedded reparatory provisions within the general policy intervention addressing the emergency response to Covid-19; the primary distributive rationale of the policy was the allocation of funds to allow schools to acquire and lend Digital Devices and connections to those who did not have them. The effectiveness of this measure as a mitigating factor of primarily socioeconomic and geographic disparities, and secondarily of educational inequalities, is yet unknown. While official competences and capacity to gauge the effects of such developments on Italian students' educational attainments belong to public institutions, in particular INVALSI, it is still possible to appraise several consequential outcomes of the pandemic context. First, one can attempt to understand how much of the intended service provision in the education sector was disrupted by the virus and the necessary public health measures to prevent its spread. Second and consequently, the capacity through which DL has prevent the realization of the worst-case scenario that would have occurred had it not been activated can be examined, with due consideration of the intrinsic flaws of such intervention. The third and final area of analysis lies in the observation of the policy measures adopted to mitigate the unintended inequitable effect of DL, and the enhancement of educational opportunities for those who would be excluded by it otherwise. The main variable operationalizing this analytical tryptic is instructional time, as it equally reflects the educational inputs that the public school system sought to provide in face of the emergency and the outputs that students could receive even when familiar channels of learning opportunities were no longer operable.

Chapter 3 - Methodology

3.1 Introduction to Methodological Rationale

As Instructional Time represents the key variable of observation, it is useful to recall its definition to single-out its fundamental characteristics, which in turn allows to guide its operationalization in a measurable policy item. Adopting IBE's definition, Instructional Time implies the active delivery of teachings and knowledge from teachers to students, a process which is intrinsically accompanied by a spatial context, that is the class, and a temporal context, that is class hours. These three initial points already influence the understanding of DL instructional time to a significant degree; teachers play a crucial role in mediating knowledge, a preposition that is also reflected by Ministerial Note 388 in establishing what DL ought to encompass and how it should be carried out by teaching personnel; there is a specific environment in which this process takes place: conventionally schools and classrooms are the designated locations, yet with the implications of lockdowns and social distancing the physical space is translated to an immaterial, digital space, which can be generally summarized with the aggregate of digital platforms used to hold lectures, explanations, exercitations and interrogations by teachers. Finally, that participation in these meta-localized educational opportunities occurs at scheduled institutional times and durations to which students and teachers must comply with.

As the ultimate research objective is concerned with understanding the quantity of educational goods that were delivered in accordance with these conditions, as well as understanding how measure how the distributive policy of Article 120 has been able to support this process, the proximate question is how to get there. There is general agreement on the notion that in general, teaching practices associated with DL were subject to a net reduction of class hours due to the array of limitations deriving from administration through virtual channels. It would be useful, in the Italian context, to construct a baseline scenario to assess such loss, and compare it to the reality observed during the first wave on Covid-19. The first step ought to gauge what is the intended amount of Instructional Time over the course of a whole school year under normal conditions; in theory, there are multiple methods to address this process. For one, the use of supporting research and year-specific Ministerial data on national and individual schools' curricular offers would allow to estimate the amount of Instructional Time that each institution set out to deliver in the span of that school year, allowing to control for individual and autonomous arrangements of school institutions. To be certain, the possibility of analyzing every single state-school would prove inestimable in terms of data extraction; alas, the bulk of resources necessary to undergo unit-specific microscopic analysis would result

insurmountably high, thus making such design practically unfeasible. School years are never perfectly homogeneous across territories and years, thus making it functionally impossible to perfectly equate the relative length of the overall instructional period. The microscopic and fragmented reality of the Education System's structure is simply too complex for it. A more practical alternative lies instead in the analysis of normative documents that establish the length of the school year, and figuratively speaking, its density in terms of Instructional Time intended for delivery. In Chapter 2 the administrative procedures for the definition of annual thresholds of instructional time have been discussed; however, there are a few implications worth remembering; first, that school years in Italy are relatively long and concentrated, meaning that there are only few short pauses throughout the 33 weeks of schooling which are then offset by long summer vacation periods of about 12 weeks between June and September (European Commission/EACEA/Eurydice 2018). Second, school calendars do not formally coincide between territories; by virtue of their autonomy, both regions and individual institutes can draw their own school calendar, establishing beginning and end dates, holidays, additional days of closures for school maintenance or other operational necessities, and extend the year when necessary to recover foregone days or to ensure compliance with national requirements. Third and pertinently, that while central-level regulations impose on institutes obligatory minimum thresholds of service provision expressed in school days per year, students must generally comply with a minimum of class attendance officially registered in terms of hours. When using time as the fundamental variable to approximate educational losses, distinguishing between these measures is necessary to grasp more precisely the implications that institutes' closures, more easily understood in days, have exerted on students' exposure to instructional time, which are intended in terms of hours instead. For these reasons, while days are practical indicators to distinguish between larger periods of time, the ultimate measure of instructional time and educational losses hinges on individual hours delivered and attended, a preposition matched by official norms regarding the registration of attendance rates for students.

Again, not all schools foresee the same number of yearly (and by extent weekly) hours, and the same applies to different grades and educational levels. The school system provides an array of standardized offers, which are then amended to a minor extent by individual service providers; this is particularly true for Primary and lower Secondary schools, where the weekly school hours regimes are heavily dependent on the indications of central legislation. In the case of Upper Secondary, a greater degree of variation can be observed, as will be discussed below and in Chapter 4. For the time being, the core operative rationale is that to calculate the overall amount of instructional time intended for year 2019-2020, the yearly quota of class hours needs to be multiplied by the number of students attending the regime foreseeing that amount of instructional time. There are obvious drawbacks to

this approach to approximation; for one, results will inevitably be skewed towards more conservative estimates, where intended yearly instructional quotas will seek to approach the minimum threshold, rather than exhaustively accommodate for the large variation in educational offers that institutes decide to provide. Therefore, the estimate will not satisfactorily consider the additional hours offered by schools seeking to propose particular formative opportunities, accounting instead for a bare minimum educational offer. Second, there is no consideration of instructional time lost at individual or institute's level: it is unfeasible to accurately determine all and every interruption of instructional time potentially due to sickness, personal undertakings, or similar unforeseen yet ordinary causes of disruption. To these stents, the instructional time will be quantified as to reflect ideal and equal conditions for school attendance, homogenized for both service providers and recipients; this latter point returns to IBE's definition's *caveat* regarding the difference between Intended and Delivered Instructional Time: as the unit-based analysis of delivered schooling is impossible to quantify without extensive research at the unit level, it is then convenient to observe what institutes set out to do in compliance with national directives.

3.2 Calculating Affected Students and Instructional Time

Intended Instructional time does not coincide with Delivered Instructional Time, as it merely represents the number of time units that normative sources impose; in this case regulations by the MI verified and enforced by RSOs. The 200 days of school foreseen by TU 297 exemplify the "intended" character of prescriptive norms, which naturally contrasts what is observable and measurable in real practice. To portray the realized quantity of educational goods delivered it is more useful to look at Delivered Instructional Time; there is no formal definition for this concept, possibly due to the fact that it is the logical consequence of the residual space that is intrinsic to the definition of Intended Time. Every administered unit of instructional time, predominantly though class hours held, becomes Delivered. Thus, in rather simplified terms, all Delivered Instructional Time is Intended, but not all the time intended necessarily becomes delivered; the difference between these measures can be captured by the concept of Foregone Instructional Time, that is the amount of Intended Time that eludes delivery by the system. In day-to-day educational life, this can be the result of normatively unforeseen circumstances: educators may fall ill and miss a couple of hours of class during the week, or take days of leave, only to resume classes once they are available again; institutes may close for a day in order to install new equipment, or to carry out lengthy interventions that lead up to the loss of a day of school or more. Or personnel, teachers, assistants, or administrators may decide to adhere to a trade unions' strike and not engage with their professional function; in any of these cases, the

educational time lost may not necessarily be recovered through formal amendments of the schoolyear agreed with the School or Class Council, yet it will still constitute a loss of instructional time, for how negligible. Under normal conditions, the accrual of these situations, when not addressed by an official recovery of class-time, constitutes Foregone Instructional Time. As a result, it is possible to describe the mutuality of these variables through a simple relation; If:

$$Foregone\ Instructional\ Time = Intended\ Instructional\ Time - Delivered\ Instructional\ Time$$

And:

$$Delivered\ Instructional\ Time = Intended\ Instructional\ Time - Foregone\ Instructional\ Timee$$

Then logically:

$$Intended\ Instructional\ Time = Delivered\ Instructional\ Time + Foregone\ Instructional\ Timee$$

The starting point lies in the quantification of Intended Instructional Time, requiring the calculation of conventional amounts of instructional time foreseen by national and regional normative documentation. The first step is the measurement of the national students' population and their distribution across grades and ISCED levels; it is of methodological relevance to point out that as the scope of research covers exclusively compulsory levels of education, only students of primary, lower secondary and upper secondary level are considered. In effect, this covers the vast majority of the Italian students' population, excluding only nursery care and maternal, pre-elementary schools which fall outside of compulsory education as designated by the Ministry (MIUR 2010). Furthermore, characteristics of the analyzed population are dependent on their status of student rather than age. On the one hand, this allows to control for potential early school leavers, whose time of dropout in the education career might be difficult to retrieve; on the other, while it cannot be denied that lockdowns and restrictive measures affected the entire population countrywide, the estimation of educational losses ought to concern those who are insiders to the public system and that have a direct, legitimate interest in the disruption of a service and goods they would normally avail of in virtue of their citizenship rights. In this regard, official figures of students' enrolments provided by National Students' Registry Office are better suited to control for these implications than demographic censuses. Once the size of the affected population is defined, it is essential to

gauge the entity of the loss it was affected by, which means quantifying the intended instructional time for each student. Comparative studies conducted by international organization tend to average out yearly or weekly thresholds of schooling hours, or select only one of multiple regimes available (Eurydice 2015; OECD 2019b); while this approach is serviceable enough to provide a rough estimate of what is provided by the education system, it also lacks specificity in light of a study that seeks to capture differences between individual educational paths and organizational regimes. As indicated earlier, there are multiple hourly arrangements that schools can offer; while all are necessarily compliant with centrally mandated directives, these numbers can vary substantially between individual educational path or even within the same ISCED level. To verify the hypothesis that school closures did not affect all students equally in terms of foregone hours of instructional time, such differences at Intended Time level ought to be appraised. This calls for a more overlayed approach; the proposed method accounts for the specific courses in which students are enrolled and the respective hourly regime delivered weekly. In other words, it is necessary to place each unit composing the national students' population in a specific hourly regime per week.

Unfortunately, precise and to-the-unit figures on regional student's enrolments for each of the possible regimes is not publicly available in the form of metadata datasets, as access to these resources is restricted to RSOs and MI officials. The MIUR however offers annual publications on Italian students' statistics, which cover in relative and absolute terms a wide range of relevant statistics at regional scope that can be availed of to estimate enrolments for each hourly regime. Data from schoolyears 2019-2020 and 2018-2019 will be employed. The estimation hinges on several variables; For elementary schools and middle schools, it is necessary to appraise students' enrolments in each school grade and the rate of observed preference for each available hourly regime. It is then possible to plug in the propensity to choose a specific regime with the number of students attending that educational level in a region to obtain a rough estimate of regime specific enrolments, and by extent, of intended instructional time for each student without losing specificity to individual curricular choices.

In mathematical terms, the estimation can be represented through the formula:

$$Regime\ Enrolments_{a,j} = Propensity\ Rate_{a,j} \times Total\ Population_{a}$$

where Regime Enrolments represent the number of students of a particular region (denoted by subscript *a*) registered in a specific weekly school hours' regime (denoted by subscript *j*); the figure is calculated by the regions' Total Population pertaining to that educational level (denoted by subscript *a*) multiplied by the Propensity Rate of selection for the corresponding weekly school hours

offer (again, denoted by subscript *j*) in that region (again, denoted by subscript *a*). In broad terms, the formula holds equivalently for the hourly regimes offered in primary, lower secondary and vocational schooling at upper secondary level, since normative regulation by the Ministry, purely speaking in terms of Intended Instructional Time, allows a rather uniform array of options which in turn reduces the total number of possible configurations of school weeks. In the case of High Schools for the upper secondary level, it is instead necessary to face a much broader spectrum of options in formative offers. The selection of weekly hours regimes no longer lies in the quantitative preference expressed by enrolling parents but depends instead on the orientation path selected and the grade attended. Therefore, the previously used rate of selection is substituted by orientation branch's required amount of instructional time, adjusted for intra-branch variations due to grade enrolment. As such, the formula describes Upper Secondary Hourly Regimes enrolments as:

$$Regime\ Enrolments_{a,l,s} = High\ School\ Population\ \times Grade\ Incidence\ Ratio \times Orientation\ Path\ Incidence\ Ratio$$

where Regime Enrolments represent the number of students of a particular region (denoted by subscript *a*) registered in a weekly school hours' regime determined by the orientation path attended (denoted by subscript *l*) and dependent on the year of upper secondary being attended (denoted by subscript *s*). The size of the population is given by the total population enrolled in High Schools' orientation-branches, thus the traditional paths which exclude VET formation, multiplied by the Incidence Ratio of the population attending a specific year of High School and the frequency of selection of that specific path, represented by the Orientation Path Incidence Ratio (MIUR 2019b). The two rations included in the formula require further explanation; for one, Grade Incidence Ratio represents the proportion of students that attend either the first two years of High School or the last three years; this distinction is important because weekly hours regimes change when students enter the third year, and in general school weeks become longer until the end of the school career. Therefore, it is necessary to appraise what portion of students constitutes either half of High School enrolments; the process is not as simple as dividing the total population by the prescribed number of school years, as dropouts become a relevant observable phenomenon after the second year; subsequently, the students' population in upper secondary diminishes for every grade advanced (MIUR 2019b). To the purposes of the study, understanding the size of enrolments for each year is not mandatory nor particularly relevant but it is a procedural requirement to appraise the proportion of students pertaining to either period, in order to reflect that on intended regimes for instructional time. As such, the variable can be represented through a proportion calculated as:

$$Grade\ Incidence\ Ratio_x = \frac{(Total\ 1^{st}\ year\ Enrolments\ \times 100)}{Total\ High\ School\ Population_a} + \frac{(Total\ 2^{nd}\ year\ Enrolments\ \times 100)}{Total\ High\ School\ Population_a}$$

or conversely represented by:

$$Grade\ Incidence\ Ratio_y = \frac{(Total\ 3^{rd}\ year\ Enrolments \times 100)}{Total\ High\ School\ Population_a} + \frac{(Total\ 4^{th}\ year\ Enrolments \times 100)}{Total\ High\ School\ Population_a} + \frac{(Total\ 5^{th}\ year\ Enrolments \times 100)}{Total\ High\ School\ Population_a}$$

where subscript *x* denotes the Incidence Ratio for the first two years, *y* for the latter three, and *a* the region examined. It ought to be pointed out that as no region-specific data in this regards are available through the Ministry, the Grade Incidence is calculated at national level and applied equivalently on all regions in the calculation of High School Regime Enrolments; this may not be perfectly representative of the microscopic reality of national education systems' population, as it lies on the unverified assumption that all regions present the same proportion of students enrolled in each year of High School. While the methodological robustness of this approach is up for debate, averaging out the population distribution at national level resulted the most appropriate and resource effective option to keep due account of a fundamental variable in the quantification of intended instructional time. A similar perspective has been adopted for the designation of the Orientation Path Incidence Ratio, which attempts to gauge the rate of selection for each available orientation branch that students can select and attend when first accessing traditional upper secondary education. As to different paths correspond different weekly thresholds of instructional time, this measure allows to identify with greater precision the intended amount to be delivered. The ratio is calculated as:

$$Orientation\ Path\ Incidence\ Ratio_q = \frac{(Total\ Enrolments\ in\ Orientation\ Path_q \times 100)}{Total\ High\ School\ Population}$$

Where subscript *q* characterizes each available orientation path in which students can enroll in. Again, orientation-specific data for each region was not available, meaning that ratios have been calculated at national level and then plugged in the estimation of regional hourly-regime enrolments indifferently. However, there is no guarantee that the proportion of students enrolled in, let us say, Dancing and Music High Schools is the same between Lombardy and Molise, two regions with vastly different characteristics in terms of territory, population size, age, array of diverse educational offers, economic structure and so on. This exemplifies the likelihood of a moderately distortive impact on final figures to be expected out of processes that mismatch scopes of observation, as the inability to

keep account of the specificity of local contexts tends to misrepresent the reality of educational paradigms. However, advancing some effort to consider, although imperfectly, the heterogeneity of national and regional educational contexts on both supply and demand sides confers greater precision and specificity to the study as opposed to recurring to even less representative simplified averages at national level. Another fundamental necessity in the extraction of these figures lies in the limitations imposed by the character of available resources; as complete metadata archives for recent school years are not yet publicly available, adapting quantitative methods becomes a necessary requirement. This is suggested by the fact that, for instance, primary and lower secondary schools' data on selection preferences for different weekly hour regimes are provided in percentages rather than absolute enrolments, as is the case for orientation paths selection in upper secondaries (MIUR 2019b). Regardless, what is important is holding a rough estimate of size and collocation of the students' population in the schooling system to identify the userbase and the quantity of educational inputs that would satisfy their demand. Ultimately, annual Intended Instructional Time for each region can be drawn through the formula:

$$Intended\ Instructional\ Time_{a,j,z} = Students'Population_{\ a,j} \times Daily\ Hours_{\ j} \times\ Schoolyear\ days_{a,z}$$

Where the population enrolled in a particular regime of weekly instructional time (denoted by subscript j) is multiplied by the product of daily hours delivered and the number of days of school foreseen for that schoolyear; subscript a indicates the region of reference while subscript z the individual schoolyear.

None of these methodological requirements applies to VET institutes, as in fact hourly regimes are equivalent between Technical and Professional Institutes, and remain completely unchanged across the years; as such, it is sufficient to take account of the population attending these formative paths in each region and multiply by the number of yearly hours, that is always 1056 (MIUR 2011).

Keeping due account of timings is of essence. To measure the disruption of conventional learning activities implies clearly identifying the affected window of time; recalling the development of the first pandemic wave and the policy response enacted to curtail the spread, it is worthy of note recalling that even with little variations countrywide, school closures did not take place simultaneously. The so-called "Red zones" of Lombardy, Veneto, and Emilia-Romagna were hit first, affecting only those few municipalities that began registering viral clusters and showing the first signs of the impending pandemic. The process of selective curtailment began as early as late February, although it never properly escalated at regional level, thus remaining somewhat isolated until the full-fledged

intervention of central authorities through the emanation of the Presidential Decrees (PCM 2020d). Yet, in spite of a relatively gradual approach to the selective closure of businesses, the establishment of social distancing and later of national-scale lockdowns, the first DPCMs featured measures intended to suspended school and university attendance immediately (PCM 2020a). As early as March 5th, all educational institutions countrywide prohibited in-presence classes for the following ten days, in hope that the progression of infections would relent and be quickly contained. The 5th of March thus represents the cornerstone moment of the introduction of the DL regime in substitution of conventional teaching practices; as all schools on national territory were closed by the date, and remained as such until the end of the school year, the time framework of DL in the first pandemic wave can be easily drawn; in effect, all Italian regions set the last day of school within the conventional first three weeks of June, with most governments selecting the date of June 10th as suggested by the MI (MIUR 2019a).

A calendar of each regions' school year is presented below in Table 2. Schoolyear calendars for every region consider days as the main unit and count exclusively days in which schooling activities are officially programmed. Present calculations consider only schooling weeks of five days, where Saturdays and Sundays are regarded as days of rest. It is necessary to acknowledge that six-days-per-week regimes are far from unpopular, and a large part of schools still operates them, as some students do prefer attending classes on Saturdays in return for less daily hours of classes; again, organizational autonomy permits that weekly-hours thresholds arrangements lie entirely within the remits of institutes' administrations, as far as the mandatory levels of hourly quotas are guaranteed at the end of the schoolyear (DPR 275/1999; L 197/2015). Furthermore, despite the presented calendars' consideration of each regional arrangement for the establishment of holidays and interruptions of class in the context of national and local festivities, only those applicable indifferently to all regions and institutes are considered. Since the beginning of March, the major festivities occurred on the week of Easter, from Thursday 9th April to Monday 13th included, on Friday 1st May for National Laborer's Day, and on Tuesday 2nd June for the National Day of the Italian Republic. Other official festivities, such as the Liberation Day of April 25th occurred on a Saturday, therefore not being *de-facto* applicable to all educational institutions. The end of the year was in similar fashion set on the first half of June, when schools closed for the summer break between June 6th and 10th.

Table 2: Schoolyear 2019-2020 calendar per Italian Region

Region	S.Y. Begins	S.Y. Ends	Total S.Y. Days	Days in Presence	% S.Y. In Presence	Days in DL	% S.Y. in DL
Abruzzo	16-Sep	08-Jun	173	111	64,16	62	35,84
Basilicata	11-Sep	10-Jun	175	112	64,00	63	36,00
Calabria	16-Sep	09-Jun	173	111	64,16	62	35,84
Campania	11-Sep	10-Jun	175	112	64,00	63	36,00
Emilia-Romagna	16-Sep	06-Jun	173	112	64,74	61	35,26
FVG	12-Sep	10-Jun	173	110	63,58	63	36,42
Lazio	16-Sep	08-Jun	173	111	64,16	62	35,84
Liguria	16-Sep	10-Jun	174	111	63,79	63	36,21
Lombardy	12-Sep	08-Jun	173	111	64,16	62	35,84
Marche	16-Sep	06-Jun	173	112	64,74	61	35,26
Molise	16-Sep	06-Jun	172	111	64,53	61	35,47
Piemonte	09-Sep	10-Jun	177	114	64,41	63	35,59
Puglia	18-Sep	10-Jun	172	109	63,37	63	36,63
Sardinia	16-Sep	06-Jun	171	110	64,33	61	35,67
Sicilia	12-Sep	10-Jun	176	112	63,64	64	36,36
Toscana	16-Sep	10-Jun	176	112	63,64	64	36,36
Umbria	11-Sep	09-Jun	175	113	64,57	62	35,43
Veneto	11-Sep	06-Jun	171	111	64,91	60	35,09

Source: Author's elaboration of MIUR 2019a.

With the relevant period defined, it is possible to proceed with the estimation of Delivered Instructional Time throughout the national lockdown by means of DL. The rationale of estimation follows the previously described method: delivered weekly hours (averaged out as hours per day) are multiplied by the number of school days in which such hourly regime was applicable, and by the number of students enrolled. Things however differ with regards to the calculation of hourly regimes and affected students' population. While normative sources expressly require a standardized amount of services provided, as is the case for intended instructional time, these benchmarks are equally applicable on all educational facilities irrespectively of their geographic location or other individual characteristics; central-state regulations on instructional time act as guarantees of minimum levels of service provision for the demand-side. However, these regulations are implicitly linked to conventionally agreed and diffused teaching practices and arrangements, a condition that with DL resulted inapplicable; in turn, the MI did not instruct teachers on quantities of services to be dispensed through DL: no minimum requirement was imposed through Ministerial Directives, nor daily amount of virtual class hours was advised. While Ministerial Decree 89 of August 7th addressed this issue during the second wave for schoolyear 2020-2021, at the crisis' onset there was no homogeneity in

the structuration of weekly programs between facilities and territories (MIUR 2020c). Whereas most teachers reported a general reduction of taught hours each week, it is difficult to quantify its entity with precision (INDIRE 2020a); some might have opted for a mild reduction of class hours with respects to the pre-pandemic period. Others, especially those teaching subjects that already faced relatively shorter weekly allocations, might have incurred in a substantial reduction of their teaching time to rationalize weekly programs. Some might have outright abandoned conventional frontal classes in favor of entirely asynchronous teaching; given circumstances of extreme uncertainty, an overall tendency to improvise approaches to DL, and lack of strong central guidance, the response of the education system in terms of the restructuration of teaching times is extremely heterogeneous. While capturing with relative accuracy the bulk of the arrangements adopted is a challenging prospect, using the guidelines offered by the ANP in the policy vacuum left by the MI is a possibility. After all, the designation of 10 weekly hours for Elementary schools, 15 for Middle schools and 25 for Upper secondaries does not stray far from the central indications later applied to Integrated Digital Learning, nor does the reduction of class-hours' duration from 60 to 40 or 45 minutes (MIUR 2020f).

Another fundamental difference underlying the calculation of Delivered Instructional Time crucially hinges on individual students' contextual capacity to engage with DL; the fact that a school sets to deliver twenty hours of weekly lectures through virtual classes is insignificant if none, or only few of the students dispose of the means to attend them. As such, digital deprivation becomes a central component when describing demand-side determinants of foregone instructional time. Several institutions have attempted to gauge and quantify the entity of Digital Deprivation, trying to identify the most appropriate descriptive characteristic that most closely associates to a material impossibility to access DL. Three main approaches emerge from published research on the subject; ISTAT analyzed the material endowments of families in terms of digital devices available in the household in terms of conventional high-computational capacity hardware, mainly desktop computers, laptops, and tablets. The number of devices was also divided by the number of family members to accurately gauge the likelihood of utilization of shared resources within the household (ISTAT 2020a). An alternative lies in the general survey-based identification of layers of difficulty encountered by families and households specifically in the context of DL; CNEL conducted a research on a sample of 800 respondents with children of schooling age, who compiled a questionnaire and positioned their DL experience from the demand side on a simplified Likert scale, which considered "Many Issues", "Few Issues", and "No Issues"; the question was specified as to distinguish between criticalities met in terms of Digital Devices and Internet Connections. The final option lies in the *ex-post* evaluation report of DL 18 included within the draft of the following Law Decree 87 of September 2020, which

allocated an additional €85 million to the same destinations of Decree *Cura Italia*. The document only references the number acquired resources between devices and connections, and the further needs assessment that resulted from the analysis of the requests for additional funds to be delivered in DL 137.

Clearly, there is no ideal measure nor source to accurately capture an indicator of Digital Deprivation applicable to the case of DL; all alternatives analyzed so far have very clear limitations in terms of validity, representativeness, and scalability between national territories. To minimize these distortive effects on the elaboration of data, the figures provided by ISTAT, expressed in terms of ratios of possession of high-end ICT devices among families with members of students' age, appears most appropriate. For one, the dataset has a significantly larger sample size that the other options considered, which ought to capture more representatively the diverse territorial, social, and economic realities that households face. Secondly, ISTAT data were extracted before the beginning of the pandemic; on the one hand, this means that an accurate portrait of the degree of preparation to a sudden disruption of normal life can be drawn, with no data influence of post-lockdown acquisitions and *in-itinere* adjustments. On the other, there is no risk of sample self-selection arising from interviews or surveys administered mainly through ICT channels, which became the more feasible options with the imposition of social distancing. In addition, no risk of misreporting linked to the contextual immanence of the crisis would be captured by *ex-ante* research. Finally, ISTAT's approach observes concrete and discreet items, that is devices, to allow following interpretation of data, rather than providing information on the perceptions of respondents. These measures coincide with the implementational focus assigned to DL *Cura Italia* and the according allocation of funds, which in turn facilitates the evaluation of the policy. Using said dataset as an indicator of Deprivation, the population that exhibits this characteristic can be calculated through the following formula:

$$Digitally\ Deprived\ Population_a = Students' Population_{\ a} \times Rates\ of\ Deprivation_a$$

where students facing difficulties to access DL determined by insufficient digital endowments is the product of regional students, whose regional pertinence is denoted by subscript *a*, and the rate of digital deprivation registered by ISTAT in that territory. It ought to be underlined that neither official data nor the formula provided can represent the distribution of digitally deprived students across the possible educational levels, grades, and paths. While the fact that some of these educational characteristics correlate more strongly to higher or lower chances to be at digital deprivation, the issue cannot be addressed with deserving and careful thought here. In deliberate consideration of these

methodological flaws, the core rationale for the distribution of Digital Deprivation will consider spreading it out equally across educational categories. Recalling the importance of timeframes, the amount of Instructional Time effectively carried out through DL can be incapsulated in the formula:

$$Delivered\ Instructional\ Time_{a,l} = (Students' Population_{a,l} - Digitally\ Deprived\ Population_{a,l}) \times Daily\ DL\ hours_l \times DL\ days_a$$

Where the number of hours delivered corresponds to how many hours of class were conducted in the period of school closures, that is the product of daily hours in DL per instructional level in accordance with ANP suggestions (denoted by subscript *l*) and the number of days in DL for the concerned region (denoted by subscript *a*), which are then multiplied by the students' population that could effectively receive DL teachings; that is calculated through the regional population of students minus units in Digital Deprivation that hence could not attend DL. Delivered Instructional Time will then be subtracted to the Intended Instructional Time in order to observe the residual aggregate of net time losses for each territorial and educational category.

Finally, the to estimate the location of digital devices provided through *Cura Italia*, it is sufficient to aggregate provincial or regional financial allocations as reported in Attachment A of DM 187, where the allocation of funds to each individual school is openly disclosed. At that point, dividing total funds by the number of devices acquired determines the price per good, which can be in turn distributed across each Italian province using DM 187 allotments to control for devices provided in each territory. Building on previous formulas for Enacted Instructional Time and substituting days in accordance with the adoption of DM 187 (March 26th), estimates for the number of hours safeguarded by the central intervention can be drawn. Again, due consideration of time frames is of essence to recognize the methodological shortcomings of the proposed approach. There is no reasonable expectation that the allocation of funds, and acquisition, target selection, and distribution of devices happened overnight since the emanation of the ministerial decree; on the contrary, it would be more representative to account for the days of bureaucratic and administrative procedures separating the policy's publication to its factual implementation. Once again, differences at micro-contextual level make the appraisal of such differences unfeasible. Nonetheless, establishing an ideal, although unrealised implementation date, is still an effective solution to highlight flaws and rationale shortcomings at the core of the policy's design, as well as ensure a degree of consistency with the conservative criteria applied to approximations procedures thus far.

Chapter 4 - Results

4.1 Estimation of Intended Instructional Time

Weekly allocations of school hours differ vastly between ISCED levels, orientation paths and the specific offers of individual institutes, as do the proportions of students enrolled in specific weekly-hours regimes. It is therefore necessary to address those before proceeding to the calculation of concerned students and later, to the estimation of Intended Instructional Time.

Primary schools, which enroll students between 6 and 11, encompass multiple regimes of class hours per week. Institutes can offer between 24, 27 or 30 hours in *Module Time*, depending on individual educational offers, availability of teaching personnel and the presence of structures and facilities to host a variety of activities in the complex. Otherwise, *Full Time* regimes consider 40 hours of school time per week (DPR 89/2009), with students spending a conspicuous part of their daily routines within educational facilities. As a consequence, there is a greater need for mobilizable resources for the provision of extended childcare and teaching hours, as well as victual services. Recent estimates from the Ministry of Education indicate that about 41% of families prefer the latter option, with the rest opting for Module Time (MIUR 2018b); It emerges that at primary level there is a general demand for higher weekly thresholds, a process that is gradually increasing over the years. The possible reasons for this are several and non-exclusive, ranging from the importance of early exposure to learning opportunities and environments, socialization networks, or the organizational necessities of working parents (Triani 2017). This trend is not universal: the regions of Sicily and Campania, for instance, feature a majority of households opting for the 27 hours Module Time rather than its extended counterpart. While the reasons for this stark contrast with the rest of Italian territories are not explored here, it is relevant to point out that these areas coincide with the provinces at highest educational risk in terms of sub-par educational achievement, early school leavers, NEETS, and households pertaining to the lowest income quintile (Save the Children 2020).

Lower Secondary "*Middle*" enroll students aged 11 to 14, and similarly to primary schools distinguish between an Ordinary Time regime and a prolonged Full Time. Article 5 of Presidential Decree 89 sets a yearly quota of 990 hours for the ordinary regime, to which 33 additional yearly hours are prescribed for the delivery of specialized, focus-driven activities complementary to the conventional program covered by curricular subjects (DPR 89/2009); as such, the minimum requirement is of 1023 hours per school year, which in accordance with the conventional 33 school-weeks paradigm entails the administration of 31 weekly hours. For what concerns the prolonged time, this number increases between 36 and 40, with the additional administration of either 33 or 66 hours to dedicate to external

activities over the year in accordance with the institute's formative offer (DPR 89/2009). The yearly total thus spans between 1221 and 1320 hours, although the former option is significantly more diffused. According to yearly enrolment reports, 86,4% of parents select the 31 hours regime, while preferences for Lower-Bound (36 hours) and Upper-Bound (40 hours) Full Time constitute only 11% and 2,6% of enrolments respectively (MIUR 2018b); Tables 3 and 4 below respectively report the distribution of primary and lower secondary students' enrolments in each time regime offered in every Italian region.

Table 3: Distribution of Primary School Enrolments per region and Weekly Hour Regimes

Primary Enrolments (*Elementary Schools*)				
Hours per Week	**Module (24 hours)**	**Module (27 hours)**	**Module (30 hours)**	**Full Time (40 hours)**
Abruzzo	2.378	20.665	16.648	13.160
Basilicata	344	3.888	7.152	10.073
Calabria	3.430	20.253	34.708	23.275
Campania	13.433	126.979	56.520	56.520
Emilia-Romagna	3.900	48.846	34.359	98.621
Friuli-Venezia Giulia	1.274	12.312	12.736	20.850
Lazio	8.523	63.450	26.280	138.265
Liguria	1.585	14.104	10.195	26.940
Lombardia	6.746	48.064	139.555	227.672
Marche	2.637	32.029	8.425	21.224
Molise	634	842	8.147	1.312
Piemonte	3.951	47.408	22.502	97.908
Puglia	3.788	96.068	40.114	32.195
Sardegna	1.887	15.770	18.997	24.233
Sicilia	10.518	140.460	42.949	25.419
Toscana	3.523	35.520	26.126	81.609
Umbria	1.310	14.667	9.681	10.700
Veneto	4.757	86.872	32.473	82.735
ITALY	74.618	828.197	547.568	992.710
Total Primary Population: 2.443.092				

Source: Author's elaboration of MIUR 2019b, 2019c.

Table 4: Distribution of Primary School Enrolments per region and Weekly Hour Regimes

Lower Secondary Enrolments (*Middle Schools*)			
Hours per Week	**Ordinary (30 hours)**	**L.B. Full Time (36 hours)**	**U.B. Full Time (40 hours)**
Abruzzo	31.123	2.243	1.139
Basilicata	11.220	2.768	893
Calabria	42.206	9.924	2.345
Campania	163.773	17.269	4.642
Emilia-Romagna	111.445	4.995	2.617
Friuli-Venezia Giulia	24.722	4.043	2.099
Lazio	145.560	8.069	4.588
Liguria	31.850	4.286	813
Lombardia	212.136	48.213	7.768
Marche	38.462	2.197	829
Molise	7.035	244	126
Piemonte	88.403	19.384	4.146
Puglia	109.854	5.574	697
Sardegna	31.087	8.166	1.132
Sicilia	129.000	17.489	2.990
Toscana	88.039	9.383	2.396
Umbria	20.770	3.119	266
Veneto	120.994	11.652	2.710
ITALY	1.407.678	179.018	42.193
Total Lower Secondary Population: 1.628.889			

Source: Author's elaboration of MIUR 2018b, 2019b, 2019c.

Finally, the organizational arrangements for yearly schooling hours at Upper Secondary level is far more articulated than in lower grades. It is necessary to consider that the array of different orientation paths, or tracks, that students can select when accessing upper secondary education carries specific educational offers. As such, each track's curriculum will feature a stronger emphasis on track-specific subjects otherwise unavailable in other paths, and will forego by contrast the study of less pertinent fields. Even if the structure of orientation paths is standardized at national level, differing yearly quotas are established for each High School orientation track to better accommodate the specificity of the activities conducted throughout the year (DLL 76/2005; MIUR 2011). A school year at an Arts-oriented high school, for instance, comprises 1122 hours of classes against the 891 required to the foreign languages' track (MIUR 2011). In addition, differences in yearly hours thresholds exist within tracks, based on the stage of education: for instance, the first two years of high school, the so called *biennio*, will typically feature less hours per week; conversely, from the third to the final year of high school, called the *triennio*, weekly school hours' thresholds will increase. For Example, students enrolled in first two years of a Classical Studies High School will attend 891 hours per year, whereas

their peers from the last three years 1023 (MIUR 2011). The distribution of students across school years and educational tracks accommodates broad variations. Slightly less than half of the total upper secondary student population attends High Schools offering traditional educational paths (49,84%), equivalent to 1.308.997 enrolments, almost half of which pertain to the math's-oriented Scientific track and its outbranching specialized variations (582.256 students); other majorly prevalent tracks are Foreign Languages (224.370), Classical Studies (152.778) and the Humanities and Social Sciences track, which splits (202.299) (MIUR 2019b). A yearly threshold of 891 hours for the first two years applies to nearly all tracks, except for Artistic Studies (1056 each of the five years) and Music and Dance Studies (1122 the first two years, reaching 1155 in the *triennio*); however, the relative incidence of selection of these tracks is less prominent with regards to the overall high school enrolments, as the tracks combined comprise only about 10,5% of the traditional-track upper secondary population. For the more common tracks, school closures affected more intensely students in the later years due to the presumed loss of a longer weekly program.

As previously anticipated, the hourly regime applied to Technical and Professional Institutes is appreciably more straightforward, as both formative paths foresee 1056 hours of class annually, irrespectively of specific educational orientations and schooling year (MIUR 2011). About half of the upper secondary student' population enrolls in these courses, equivalent to 826.237 pupils for technical institutes and 490.992 for professional tracks (MIUR 2019b). Students' population at upper secondary level is reported in Table 5, with specific reference to orientation tracks' enrolments and regional territories.

Table 5: Estimates of Upper Secondary Enrolments per Region, Orientation Track, and Weekly Hour Regime

Upper Secondary Enrolments (High Schools, Technical Institutes, Professional Institutes)									
Weekly Hours Regimes	**Technical Institutes (32 hours)**	**Professional Institutes (32 hours)**	**Dancing and Music's H.S. (32 hours) [1]**	**H.S. Biennio (27 hours) [2]**	**H.S. Biennio (34 hours) [3]**	**H.S. Triennio (30 hours) [4]**	**H.S. Triennio (31 hours) [5]**	**H.S. Triennio (35 hours) [6]**	**H.S. Triennio (37 hours) [7]**
Abruzzo	17.258	7.483	496	12.545	1.373	13.914	2.107	1.602	152
Basilicata	8.251	6.122	224	5.670	621	6.289	952	724	69
Calabria	30.931	18.295	725	18.354	2.009	20.356	3.082	2.343	222
Campania	84.805	63.966	2.503	63.347	6.933	70.259	10.639	8.088	766
Emilia-Romagna	67.599	40.488	1.307	33.071	3.619	36.679	5.554	4.222	400
Friuli-Venezia Giulia	18.519	8.046	353	8.942	979	9.917	1.502	1.142	108
Lazio	62.696	33.246	2.374	60.082	6.575	66.637	10.091	7.671	726
Liguria	17.150	12.375	499	12.641	1.383	14.020	2.123	1.614	153
Lombardia	137.668	66.155	2.782	70.404	7.705	78.086	11.824	8.989	851
Marche	21.950	14.766	539	13.645	1.493	15.134	2.292	1.742	165
Molise	4.476	2.185	107	2.709	296	3.004	455	346	33
Piemonte	59.950	31.437	1.302	32.950	3.606	36.545	5.534	4.207	398
Puglia	65.291	42.825	1.507	38.137	4.174	42.298	6.405	4.869	461
Sardegna	22.179	14.408	572	14.471	1.584	16.049	2.430	1.848	175
Sicilia	69.764	49.421	1.918	48.544	5.313	53.841	8.153	6.198	587
Toscana	49.587	33.087	1.293	32.718	3.581	36.288	5.495	4.177	395
Umbria	10.696	6.619	333	8.438	923	9.358	1.417	1.077	102
Veneto	77.467	40.068	1.324	33.511	3.667	37.167	5.628	4.279	405
ITALY	826.237	490.992	20.157	510.177	55.834	565.843	85.684	65.137	6.166
Total VET Population: 1.317.229			Total High School Population: 1.308.997			**Total Upper Secondary Population**: 2.626.226			

Source: Author's elaboration of MIUR 2011, 2019b, 2019c.

Regimes of Yearly Hours for Upper Secondaries as prescribed by MIUR 2011:

[1] Regime applied to Dancing and Music's tracks (1056 yearly hours)

[2] Regime applied to the first two years for tracks: Classical Studies, Foreign Languages, Sciences and variants, Humanities and variants (891 yearly hours)

[3] Regime applied to the first two years for tracks: European Classical Studies, Arts (1155 yearly hours)

[4] Regime applied to the last three years for tracks: Foreign Languages, Sciences and variants, Humanities and variants (990 yearly hours)

[5] Regime applied to the last three years for Classical Studies' tracks (1023 yearly hours)

[6] Regime applied to the last three years for Arts' tracks (1155 yearly hours)

[7] Regime applied to the last three years for European Classical Studies' tracks (1221 yearly hours)

For the purposes of Intended Instructional Time estimation, it shall be assumed that starting from the beginning of the second half of the school year, when the Presidential Decrees of 4th, 8th, 9th, and 11th March first imposed school closures, the delivery of school hours was on track and proceeding homogeneously across the country; it shall also be assumed that until then all demand side units could perfectly attend classes and did not incur in any loss of school days that was not directly determined by lack of access to DL later in the schoolyear. As such, there is no statistical adjustment in consideration of students' missed days or hours of school, or unpredicted school closures earlier in the schoolyear, teachers' participation to demonstrations and strikes, health indispositions of actors involved in either the delivery or reception of Instructional Time, or any other microscopic instances of schooling disruption.

At a first glance, the observation of Intended Yearly Hours captures the overall number of hours that the aggregate of Italian students receives every year. The school system generates and delivers nearly 7 and a half billion hours of instructional time across compulsory levels of education, reaching about 6,7 million students enrolled in state schools. Perhaps unsurprisingly, the amount of instructional time provided between regions changes significantly in accordance with the heterogeneity of the students' population distribution countrywide. In this sense, Lombardy, Campania, and Lazio together generate more than a third of yearly national Instructional Time, producing 16,5%, 10,75%, and 9,75% of countrywide thresholds, respectively. The overall educational yield of the smallest regions, by contrast, is significantly smaller: the sum of Instructional Time generated between Abruzzo, Basilicata, Liguria, Molise, Sardinia, and Umbria constitutes less than two thirds of Lombardy's yearly outputs; a comparison that is also well reflected through the proportion of students' population between the regions. Nevertheless, differentials in relative total thresholds of Instructional time are not exclusively explained by the size of the students' population, as rates of selection for different hourly regimes notably differ between regions, determining dissimilar volumes of education market demands to which local institutions are expected to cater. In Northern regions, more than half of primary enrolments is in the 40 hours Full Time regime, with only a minority of families opting for shorter regimes. A similar tendency can be observed in highly urbanized central regions, such as Lazio and Tuscany, where the rates of selection for longer time regimes are considerably higher than Module Time's. On the contrary, southern regions present relatively higher propensities to choose shorter weekly regimes in Primary Education; the majority of households in Sicily, Puglia, and Campania favors enrolments in the 27 hours regime, with Full-Time being selected only by a marginal part of the population. Basilicata is an exception in this regard, as similarly to Northern and Central regions it displays linearly higher rates of selection for longer regimes of Instructional Time (MIUR 2019c). An inverse trend is instead detected in Lower Secondary enrolments. Generally, the shortest

regime of weekly hours is selected by more than 75% of Middle-school students, yet propensities to choose longer regimes again increment in northern territories (Piedmont, Lombardy, and Friuli Venezia Giulia). In addition, Basilicata and Calabria constitute outliers in the overall southern trend of preference for short weeks, as large parts of their population opt for 36 weekly hours of schooling. The annual provision of Instructional Time across Italian regions is in conclusion mediated to a primary extent by the absolute quantities of local students, and to a secondary degree by different rates of selection for available weekly hours regimes; there is a general tendency for regions with higher students' populations to also register greater preference for enrolments in longer weekly hours regimes, although evidence from Basilicata and Calabria underlines that such relation is not always realized. As a consequence, the planned delivery of Instructional Time is not uniform across national territory, with more urbanized and populated regions usually generating relatively higher thresholds of teaching hours.

Table 6: Intended Hours of Instructional Time for Schoolyear 2019-2020 per Region and level of Education

Region	S.Y. Days	Primary Schools IT Hours	Lower Secondary Schools IT Hours	VET IT Hours	High Schools IT Hours	Regional Total IT	% Regional thresholds Total
Abruzzo	**173**	56.775.003	36.674.716	27.393.235	32.719.990	153.562.944	2,09%
Basilicata	**175**	25.575.181	16.518.803	16.097.760	14.960.436	73.152.180	1,00%
Calabria	**173**	90.006.949	59.416.638	54.503.027	47.869.301	251.795.914	3,43%
Campania	**175**	269.752.765	200.219.344	166.623.520	167.130.356	803.725.985	10,95%
Emilia-Romagna	**173**	221.026.384	125.523.607	119.673.926	86.254.399	552.478.315	7,53%
FVG	**173**	54.635.103	33.602.365	29.412.768	23.321.176	140.971.412	1,92%
Lazio	**173**	284.990.995	167.491.934	106.226.982	156.703.827	715.413.738	9,75%
Liguria	**174**	62.720.112	39.752.572	32.879.040	33.160.634	168.512.358	2,30%
Lombardia	**173**	510.459.455	291.001.026	225.672.826	183.625.543	1.210.758.850	16,49%
Marche	**173**	70.231.528	43.807.396	40.651.955	35.588.631	190.279.510	2,59%
Molise	**172**	11.518.518	7.735.701	7.332.429	7.024.029	33.610.677	0,46%
Piemonte	**177**	211.203.116	124.456.412	103.523.194	87.926.311	527.109.032	7,18%
Puglia	**172**	178.052.284	121.231.156	119.014.093	98.892.269	517.189.802	7,05%
Sardegna	**171**	68.752.468	43.497.786	40.040.813	37.305.317	189.596.383	2,58%
Sicilia	**176**	223.522.718	162.595.842	134.249.984	128.807.137	649.175.681	8,84%
Toscana	**176**	179.228.854	108.231.653	93.123.994	86.815.264	467.399.765	6,37%
Umbria	**175**	40.105.707	26.110.862	19.392.800	22.261.220	107.870.588	1,47%
Veneto	**171**	230.620.856	142.192.736	128.630.304	86.391.630	587.835.526	8,01%
ITALIA	**AVG. 173,6**	2.789.177.997	1.750.060.546	1.464.442.650	1.336.757.469	7.340.438.661	100,00%

Source: Author's elaboration of MIUR 2011, 2019a, 2019b.

4.2 Estimation of Delivered Instructional Time

Building on the estimates presented above, the calculation of Delivered Instructional Time ought to consider the two periods through which schoolyear 2019-2020 was effectively split due to the pandemic. In the first part of the year, hence before the eruption of the pandemic, conventional in-presence learning was in place, remaining in force until the central government first instated the national lockdown on March 5th. With respects to the entirety of the planned schoolyear, this means that about two thirds were spent in conventional learning arrangements, that is 64,16% of the intended year considering the national average. It is worth pointing out that, although to a negligible extent, regions that opted for early school openings in Autumn 2019 managed to gain a few additional school days in presence learning with respects to those who opened a week later. For instance, classes in Piedmont began on September 9th, 2019, while in Tuscany on September 16th; as both regions concluded the year on June 10th, 2020, the former unknowingly managed to secure an additional week of full-time attendance vis-à-vis the latter.

Conversely, the remaining 35,84% was instead subject to social-distancing measures and the implementation of DL. In this period daily virtual classes witnessed to a substantial reduction of Instructional Time, since in no way could conventional learning methods and teaching periods be maintained through DL. Crucially, reductions in Instructional Time affected all grades and school typologies, irrespectively of the hourly regime selected by families during enrolments or by the specificities of orientation tracks. It has been advanced before that due to Ministry's decision not to provide hard requirements nor guidance on the configuration of DL hours and activities (MIUR 2020b), schools had practically near complete autonomy in the organization and delivery of Instructional Time, a preposition that strongly fragmented the approaches to service provision during the crisis. It has also been discussed that this lack of uniformity was to some extent offset by the guidelines published by ANP, which suggested weekly hours allocations for each educational level, assigning 10 weekly hours to Elementary Schools, 15 for Middle School students and 25 for upper secondary institutes; furthermore, estimations consider a 25% reduction in class-hour duration to match the documents' suggestion regarding the shortening of class hours (ANP 2020). Table 7 shows the regional estimates for Delivered Instructional Time across the different levels of compulsory education in absolute hours with respects to DL thresholds as foreseen by each regions' school calendar. Notably, the results presented thus far cover exclusively the volume of Instructional Time that providers could effectively supply from their side, without acknowledging demand-side's capacity and limitations in availing of such resources; while figures accounting for digital deprivation

are discussed later, the relative loss of hours constituted by the activation of DL vis-à-vis the planned schoolyear is reported in Table 8.

Table 7: Delivered Hours of Instructional Time for Schoolyear 2019-2020 per Region and level of Education

Region	S.Y Days	Primary Schools DL Hours	Lower Secondary Schools DL Hours	VET DL Hours	High Schools DL Hours	Upper Secondary Schools DL Hours
Abruzzo	**173**	41.343.128	28.344.484	23.328.289	28.477.461	51.805.750
Basilicata	**175**	18.395.802	12.681.416	13.698.188	13.011.880	26.710.068
Calabria	**173**	65.344.968	45.722.076	46.415.195	41.662.486	88.077.682
Campania	**175**	196.592.984	154.461.087	141.786.202	145.362.085	287.148.287
Emilia-Romagna	**173**	160.086.154	97.604.411	102.201.663	75.250.893	177.452.556
FVG	**173**	39.196.742	25.740.638	24.977.741	20.248.541	45.226.282
Lazio	**173**	204.851.761	129.537.194	90.463.712	136.385.344	226.849.056
Liguria	**174**	45.002.974	30.596.920	27.949.841	28.816.730	56.766.571
Lombardia	**173**	366.769.670	224.113.823	192.184.707	159.816.345	352.001.052
Marche	**173**	51.352.724	34.055.085	34.716.814	31.048.576	65.765.390
Molise	**172**	8.434.015	6.008.562	6.255.678	6.122.762	12.378.440
Piemonte	**177**	152.261.201	96.024.728	88.266.134	76.603.553	164.869.687
Puglia	**172**	129.104.957	93.287.439	100.964.127	85.787.163	186.751.290
Sardegna	**171**	49.797.894	33.523.873	34.126.524	32.490.602	66.617.126
Sicilia	**176**	163.298.946	124.995.057	114.036.208	111.860.898	225.897.106
Toscana	**176**	128.145.414	83.248.336	79.102.483	75.393.597	154.496.080
Umbria	**175**	29.278.122	20.229.779	16.547.946	19.407.780	35.955.726
Veneto	**171**	168.316.587	110.573.571	109.942.239	75.424.502	185.366.741
ITALY	**AVG. 173,6**	2.017.574.044	1.350.748.480	1.246.963.690	1.163.171.199	2.410.134.889

Table 8: % of Losses in Instructional Time over Intended Schoolyear (Unadjusted for Digital Deprivation)

Region	S.Y Days	Primary Schools IP Hours	Lower Secondary Schools IP Hours	VET IP Hours	High Schools IP Hours	Upper Secondary Schools IP Hours
Abruzzo	**173**	-27,18%	-22,71%	-14,84%	-12,97%	-27,81%
Basilicata	**175**	-28,07%	-23,23%	-14,91%	-13,02%	-27,93%
Calabria	**173**	-27,40%	-23,05%	-14,84%	-12,97%	-27,81%
Campania	**175**	-27,12%	-22,85%	-14,91%	-13,02%	-27,93%
Emilia-Romagna	**173**	-27,57%	-22,24%	-14,60%	-12,76%	-27,36%
FVG	**173**	-28,26%	-23,40%	-15,08%	-13,18%	-28,25%
Lazio	**173**	-28,12%	-22,66%	-14,84%	-12,97%	-27,81%
Liguria	**174**	-28,25%	-23,03%	-14,99%	-13,10%	-28,09%
Lombardia	**173**	-28,15%	-22,99%	-14,84%	-12,97%	-27,81%
Marche	**173**	-26,88%	-22,26%	-14,60%	-12,76%	-27,36%
Molise	**172**	-26,78%	-22,33%	-14,68%	-12,83%	-27,52%
Piemonte	**177**	-27,91%	-22,84%	-14,74%	-12,88%	-27,62%
Puglia	**172**	-27,49%	-23,05%	-15,17%	-13,25%	-28,42%
Sardegna	**171**	-27,57%	-22,93%	-14,77%	-12,91%	-27,68%
Sicilia	**176**	-26,94%	-23,13%	-15,06%	-13,16%	-28,21%
Toscana	**176**	-28,50%	-23,08%	-15,06%	-13,16%	-28,21%
Umbria	**175**	-27,00%	-22,52%	-14,67%	-12,82%	-27,49%
Veneto	**171**	-27,02%	-22,24%	-14,53%	-12,69%	-27,22%
ITALY	**AVG. 173,6**	-27,57%	-22,81%	-14,84%	-12,97%	-27,81%

Sources for Tables 7 and 8: Author's elaboration of MIUR 2011, 2019a, 2019b.

Pupils enrolled in Full Time, both at primary and lower secondary level, and to a smaller extent students in upper secondary tracks characterized by longer school weeks, suffered larger losses in terms of absolute hours delivered. Given the greater proportion of primary students selecting longer regimes, the overall impact of DL on the education system was borne with substantial intensity by elementary students. This category is also the one more likely to face difficulties in approaching ICT technologies due to the younger age and lack of experience with digital platforms. For this reason, the loss in Instructional Time unadjusted for digital deprivation is remarkably higher at this educational level, with a national average net loss of 27,57% of hours over the amounts planned at the beginning of the year. Losses where naturally more prominent in regions with relatively larger primary populations, and where the selection of longer hourly regimes is more diffused: such has been the case for Lombardy (-28,15%), Lazio (-28,12%), and Tuscany (-28,5%).

By contrast, the opposite argument can be advanced for relatively older students in upper secondary education, who are also presumed to be more versed, experienced, and autonomous with the employment of digital tools. Again, differences emerge within the different characteristics of the upper secondary population in terms of type of school, orientation path chosen, and grade. For one, the impact on students in VET institutes is heftier when considering DL's incapacity to substitute practice-oriented learning methods, in addition to the reduction of Instructional Time. Since High Schools' programs are typically inclined towards the delivery of theoretical knowledge and the development of overarching cognitive competences, and their activities thus more compatible with virtual environments, VET formation fundamentally hinges on laboratorial activities and practice-by-doing approaches, where usage of specific physical technologies and development of applied techniques pertinent to specific professional preparation is of critical importance. A degree of immediacy and presence in VET environments, as also reflected by the structuration of the allotment of subject hours in the programs, characterizes the fulcrum of these formative channels' educational contents, which social distancing and DL could not by any means guarantee (MIUR 2011; OECD 2020b). The impact of DL, purely intended in terms of Instructional time, is otherwise rather homogeneous across this category due to the relative similarity of hourly regimes foreseen before and during the pandemic. An analogous argument can be advanced for some High School tracks, which didactic approaches also hinge on an array of laboratorial activities that DL environments cannot substitute; such is the case for Arts' and Dancing and Music's High Schools' students, which could not as easily keep their practices away from the dedicated spaces available in these facilities. For the former track, these effects can additionally be compounded to the relatively large loss of hours for students in the last three years, as the reduction of 35 weekly hours impinged learning schedules more

intensely than students in the *biennio*. The rest of the High School population, especially students in early grades enrolled in the more popular orientation tracks were subject to relatively smaller losses, in function of their shorter hourly regime under normal conditions.

Circumstances change when observing the demand-side's fruition capacity of the Instructional Time provided by schools. As empirically observed in the course of the first pandemic wave, disadvantaged households' lack of material assets to access DL resulted in partial or total exclusions from virtual-based channels of educational provision. The logical effect is in turn a further reduction of received Instructional Time on the students' population borne entirely on those students who did not dispose of connections and appropriate digital devices. Drawing from ISTAT's reports on ICT assets across Italian regions, estimates of the students' population in a condition of digital deprivation is provided in Table 9. It is thoroughly evident, as also explicitly highlighted in the report, that Southern regions present substantially higher proportions of students lacking laptops, computers, and connections with respects to their counterparts from Central and Northern Italy (ISTAT 2020a). More than half of Italian students in such condition is indeed localized in the South and on the Islands, marking a greater educational vulnerability of students in these areas and suggesting larger risks of educational loss.

Table 9: Distribution of Students at Digital Deprivation across Regions and level of Education

Region	Primary Schools	Lower Secondary Schools	VET Institutes	High Schools	Upper Secondary Schools
Abruzzo	9.605	6.271	4.496	5.850	10.346
Basilicata	3.900	2.704	2.612	2.644	5.256
Calabria	14.842	9.900	8.946	8.558	17.505
Campania	46.063	33.746	27.038	29.539	56.577
Emilia-Romagna	16.324	10.464	9.500	7.458	16.958
FVG	4.146	2.713	2.335	2.016	4.351
Lazio	20.789	13.906	8.433	13.549	21.982
Liguria	4.643	3.248	2.595	2.851	5.446
Lombardia	37.094	23.566	17.915	15.877	33.792
Marche	5.653	3.647	3.227	3.077	6.304
Molise	1.987	1.346	1.211	1.263	2.474
Piemonte	15.097	9.838	8.032	7.431	15.463
Puglia	31.289	21.105	19.649	17.783	37.432
Sardegna	11.066	7.340	6.649	6.748	13.397
Sicilia	39.864	27.166	21.661	22.636	44.297
Toscana	12.901	8.773	7.267	7.378	14.645
Umbria	3.196	2.123	1.522	1.903	3.425
Veneto	18.180	11.897	10.331	7.557	17.888
ITALY	**296.638**	**199.753**	**163.418**	**164.120**	**327.538**
National Total: 823.929					

Sources: Author's elaboration of ISTAT 2019, 2020a, MIUR 2019a, 2019b.

Combining figures for Digital Deprivation and Enacted Instructional Time through DL, it is possible to grasp the exacerbating impact of digital assets' unavailability on educational losses and isolate the impact of such phenomenon with respect to the general losses of weekly school hours attributed to the disruption of conventional learning environments and opportunities; while Table 10 first accrues foregone hours of Instructional Time, the relative incidence on each region and educational level is included in Table 11.

Table 10: % of Hours Lost over Intended School Year, considering Digital Exclusion

Region	Enacted S.Y Days	Primary Schools Hours	Lower Secondary Schools Hours	VET Hours	High Schools Hours	Upper Secondary Schools Hours
Abruzzo	**173**	- 28,75%	- 25,10%	- 18,66%	- 17,12%	- 35,78%
Basilicata	**175**	- 29,51%	- 25,55%	- 18,74%	- 17,20%	- 35,94%
Calabria	**173**	- 28,93%	- 25,37%	- 18,66%	- 17,12%	- 35,78%
Campania	**175**	- 28,73%	- 25,24%	- 18,74%	- 17,20%	- 35,94%
Emilia-Romagna	**173**	- 28,25	- 23,39%	- 16,42%	- 14,73%	- 31,15%
FVG	**173**	- 28,97%	- 24,54%	- 16,95%	- 15,22%	- 32,17%
Lazio	**173**	- 28,80%	- 23,82%	- 16,68%	- 14,98%	- 31,66%
Liguria	**174**	- 28,95%	- 24,19%	- 16,86%	- 15,13%	- 31,99%
Lombardia	**173**	- 28,82%	- 24,11%	- 16,68%	- 14,98%	- 31,66%
Marche	**173**	- 27,62%	- 23,40%	- 16,42%	- 14,73%	- 31,15%
Molise	**172**	- 28,36%	- 24,71%	- 18,46%	- 16,94%	- 35,41%
Piemonte	**177**	- 28,58%	- 23,97%	- 16,57%	- 14,87%	- 31,44%
Puglia	**172**	- 29,15%	- 25,52%	- 19,07%	- 17,50%	- 36,57%
Sardegna	**171**	- 29,04%	- 25,25%	- 18,57%	- 17,04%	- 35,61%
Sicilia	**176**	- 28,66%	- 25,53%	- 18,93%	- 17,37%	- 36,30%
Toscana	**176**	- 29,19%	- 24,25%	- 16,93%	- 15,20%	- 32,13%
Umbria	**175**	- 27,74%	- 23,66%	- 16,49%	- 14,81%	- 31,30%
Veneto	**171**	- 27,73%	- 23,37%	- 16,34%	- 14,66%	- 31,00%
ITALIA	**AVG. 173,6**	- 28,66%	- 24,50%	- 17,56%	- 15,93%	- 33,50%

Source: Author's elaboration of ISTAT 2019, 2020a; MIUR 2011, 2019a, 2019b.

Table 11: % Incidence of Digital Deprivation over total Hours Lost

Region	Enacted S.Y Days	Primary Schools Hours	Lower Secondary Schools Hours	VET Hours	High Schools Hours	Upper Secondary Schools Hours
Abruzzo	**173**	-1,57%	-2,39%	-3,82%	-4,16%	-7,97%
Basilicata	**175**	-1,44%	-2,32%	-3,83%	-4,18%	-8,01%
Calabria	**173**	-1,53%	-2,32%	-3,82%	-4,16%	-7,97%
Campania	**175**	-1,61%	-2,39%	-3,83%	-4,18%	-8,01%
Emilia-Romagna	**173**	-0,68%	-1,14%	-1,82%	-1,98%	-3,79%
FVG	**173**	-0,72%	-1,14%	-1,88%	-2,04%	-3,92%
Lazio	**173**	-0,68%	-1,16%	-1,85%	-2,01%	-3,86%
Liguria	**174**	-0,70%	-1,16%	-1,86%	-2,03%	-3,90%
Lombardia	**173**	-0,68%	-1,13%	-1,85%	-2,01%	-3,86%
Marche	**173**	-0,74%	-1,14%	-1,82%	-1,98%	-3,79%
Molise	**172**	-1,58%	-2,39%	-3,78%	-4,11%	-7,89%
Piemonte	**177**	-0,68%	-1,12%	-1,83%	-2,00%	-3,83%
Puglia	**172**	-1,66%	-2,47%	-3,90%	-4,25%	-8,15%
Sardegna	**171**	-1,47%	-2,32%	-3,80%	-4,14%	-7,94%
Sicilia	**176**	-1,71%	-2,41%	-3,87%	-4,22%	-8,09%
Toscana	**176**	-0,69%	-1,17%	-1,87%	-2,04%	-3,91%
Umbria	**175**	-0,74%	-1,13%	-1,82%	-1,99%	-3,81%
Veneto	**171**	-0,71%	-1,13%	-1,81%	-1,97%	-3,78%
ITALY	**AVG. 173,6**	-1,09%	-1,69%	-2,72%	-2,97%	-5,69%

Source: Author's elaboration of ISTAT 2019, 2020a; MIUR 2011, 2019a, 2019b.

Differentials over the incidence of digital deprivation between regions depict starkly different scenarios in relative terms. A first general observation is that incidence rates are nearly always double in southern territories, and consistently so across educational levels; in these areas the aggregate sum of Digital Deprivation incidence ranges between 10% and 13%, with students in Apulian and Sicilian schools manifesting the greatest impact of capital entry barriers in emergency opportunities in education (a combined 12,28% and 12,21% of incidence over total lost hours, respectively).

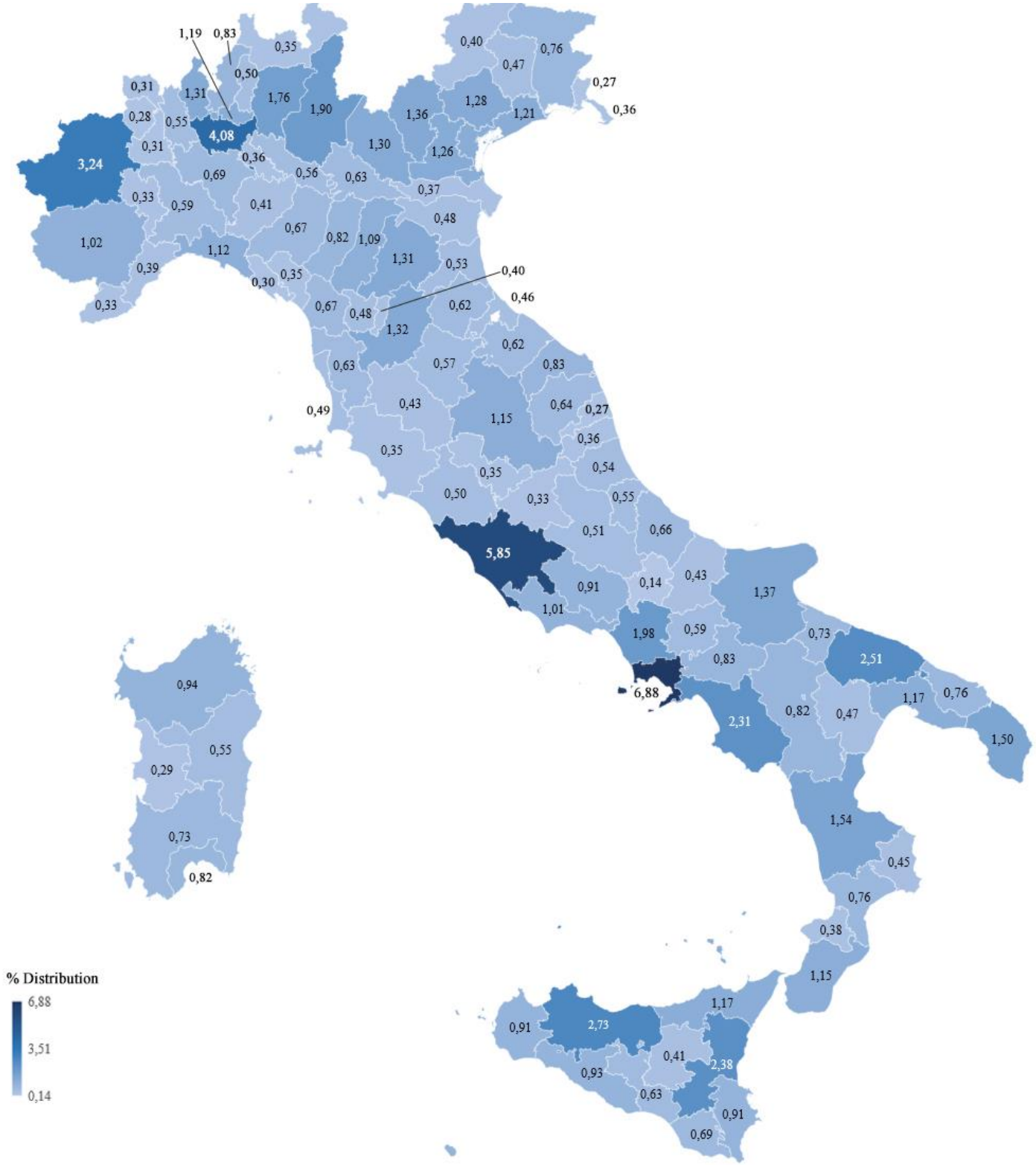
For what concerns differences between educational levels and orientation paths, the presumed effect on higher grades is substantially more intense if compared to primary schools. In Puglia, Sicilia, Basilicata, and Campania almost a tenth of overall losses in Instructional Time can be attributed to digital deprivation at Upper Secondary level, with concerning implications on the efficacy of DL as a guarantee of individual development in these areas. Proportions of Instructional Time's disruption remain relatively high in overall better faring regions such as Piedmont, Friuli Venezia Giulia and Veneto in ISCED 2 grades, although the incidence of digital divides is less than half in these areas. Middle Schools and Primaries seem to have suffered less in this regard, although there are some

methodological implications that may lead to misleading assumptions especially in the latter case. Considering that elementary schools shifted from offering the longest school weeks (between 30 to 40 hours) in the system to the shortest (10 hours), assuming the application of ANP's note on suggested daily DL hours, it is possible that most of the relative impact on overall losses in Instructional Time is prominently captured by the reconfiguration of schooling times, rather than dispositional disadvantages with regards to DL access.

4.3 Estimate Results of Decree *Cura Italia* and DM 187

The remedial intervention foreseen by DL 18 was formally enacted on March 26th by the MI through implementing decree 187; the allocation of funds to school and families thus began almost in concomitance with the upcoming officialization of DL as the substitutive channel for the continued provision of compulsory education services. Employing the 70:30 criteria for the allocation of funds, the former proportion based on indicators of low socioeconomic status of students' families and the latter on overall number of students enrolled in the institute, the €70 million offered by the government for schools' acquisition of digital devices were distributed as stated in Attachment A of the Ministerial decree (MIUR 2020g), and as summarized in absolute and relative terms at provincial level in Figure 4 and Table 12. The first notable point is the intense concentration of funds in the urban and suburban areas of the metropolitan cities of Naples, Rome, Milan, and Turin, which together accrue 20% of the total fund. The relatively significant concentration of students in these areas is a determinant factor, although the weight configuration for the distribution of resources clearly prioritizes socioeconomic variables; this is reflected in proportionally large resources directed to relatively less-populated educational district, such as Catania (2,38%), Caserta (1,98%), Lecce (1,50%), and Foggia (1,37%). However, it is fundamental to consider the absolute students' population of a province and compare it to the intensity of the fund allocation in that area. For instance, Lombardy and Campania received similar proportions of DL 18 funds (14,17% and 12,58% respectively), but present rather different educational and social realities; for one, Lombard schools enroll about 1.100.000 students against the 750.000 of Campania, a difference in proportion that already suggests a relatively higher concentration of households with low ESCS indicators in the latter region. Secondly, more than half of the aids distributed in the southern region are concentrated exclusively in the highly urbanized and densely populated province of Naples; Milan is arguably an even denser metropolitan area, yet the proportion of the respective allocation is lower, thus confirming an area of overall greater socioeconomic indigence.

Figure 4: % Distribution of Funds from DL 18/DM 187, Lett. B over total allocation per Province



Source: Author's elaboration of MIUR 2020g.

Table 12: Absolute and Relative Distribution of Funds from DL 18/DM 187, Lett. B over total allocation per Province

North				Centre				South			
Region	**Province**	**% of Let. B Funds**	**Absolute Let. B Funds (€)**	**Region**	**Province**	**% of Let. B Funds**	**Absolute Let. B Funds (€)**	**Region**	**Province**	**% of Let. B Funds**	**Absolute Let. B Funds (€)**
Emilia-Romagna	Bologna	1,31%	919.830,50	**Abruzzo**	Chieti	0,66%	461.324,73	**Basilicata**	Matera	0,47%	328.367,33
	Ferrara	0,48%	336.342,39		L'Aquila	0,51%	358.803,52		Potenza	0,82%	573.936,05
	Forlì Cesena	0,62%	431.643,56		Pescara	0,55%	387.315,29	**Calabria**	Catanzaro	0,76%	532.625,63
	Modena	1,09%	763.165,96		Teramo	0,54%	376.525,69		Cosenza	1,54%	1.075.433,20
	Parma	0,67%	469.567,74	**Lazio**	Frosinone	0,91%	638.591,04		Crotone	0,45%	314.957,33
	Piacenza	0,41%	286.417,28		Latina	1,01%	704.732,94		Reggio Calabria	1,15%	806.502,85
	Ravenna	0,53%	373.206,69		Rieti	0,33%	228.721,78		Vibo Valentia	0,38%	268.080,52
	Reggio Emilia	0,82%	571.892,12		Roma	5,85%	4.093.387,14	**Campania**	Avellino	0,83%	578.604,72
	Rimini	0,46%	321.111,74		Viterbo	0,50%	349.754,23		Benevento	0,59%	409.661,17
Friuli-Venezia Giulia	Gorizia	0,27%	192.011,14	**Marche**	Ancona	0,83%	577.664,65		Caserta	1,98%	1.384.107,91
	Pordenone	0,47%	325.767,39		Ascoli Piceno	0,36%	252.898,35		Napoli	6,88%	4.817.238,36
	Trieste	0,36%	255.487,19		Fermo	0,27%	188.250,93		Salerno	2,31%	1.618.773,60
	Udine	0,76%	532.110,78		Macerata	0,64%	446.269,20	**Puglia**	BAT	0,73%	512.609,52
Liguria	Genova	1,12%	783.626,73		Pesaro Urbino	0,62%	436.584,40		Bari	2,51%	1.759.131,18
	Imperia	0,33%	231.783,67	**Molise**	Campobasso	0,43%	298.058,63		Brindisi	0,76%	532.062,44
	La Spezia	0,30%	210.782,40		Isernia	0,14%	99.780,57		Foggia	1,37%	958.085,95
	Savona	0,39%	273.893,18	**Toscana**	Arezzo	0,57%	399.497,09		Lecce	1,50%	1.049.556,80
Lombardia	Bergamo	1,76%	1.232.031,33		Firenze	1,32%	924.289,02		Taranto	1,17%	818.522,50
	Brescia	1,90%	1.330.812,85		Grosseto	0,35%	247.844,13	**Sardegna**	Cagliari	0,82%	570.801,97
	Como	0,83%	581.390,91		Livorno	0,49%	346.113,51		Nuoro	0,55%	384.812,13
	Cremona	0,56%	393.364,74		Lucca	0,67%	469.109,12		Oristano	0,29%	200.189,27
	Lecco	0,50%	350.501,31		Massa Carrara	0,35%	243.102,18		Sassari	0,94%	657.781,83
	Lodi	0,36%	255.174,82		Pisa	0,63%	437.666,92		Sud Sardegna	0,73%	507.522,10
	Mantova	0,63%	444.440,17		Pistoia	0,48%	337.235,01	**Sicilia**	Agrigento	0,93%	648.722,11
	Milano	4,08%	2.855.563,77		Prato	0,40%	277.547,47		Caltanissetta	0,63%	440.688,08
	Monza e Brianza	1,19%	830.094,97		Siena	0,43%	300.847,22		Catania	2,38%	1.668.429,87
	Pavia	0,69%	484.711,16	**Umbria**	Perugia	1,15%	805.863,52		Enna	0,41%	290.309,10
	Sondrio	0,35%	247.249,10		Terni	0,35%	246.680,01		Messina	1,17%	821.742,06
	Varese	1,31%	916.781,55						Palermo	2,73%	1.908.769,55
Piemonte	Alessandria	0,59%	414.494,62						Ragusa	0,69%	484.642,86
	Asti	0,33%	232.681,84						Siracusa	0,91%	640.108,28
	Biella	0,28%	193.262,63						Trapani	0,91%	638.627,29
	Cuneo	1,02%	717.402,35								
	Novara	0,55%	385.131,72								
	Torino	3,24%	2.266.518,04								
	Verbano	0,30%	212.390,71								
	Vercelli	0,31%	215.335,52								
Veneto	Belluno	0,40%	277.944,19								
	Padova	1,26%	884.156,08								
	Rovigo	0,37%	261.576,02								
	Treviso	1,28%	897.665,31								
	Venezia	1,21%	846.770,91								
	Verona	1,30%	906.726,53								
	Vicenza	1,36%	951.324,54								

Source: Author' elaboration of MIUR 2020g.

Building on the data map of DM 187's distribution of funds across the national territory, allocations at provincial and regional level can be combined with the estimated geographical and educational distribution of Italian students. Again, due consideration of implementation times is of essence when estimating the mitigating effect of *Cura Italia*'s allocation on Instructional Time losses; according to the date of adoption of the measure, that is the moment in which the MI published the enacting decree and began the distribution of funds, two weeks elapsed between the activation DL and the provision of easing measures to access it; as schools received directives to autonomously set the arrangements for the acquisition and distribution of digital assets on March 26th, this date is considered the first effective day in which DL-excluded students could reach previously inaccessible educational opportunities.

In factual terms, however, this is far from a realistic expectation. On central government's side, the bureaucratic procedure for the transfer of funds to RSOs, provincial departments, and then individual institutes is not instantaneous, and in all likelihood a mechanism of accountability and checks-and-balances operating on mutual formal approvals and green lights may require some days to conclude the process. On the side of schools' administrations, a number of tasks had to be completed in order to begin the distribution of devices. Devices needed to be acquired, billed, and delivered to the institute in order to begin their distribution; the establishment of school-specific criteria for the selection of recipients needed to be drawn, thus requiring meetings between administrative personnel, conferral of formal competences over the operative tasks, creation of application forms, and circulation of information across the students' population. Furthermore, selection processes remained open for some time, as to guarantee opportune timeframes for applicants' participation in the program. It is evident that handling all the essential tasks for the functioning of the policy was not something achievable overnight, and by extent that some schooldays elapsed between the emanation of DM 187 and students' reception of the leased goods. Again, the bottom-up structure of policy enactment in this prospect comes with extremely heterogeneous contexts between regions, provinces, and schools. In some cases, administrations established distributional criteria the same day the ministerial directive arrived, as internal school communications declaring the initiative were circulated shortly after that date (IC Donatello 2020). Different amounts of time were required for the same process in other contexts, and dates of final implementation ranged between the first days of April to early May (ISS Carlo Levi 2020; IC 4° De Lauziers 2020). In light of this lack of time consistency in the deployment of digital resources, estimates take a limited, simplified consideration of timeframes. Figures are thus calculated under the assumption that all schools obtained DM 187's funds and borrowed the digital devices on the very day of emanation of the act, and that devices remained at receiving students' disposal until the end of the schoolyear in accordance with the

regional calendar. The period in question ranges from 42 to 49 days of schooling depending on the territory, and results are presented in Tables 13 and 14 below.

Table 13: Hours Recovered on projected losses with DL 18/DM 187

Regions	Enacted Days	Primary Schools IP Hours	Lower Secondary Schools IP Hours	VET IP Hours	High Schools IP Hours	Upper Secondary Schools IP Hours
Abruzzo	**47**	192.368	188.379	225.127	292.890	518.018
Basilicata	**48**	100.453	104.500	168.222	170.282	338.503
Calabria	**47**	349.150	349.354	526.152	503.332	1.029.484
Campania	**48**	1.007.313	1.106.967	1.478.179	1.614.927	3.093.107
Emilia-Romagna	**46**	541.636	520.812	788.040	618.639	1.406.679
FVG	**48**	163.473	160.441	230.156	198.766	428.922
Lazio	**47**	731.498	733.992	741.815	1.191.920	1.933.735
Liguria	**48**	176.831	185.533	247.092	271.437	518.528
Lombardia	**47**	1.291.954	1.231.149	1.559.875	1.382.454	2.942.329
Marche	**46**	223.557	216.313	319.054	304.229	623.283
Molise	**46**	44.182	44.879	67.283	70.203	137.486
Piemonte	**42**	513.440	501.872	682.923	631.771	1.314.694
Puglia	**48**	664.028	671.832	1.042.495	943.506	1.986.001
Sardegna	**46**	262.071	260.739	393.697	399.518	793.215
Sicilia	**43**	819.189	837.386	1.112.797	1.162.916	2.275.713
Toscana	**49**	489.063	498.884	688.672	699.284	1.387.956
Umbria	**47**	127.545	127.105	151.854	189.863	341.717
Veneto	**45**	604.734	593.614	859.099	628.461	1.487.560
ITALIA	**AVG. 46,6**	8.302.485	8.333.750	11.282.531	11.274.399	22.556.930

Table 14: % Mitigating Incidence of DL 18/DM 187 over projected Hours Lost

Regions	Enacted Days	Primary Schools IP Hours	Lower Secondary Schools IP Hours	VET IP Hours	High Schools IP Hours	Upper Secondary Schools IP Hours
Abruzzo	**47**	0,34%	0,51%	0,82%	0,90%	1,72%
Basilicata	**48**	0,39%	0,63%	1,05%	1,14%	2,18%
Calabria	**47**	0,39%	0,59%	0,97%	1,05%	2,02%
Campania	**48**	0,37%	0,55%	0,89%	0,97%	1,85%
Emilia-Romagna	**46**	0,25%	0,41%	0,66%	0,72%	1,38%
FVG	**48**	0,30%	0,48%	0,78%	0,85%	1,63%
Lazio	**47**	0,26%	0,44%	0,70%	0,76%	1,46%
Liguria	**48**	0,28%	0,47%	0,75%	0,82%	1,57%
Lombardia	**47**	0,25%	0,42%	0,69%	0,75%	1,44%
Marche	**46**	0,32%	0,49%	0,78%	0,85%	1,64%
Molise	**46**	0,38%	0,58%	0,92%	1,00%	1,92%
Piemonte	**42**	0,24%	0,40%	0,66%	0,72%	1,38%
Puglia	**48**	0,37%	0,55%	0,88%	0,95%	1,83%
Sardegna	**46**	0,38%	0,60%	0,98%	1,07%	2,05%
Sicilia	**43**	0,37%	0,52%	0,83%	0,90%	1,73%
Toscana	**49**	0,27%	0,46%	0,74%	0,81%	1,55%
Umbria	**47**	0,32%	0,49%	0,78%	0,85%	1,64%
Veneto	**45**	0,26%	0,42%	0,67%	0,73%	1,40%
ITALIA	**AVG. 46,6**	0,32%	0,50%	0,81%	0,88%	1,69%

Source for Table 13 and 14: Author's elaboration of ISTAT 2019, 2020a; MIUR 2011, 2019a, 2019b, 2020g.

Overall, DM 187 managed to target the most vulnerable areas with some effectiveness: in all educational levels there is a registered larger mitigating impact on southern regions, with Calabria, Puglia, Sardinia, and Sicily presenting higher rates of ameliorations over estimated educational losses due to digital deprivation. Basilicata emerges as the region where the policy resulted most successful, and between its two provinces the amount of hours recovered supported Upper Secondary students in particular, with relative gains quite higher than Northern and Central regions, and even for other principal recipients of the aid such as Sicily, Abruzzo and Campania. As the borrowing of devices granted access to otherwise restrictive educational opportunities, students enrolled in grades with higher weekly thresholds of DL were unquestionably better overall recipients of the goods offered; indeed, access to a device for students in the third year of High School or attending virtually compatible VET programs allowed them to engage with vast set of activities carried out throughout relatively long school weeks, if compared to what was offered to primary school students at the same time. Without considering the intrinsic implications of DL, as their effect is to some degree universally applicable regardless of individual students' characteristics, it is evident that by design, the conferral of digital goods would have benefitted more those students risking higher quantitative losses in Instructional Time, and less those faced with relatively shorter DL weeks. From this perspective, the deployment of DL and the policy aimed at enhancing its accessibility constituted a reversal of Instructional Time distribution across the education system; lower grades, which normally feature longer learning periods, have been subject to a substantial reduction of weekly hours, whereas later grades which usually consider shorter class times have managed to secure greater exposure to Instructional Time.

It is difficult to materially assess the consequences of this prospect or evaluate the preferability of one case against its unobserved contrary; determining whether distributive policies ought to favor lower or higher grades of schooling is not uncontroversial. On the one hand, early schooling is a critical stage of individual growth where the rules of socialization and peer-to-peer relations are explored and embedded in the future citizen, as well as core skills and competences to properly function as one; on the other, the development of effort-intensive skills and technical knowledge attained during later stages of schooling is fundamental to ensure the appropriate preparation of the prospective worker in the opening of life opportunities after schooling. The assessment of a case against the other is politically, sociologically, and pedagogically involved, and would be deservingly addressed elsewhere. Of pertinence and relevance is instead the conclusion that materially, the aggregate effect of policies adopted in the continuation of education systems' tasks ultimately brought a relatively lower impingement if learning opportunities for upper-level students, impacting more those at primary level instead.

Chapter 5 - Discussion and Conclusions

5.1. Descriptive Discussion of Results

Recourse to distance-based learning arrangements during the first pandemic wave has inevitably reduced the system's overall output of Instructional Time in Italy, affecting to some degree the entirety of students in the public education system. Yet the burden of these losses was borne unequally on the population, and losses across specific age groups, educational orientation paths, and territory were more acute.

From the comparison of educational levels, it emerges that students from primary schools were hit most intensely by school closures and the activation of DL, and are likely to have incurred in substantial educational losses with respects to other categories of students. Qualitative and quantitative evidence seems to support this preposition. In the former case, the substantive character of primary programs and teaching practices adopted faces stronger challenges in successfully translating to virtual spaces for a variety of factor. First, ICT skills and familiarity are comparatively inferior in the sector for both the demand and supply side than in other educational levels. Children can rely on limited experience with digital devices, software, and non-physical environments, which limits their capacity to engage with DL and completely assimilate the received instructional time. Furthermore, their learning and functional autonomy is not equivalent to their older counterparts, and additional educational inputs in the forms of parental surveillance, specific assistance with the received tasks and technical equipment is needed. A second relevant factor is the difference in training and formation of the teaching personnel; a higher level of specialization is required to teach in upper grades, making the formal preparation of elementary educators inferior. The employment of digital resources and the development of effective teaching practices hence turns more challenging for this category. The highest degree of difficulty in providing stimulating educational inputs was found at the primary level, with teachers lacking the preparation or instruments to foster students' motivation (INDIRE 2020b). In addition, the objectives of primary school curricula foresee a strong character of peer-to-peer and student-to-teacher socialization in addition to the development of basic cognitive skills, which especially at a younger age operate on physical environments to mediate interactions and social contacts. Qualitative interviews underline the essential role of physical contact in early-age socialization and learning, and overall share the idea that DL cannot in any way act as viable substitute on that regard (Scuola.net 2020). Accordingly, there is wide agreement that educational losses at primary level are chiefly driven by the sustained deterioration of relational and communicational quality between students and with teachers. The adoption of DM 187 also turned

only marginally beneficial, as its effectiveness on the demand-side critically depended on the number of hours that the supply side could generate. As designated Instructional Time in primary schools was drastically decreased through DL, the guarantee of access to excluded students generated limited additional exposure to educational opportunities and learning environments in their translation on the digital space. While granting young students at a critical age of development access to education is an undeniably good and desirable effort, in purely quantitative terms DM 187 turned more favorable for relatively older students in higher grades of education. The pandemic left a conspicuous mark on young students, and it is perhaps in recognition of these criticalities that in the reopening of schoolyear 2020-2021, the government strongly prioritized presence learning arrangements for primary schools, which according to DL 137 had to be fully guaranteed under all circumstances expect in cases of severe pandemic risk at regional level. As a consequence, it is plausible that in the last schoolyear educational losses from the first pandemic wave may have been recovered with greater efficacy than in the case of secondaries, which still availed of virtual learning in the context of Integrated Digital Learning (DL 137/2020).

With reference to the territorial dimension, the country appears split in two separate realities. While regions in Northern and Central Italy were not completely prepared for a shift to remote learning, their students' population could still rely on relatively sufficient endowments and infrastructures to adapt to virtual environments. The situation among southern provinces presented concrete challenges, leading to considerably larger projected losses. Differences in impact thresholds of DL on Instructional Time underscore this preposition, as the impact of Digital Divides affected the educational opportunities of students in the *Mezzogiorno* twice as much than in other Italian territories. On the one hand, long-hauled differentials in terms of digital infrastructures disadvantaged southern provinces from the start; in terms of digital devices available, a condition of digital deprivation characterized more than half of the students' population pertaining to these areas, and constituted fundamental barriers to access of remedial educational opportunities. Similarly, despite advanced networks of infrastructures for internet connections in southern provinces, these resources did not sustain the overload of service usage caused by the sudden interdiction of personal movement. Moreover, the challenges that DL wrought on southern students are not only limited to questions of lacks of tangible endowments, but relate also to human capital and sector-specific skills. The country registers comparatively low levels of integration and assimilation of ICT and in the development of school practices availing of these resources. Also, income and education are considered fundamental drivers of digital divides, southern territories result at disadvantage. The match between regions displaying higher incidences of Digital Divides and the maps of educational risks drawn by Save the Children is of dire concern. What critically emerges is that those provinces and regions that least

effectively managed to adopt DL were also the ones in which the highest levels of implicit educational dispersion was registered. In effect, not only did a substantial portion of students from the south start the year with substandard competences in Italian and mathematics skills, but with the eruption of the pandemic their capacity to attend classes and avoid learning losses was disrupted more than for those students who scored in line with average scores or even better. From this perspective, the translation of learning opportunities on digital platforms has deepened pre-existent educational inequalities across the two halves of country.

Two prepositions can thus be advanced: first, that the implementation of DL has indeed created winners and losers also in geographical terms, with territories starting the pandemic in a position of disadvantage emerging relatively worse off; second, that long-hauled horizons of human capital development for Italian students remain critically anchored to a question of geographic position, with the implication that life opportunities for students living in southern regions and attending local schools are already exacerbated by systemic inequalities across the country. While *Cura Italia*'s distribution of €70 Million attempted to address the issue in the short term, its effectiveness is hampered by shortcomings in policy design, and accounting for the localization of Educational Risks, local allocations of DM 187's funds proved inadequate in reaching structurally vulnerable areas. The loss of learning is severely concentrated in the *Mezzogiorno*, oscillating between extremely urbanized centers with extensive peripheries in socioeconomic disadvantage, such as Palermo, Naples, Catania, Brindisi, and more isolated rural areas like Sud Sardegna, Barletta-Andria-Trani, Crotone, and Trapani, among others. Nevertheless, the scarcity of funds received in these territories is also driven by lower students' populations, as the only substantial exceptions are the big cities of Palermo, Naples, and Catania. Conversely, it is quite striking to compare those figures with the high portion of funds allotted to provinces such as Rome and Milan, and to a lesser extent also Bologna, Genova, and Florence, where rates of digital deprivation, risks of educational loss, levels of implicit dispersion and number of households in the lowest ESCS quintile are substantially lower (Save the Children 2020).

In acknowledgment of all these critical shortcomings, was the activation of Distance Learning a liability in the long-run development of Italian students' competences, skills, and social dispositions? Did eventual costs overshadow benefits in terms of policy outputs and projected outcomes? Answering either question requires a challenging trade-off between policy priorities, weighing on one side an absolutistic efficacy-oriented position against a relativistic question of social equitability on the other. A first point is that the deployment of a remedial system to guarantee schooling and education was necessary and imperative; the fact that nearly all world countries affected by Covid-19 and resorting to national lockdowns decided to dedicate substantial efforts to ensure continuity in the provision of educational services underlines the high-stakes that the sector embodies for national

governments, and its cardinal role in contemporary societies (OECD 2020b). To a degree, in the context of the first pandemic wave this role has surpassed the conventional emphasis on the development of skills and knowledge, underlining instead the social function that schools can carry out. The severity of the disease exerted a strong emotional toll on students and their families, especially at its onset when very little clarity and certainty on the immediate future were available. The importance of maintaining learning activities as a platform for social interaction and indirect contact was an element amply recognized by institutions, teachers, and students, as in parallel to educational continuity it guaranteed a degree of relief or distraction over a population distraught by the sudden and radical transfiguration of daily, habitual, and normal life. While the implications of this aspect have not been discussed at length, it is worth reminding that the essentialization of the school system and its activities emphasized the socializing mission of education during the crisis (MIUR 2020b); ensuring equitable access to DL was a fundamental priority to ameliorate the sense of disorientation that came with the crisis. This preposition holds with further strength when considering that households facing challenges in accessing DL also eminently coincide with conditions of socioeconomic disadvantage, which may find themselves experiencing social marginalization since before Covid-19 crisis. The government-sponsored provision of digital devices and goods might have helped bridging a gap between institutions and less-endowed households at a moment in which distance and exclusion were massively amplified by the pandemic. And lastly, the initiative underlined the institutional commitment in ensuring that the constitutionally guaranteed educational service maintained a degree of social equitability irrespectively of the measure's ultimate efficacy. While the activation of DL emerged as the most viable option to maintain schooling system's operations, providing policy tools to counteract the unintended effects of improvised and unfamiliar channels of education's service provision was a sensible effort to abide to its founding principles.

It is extremely difficult to imagine alternative courses of action without sacrificing efficacy over equitability or vice versa when the spread of infections threatened the country's internal security. Nevertheless, in implementational terms the chosen array of interventions was far from perfect, and it is worth addressing some of the policy design shortcomings that may have undermined the effectiveness of the measures. With respects to the projected demand for digital devices and connections, the allocation of funds results severely disproportionate; considering €70 Million to be distributed across the disadvantaged students' population and the 329.196 digital goods acquired (211.469 devices and 117.727 connections), it can be surmised that the average cost per good oscillates around €211. Due to unavailable data, it is impossible to determine with greater specificity the average cost per unit of each specific good, although it would seem reasonable to presume that

devices are relatively more expensive than connections. Even when considering equal prices among the goods, it results that the overall amount of devices could satisfy only about a quarter (25,67%) of the actual demand registered in the previous year (ISTAT 2019). Therefore, in terms of inputs the policy resulted proved insufficient in meeting the quantities detected by needs assessments.

Another point of contention ought to be the criteria for the allocation of funds, which heavily took account of income rather than the variables effectively related to the policy's objective. As a consequence, the geographical distribution of financial aids did not necessarily match that of actual needs. As previously shown in Figure 4, from the localization of distributed funds across Italian provinces it is evident that the regions of the South, where more than half national digital deprivation was identified by ISTAT, did not receive a proportionate quantity of financial resources to mitigate the students' population digital divide. In fact, only 30 of the 70 Million allotted were directed towards southern regions, where 55,28% of students' digital deprivation was located. This mismatch originates from the mechanism of allocation established in DM 187, which used ESCS status as the main variable associated to lack of digital goods. However, the effectiveness of ESCS indicators in this regard may be limited and reflect only partially the likelihood of specific needs. Resorting to policy-output specific evidence from ISTAT's ICT report would have been more effective to reach the interested population in this regard.

In terms of implementation, the choice of distributive and information channels similarly suffered from a logical short-circuit, as the internal advertisement of the policy initiative to the target population availed predominantly of digital channels; typical methods of publication and circulation of internal communications within educational institutes were discontinued with closures, so school administrations chiefly availed of institutional websites, emails, and similar virtual channels to spread information across students and families. Moreover, recourse to printable forms and virtual submission of applications for policy selection further emphasized the role of ICT as a direct link between intended recipients and policy providers. Two consequences emerge from this: on the one hand, such bottom-up selection process meant that intended policy recipients lacked the instruments to discover the initiative, and therefore may not have applied simply because that knowledge was not available to them at the time; on the other, that even if they knew, those who were in greater need of the intervention also had to face higher application barriers in order to avail of the leases, which in turn might have exerted a negative effect on the policy's capacity to reach its targets. Discouragement is indeed a pivotal factor to take account of when deploying similar mechanisms of assistance; while excessively high selection barriers may further discriminate policy recipients, stigmatization may be another relevant factor preventing users' participation in the policy initiative. The process of selection of lease applications within schools, in some cases, culminated with the publication of a ranked list

of those who submitted application forms, and with the rest of internal institutional communications, it becomes available documentation for every stakeholder in the school. As such, it is conceivable that families or students may prefer not to expose a personal situation of relative deprivation as to avoid stigmatization in the local community. It is perhaps because of this processes that the needs assessment concluded in September by the Technical Report of DL 137 encompassed an overall demand equal to just 60% of the figures reported in the previous year (ISTAT 2019; DL 137/2020). It is also possible that by September households might have acquired digital goods autonomously not to wait another formal governmental intervention, and that by August 2020 the number of students in need might have diminished through private initiatives.

All mentioned shortcomings ought to be contextualized in the policy design and adaptation stages; with extremely limited resources in terms of central-budget financial assets and even scarcer time, these drawbacks appear motivated by the lack of a solidly established crisis response mechanisms and a substantial absence of experiential repertoires to drive sectorial policy interventions. The delay between the activation of DL and the provision of easing measures to ensure access to the disadvantaged population underlines an initial underestimation of the Digital Divide's intensity in the country's demand side, especially in households with children of schooling age; an underestimation that inadvertently created winners and losers, and that required later adjustment down the line through *Cura Italia*, which however managed to address the issue only partially. Even with the allocation of €70 Million to families in need, the projected figures of school exclusion linked to DL remain worrying: an estimated 600.000 students across all educational levels might have been completely left out of education ever since the start of the pandemic, almost a tenth of the overall students' population in compulsory levels. For these pupils, the reception of instructional time terminated on March 5th until the beginning of the new school year, with an accrual of educational losses twice as large as normally registered with typical summer slides. Drawing from previous literature, a total of 27 weeks of absence from educational environments is projected to have a substantial diminishing effect on literacy skills, and possibly reversing a schoolyears' worth of learning in mathematics (Kuhfield & Tarasawa 2020). The likely socioeconomic and geographic origin of excluded students further exacerbates this prospect; the notable concentration of digital deprivation in the southern regions, as well as relatively weaker digital infrastructures intensifies the hardships of access to DL for students in these areas, who were already at remarkable educational risk in terms of substandard linguistic competences and numerical literacy before the start of the pandemic (Save the Children 2020). While recourse to DL was the only feasible approach identified in the midst of an unprecedent crisis for the country, policy alternatives for the mitigation of educational losses could have been adopted through the reinstatement of in-presence learning and the prolongment of the schoolyear in

early July. With the slowing of infection rates in early May and the gradual lifting of restrictions to personal movement, allowing schools to reopen through the second half of May would have prevented an aggregate sum of four months of losses for those excluded by DL, and mitigating those still experienced by students who could attend virtual classes in their reduced capacity.

The Dutch experience in this regard is useful to underline the importance of reinstating school attendance after closures, as the impact on students' attainment was fundamentally reduced with the readmission of students in classes (Hoekman et al. 2020). The study in the Netherlands also reinforces the preposition that educational losses were nonetheless more nuanced for students pertaining to low socioeconomic strata, which in the Italian context highlights the deepening effect on inequalities. However, through the governments' adoption of a broad array of policies supporting schools' digital infrastructure, the readaptation of educational environments in compliance with measures of public safety, and the extensive delivery of training programs for teachers and educators through late spring and summer 2020, the clear policy objective was the full-fledged readmission of students in classes for September, rather than providing reparatory measures for the elapsed schoolyear. These dispositions also matched with the preferences expressed by students' families, of which only 32% would have been favorable to an extension of the school year until July (CNEL 2020). In parallel, the activation prospects of extracurricular programs for the recovery of educational losses for students who failed to obtain a sufficient mark in one or more subjects was almost entirely left to the autonomy of individual institutes: the MI simply indicated that from September 1st , teachers were to designate plans for students' recovery of competences through an individual learning plan (MIUR 2020e); however, the directive was not accompanied by additional financial resources to compensate teachers assigned to the drawing of the plans, and no *ex-post* implementational assessment framework has been drawn. Once again, the incumbent publication of INVALSI tests will provide definitive evidence on the entirety of the pandemic experience on educational achievement, and appropriately gauge variations across territories, educational levels, and social strata.

From the appraisal of comparative education strategy adopted during the first pandemic wave, a brief discussion over the organization of the schoolyear and the drawing of regional calendars is in order. Much of the educational losses mediated by foregone attendance in Netherlands have been offset by reversing the dynamics at the core of the experienced events: resuming in-presence schooling was the best option to offset the loss of physical attendance, rather than furthering access to its remote-based substitute. While the intensities of the public health threats between the countries are not directly comparable, the different prospects of the organization of schooltime and summer slides are. In the Italian system of education, a long schoolyear is sided by proportionately long summer breaks, whereas in the Netherlands there is a preference for shorter terms alternated with relatively brief

vacations throughout the year; as a consequence, educational cycles in the latter case are more dense and frequent with respects to the former, which reduces the overall impact of temporary interruptions of Instructional Time for the simple reason that the next cycle will follow shortly afterwards.

A possible path of reform in Italy could consider a less polarized distribution of Instructional Time across the year, which would presumably reduce the significant impact of nearly three months of continuous school unattendance on educational attainment. While this prospect appears very unpopular due to the popular embedment of the notion that "*summer (...) is almost sacred*" (CNEL 2020, 99), pervasive crises or emergencies impinging school attendance for several weeks would not bear the risk of keeping students away from classes for long terms when in proximity of summer breaks. Moreover, a greater degree of flexibility in the configuration of the schoolyear might allow schools to easily designate multiple educational recovery periods as needed throughout the year, instead of concentrating the conduction of such activities in the first weeks of September before school openings. This is merely one of the multiple dimensions that could drive future reform proposals originating from the analysis of the first pandemic wave on education. It is imperative to make of this context a teaching experience, both in terms of the overarching organizational structure of education system's service provision and crisis management efforts.

In the former domain, the pervasiveness of Covid-19 has underlined the cruciality of coordination in a vertical sense, that is between central, regional, and local authorities, and horizontal actors such as institutes' administrations, education workers trade-unions and associations, and independent interest groups in the sector. The administrative fragmentation in a complex network of interacting actors is a determinant of policy success or failure in decentralized systems. It is possible that the impact of school closures on educational losses would have resulted more homogeneous in the context of a centralized system in which central directives establish clear, uniform, and binding sets of policy practices; by no means does this entail that overall losses in Instructional Time would have been reduced in the context of a cohesive policy sector, as differences in the capacity to comply with governmental provisions may undermine the effectiveness of institutions positioned in local contexts with very specific characteristics; it is only argued that more homogeneity in the impact of Covid-19 would have been a reasonable yet debatable expectation. Later, the prospect of interregional differentials was exacerbated by the adoption of multitiered systems of pandemic threat as adopted in the second wave; while on the one hand this allowed relatively low-risk regions to guarantee presence learning in schoolyear 2020-2021, it came at the cost of further fragmentation in the delivery of educational services countrywide (Rota et al. 2020). However, the implications of prioritizing either national system's effectiveness or equitability are not appropriately addressed here and would require further exploration in both policymaking practices and political discussions.

In the case of emergency education policies, carefully selecting evidence when informing the design of interventions is of pivotal importance. For what concerns the supply-side, the thorough appraisal of available resources in terms of infrastructures and human capital is fundamental to drive the effective and equitable delivery of services. Evidence suggests that few teachers started the pandemic equipped with the necessary competences to translate learning environments to the digital space, and that a strong degree of adaptation and improvisation characterized teaching approaches in DL. While the exiguity of Ministerial guidance on suggested practices contributed to the haphazardness of DL implementation, the lack of foregoing preparation was a structural shortcoming that emphasized the weak experiential foundations at the basis of DL practices; this becomes particularly true when considering the education system's emphasis on bottom-up sources of added value originating from diversification in the curricular offers of schools. It will be useful in the future to prepare training and formation activities in unconventional forms of teaching and learning, diversify educational approaches through the integration of multiple tools and channels, and prioritize the development of digital skills for teachers and students alike. Accordingly, schools ought to accelerate the adoption of digital devices and platforms, also as inventories of goods to provide to those who might lack access capacity at home, and integrate them in everyday schooling practices. Auspiciously, the momentum of pertinent policies in the education sector from the start of the pandemic will catalyze the digitalization processes foreseen by the PNSD.

Better appraisal of the demand-side's capacity to absorb new, capital-intensive practices is a crucial effort, if the system intends to successfully deliver any form of intervention on learning and teaching methodologies. To avoid creating unintended exclusion from educational opportunities and to sub-optimally allocate reparatory policy inputs later, competent authorities ought to carefully select the evidence used to designate policy targets and the channels through which recipients are reached. While ESCS indicators soundly capture households at educational risk, the specificity of the area of intervention may require consideration of other variables directly related to the policy issue. In the case examined, localizing material digital deprivation rather than conditions of socioeconomic disadvantage related to educational risk might have proved more effective in directing input-specific resources such as devices and connections.

5.2. Conclusive Remarks

The forceful closure of schools urged by the start of the Covid-19 pandemic is an unprecedented event in recent history, which effects on educational development, opportunities, and equality might loom on Italian citizens with great intensity in the long run. Seeking to grasp the entity of this proposition,

overview of the pedagogic and education theory framework has been proposed, in parallel to the systemic characteristics of the historical, social, and policy context in which DL has been adopted in Italy. From these elements, it was possible to create an evaluation framework for interventions adopted during and after the onset of the pandemic, using Instructional Time as a proximate measure for what was provided by the supply-side of education and what could be received by the demand-side. A few final takeaway points can be surmised from the estimation of intended thresholds of learning hours with respects to what was observed in practice.

First, that the activation of DL has inevitably implied the loss of Instructional Time throughout the entire education system; a prominent driver of foregone class hours was the general reconfiguration of learning times in shorter weeks of digital schooling. Evidence shows that programs' reductions were significantly more intense in lower educational levels, as they used to provide higher thresholds of Instructional Time before the pandemic. During the first pandemic wave, elementary students did not manage to substitute the disrupted schooling activities with DL as much as lower and upper secondaries. Conversely, high schoolers endured a relatively marginal loss of overall instructional time, more pronounced in orientation tracks and years that foresee higher thresholds of weekly hours or specific arrangements for curricular learning. The other driver of losses was students' individual capacity to avail of the necessary endowments to participate in DL; as such, a significant portion of Italian students lacking devices, connections, skills, and familiarity with ICT could not be rapidly integrated in virtual-based classes. Research shows that geography and socioeconomic status relate both digital deprivation and lower rates of educational proficiency in the southern provinces of the country, consolidating the prospect that regions at an educational disadvantage before the pandemic also faced the highest difficulties in adapting to virtual educational environments. School closures and DL thus deepened the existing inequalities in educational opportunities between the upper and lower half of the country. Therefore, through *Cura Italia* the government injected financial resources to assist disadvantaged families in the acquisition of necessary assets to facilitate access to DL and reduce exclusion.

The second point is that in spite of the measure, only about a quarter of the demand for ICT goods was met due to shortcomings in the designing phase of the policy. It is argued that the selection of criteria to determine end recipients, the channels of implementation, and initial resources allocated were not adequate to effectively address the policy issue. Greater emphasis was thus put on following policy interventions to minimize and recover educational losses in the following schoolyear.

Covid-19 has been a dramatic experience that urged governments to redesign institutional management and policy practices in education as in any other sector. While the emergence of

pervasive crises can lie outside human deliberation, policymaking analysts and evaluators have a responsibility in availing of these instances to draw lessons from this context and prepare effective interventions in the future; the study proposed here attempts to locate itself in such research framework. Its limitations do not allow to grasp completely the intensity of educational losses linked to the Covid-19 pandemic, nor to capture the entirety of the emergency policymaking context. In this regard, definitive *ex-post* evaluation on foregone students' skills and competences will be possible only after INVALSI distributes results on actual educational attainments across the country. In the meantime, this study constitutes a first transitory and complementary effort to substantiate and operationalize the effects school closures through measurable variables, evaluate policy choices and implementation mechanisms, and contribute to a broad and committed discussion best adoptable practices to preserve core objectives during pervasive crises.

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The Distance of Inclusion: Compendio in Italiano

Il settore dell' istruzione è stato uno dei più colpiti dalla pandemia del virus Covid-19. A causa della relativa inesperienza con crisi pandemiche così pervasive e l'assenza di conoscenze pregresse sulle specifiche caratteristiche virologiche e di contagio della malattia, il governo italiano ha prescritto l'interdizione degli spostamenti personali a livello nazionale, così come la chiusura di tutte le attività economiche considerate non essenziali, dei luoghi di aggregazione, e delle istituzioni pubbliche che forniscono servizi sul territorio. Pertanto, tutte le scuole sul territorio nazionale sono state chiuse e la partecipazione in presenza alle attività didattiche sospesa. Per sopperire alla carenza dei servizi della pubblica istruzione, i quali sono pubblicamente garantiti dalla costituzione, il governo ha deciso di adottare delle forme di insegnamento che superassero la dimensione fisica e presenziale delle tipiche lezioni in classe, prescrivendo quindi l'adozione della Didattica a Distanza (DAD). Questa nuova metodologia didattica si fonda sull' utilizzo di piattaforme digitali e servizi telematici che gravitano intorno alle tecnologie di comunicazione istantanea (ICT), fondamentalmente utilizzando portali web, software, e siti internet per ospitare quelle pratiche didattiche che la pandemia ed i lockdown avevano sospeso in un primo momento.

Tuttavia, dopo soli pochi giorni dall' attivazione della DAD emerge che la mancanza di esperienza, preparazione professionale, e indicazioni ufficiali dal ministero costituiscono sostanziali ostacoli alle efficacie implementazione dell' apprendimento a distanza. Si scopre quindi che la traslazione delle attività scolastiche nell'ambiente digitale non può semplicemente imitare quelle che erano le pratiche comunemente accettate e diffuse tra il personale docente. È quindi necessaria una profonda ristrutturazione delle pratiche quotidiane, delle circostanze educative e dell'organizzazione del programma curriculare previsto per la fine dell'anno. Un fattore determinante che emerge da questo processo è l'impossibilità di sostenere i tempi della didattica come in presenza, spingendo quindi i docenti e i consigli di classe a ridurre il monte ore previsto settimanalmente dal programma d'istituto. Come prima conseguenza del Covid-19 sull' istruzione quindi si distaglia una significativa riduzione del monte ore di lezione annuale, un primo elemento costitutivo di perdita educativa generale rispetto a quanto inteso all'inizio dell'anno scolastico.

Un'altra difficoltà critica deriva dai requisiti di accesso alle forme sostitutive della didattica convenzionale. Moltissimi studenti, infatti, ne risultano sistematicamente esclusi a causa di un'assenza di beni fisici essenziali alla partecipazione: tra questi spiccano dotazioni digitali adeguate alla frequenza delle attività online come PC, Laptops e Tablet, e una connessione internet stabile e sufficientemente capace di sostenere attività di videoconferenza con più studenti collegati

contemporaneamente. Gli studenti in questa condizione di deprivazione digitale non hanno quindi modo di accedere alle opportunità educative costituite dalla DAD, e con la chiusura delle scuole restano estromessi dal proprio percorso di studi. Inoltre, questi individui appartengono a famiglie in situazioni di svantaggio socioeconomico, dove lo sviluppo di competenze e capacità tecniche, raccolte in un concetto di capitale umano, risulta una risorsa fondamentale per favorirne la mobilità sociale e il raggiungimento di una destinazione sociale migliore di quella di origine. Mentre con la DAD la generale riduzione del monte ore di lezione annuali è avvenuta trasversalmente, ed è quindi ricaduta su tutti gli studenti indipendentemente dalle proprie caratteristiche socioeconomiche, le perdite crescono ulteriormente nei casi in cui gli studenti non potevano accedere alle misure correttive messe in atto dal sistema di pubblica istruzione italiano.

Nel riconoscimento di questo effetto discriminatorio non inteso dalla adozione della DAD, parte di questo studio si volge a determinare in misure quantitative il livello di esclusione causato dalla DAD e come questo si rifletta sulle possibili perdite educative degli studenti italiani, tenendo in considerazione prima l'effetto complessivo della riduzione del tempo speso in apprendimento e poi la proporzione di studenti che non hanno potuto prendere parte nemmeno alle forme sostitutive della didattica a causa di una condizione di deprivazione digitale. Si argomenta che la DAD ha inavvertitamente creato dei "vincitori" e "vinti" in termini di accesso alle cruciali opportunità di sviluppo umano rappresentate dalla partecipazione alle attività scolastiche, e che questo effetto abbia approfondito delle disuguaglianze educative tra studenti che già partivano in una situazione di svantaggio prima della pandemia.

Il governo centrale ha inoltre deciso di intervenire sul fenomeno dell'esclusione educativa, e nell' articolo 120 del DL 18 Cura Italia commissiona al Ministero dell'Istruzione la distribuzione di €85 milioni da iniettare nel sistema scolastico verso ciascun istituto, e di acquisire con questi fondi dispositivi digitali e connessioni da garantire in comodato d'uso gratuito alle famiglie meno abbienti con figli iscritti nella propria scuola. Con il Decreto applicativo Ministeriale 87, i fondi vengono distribuiti tra regioni e scuole, e i dispositivi acquistati a partire dal 26 marzo 2020 a tre settimane dal lockdown nazionale. Tuttavia, sorgono dubbie sulla relativa efficacia della misura adottata, sia in termini assoluti di risorse indirizzate al problema, sia di policy-design nella determinazione dei canali di distribuzione e criteri per la selezione della popolazione interessata. Lo studio qui presentato quindi tenta di verificare in che misura i fondi del DL 18 hanno permesso agli studenti altrimenti impossibilitati di accedere alla DAD, e di non incorrere quindi in perdite educative maggiori rispetto ai propri compagni più privilegiati.

Lo studio si articola in quattro sezioni: framework teorico (Capitolo 2), metodologia (Capitolo 3), risultati (Capitolo 4), e discussione conclusiva (Capitolo 5). Nel secondo capitolo viene prima presentata una prospettiva generale sulla funzione socializzante e di sviluppo umano svolta dai sistemi di istruzione pubblica, sottolineando l'importanza della frequenza scolastica come dimensione spaziale e temporale delle opportunità educative.

I sistemi di istruzione pubblica sono da lungo tempo un nodo fondamentale delle società e degli stati moderni. Da una parte, svolgono un ruolo centrale nel garantire la trasmissione dei valori fondamentali alla base degli ordinamenti sociali, trasmettendo nozioni di cittadinanza e ruoli che permettano la completa integrazione dell'individuo nella società. Sotto questo punto di vista, le suole offrono una prima piattaforma sociale e relazionale che imita il contesto della vita pubblica in uno spazio sicuro per gli studenti, ed in forma alternativa all'educazione fornita dal nucleo familiare. Questo inoltre permette ai giovani cittadini di astrarsi dal conteso rigido e ascritto dei ruoli familiari e di confrontarsi con propri pari dalle diverse caratteristiche personali, contestuali, e socioeconomiche: ricercatori e sociologi hanno più volte consolidato l'ipotesi che la scuola agisca da equalizzatore sociale, facendo sì che l'interazione tra studenti di diverse origini sociali livelli le differenze educative relative al contesto familiare e offrendo quindi opportunità di sviluppo più eque. Dall'altra parte, la formazione scolastica si lega allo sviluppo di capacità tecniche e cognitive scalabili nella forza lavoro nazionale. Negli ultimi decenni, la globalizzazione ha creato una interdipendenza economica ed eroso barriere nello spostamento di beni, capitali, servizi e forza lavoro; per competere con l'economia di scala dei paesi emergenti e mantenere standard di vita elevati, nei paesi occidentali è necessario perseguire una forte specializzazione della forza lavoro in modo da contribuire allo sviluppo di capacità rare e preziose per l'economia globalizzata del futuro; di conseguenza il sistema scolastico italiano, in collaborazione con organizzazioni internazionali competenti, ha di recente adottato riforme volte sia alla razionalizzazione dell' apparato amministrativo-operativo della sistema educativo nazionale che alla riconfigurazione dei curricoli scolastici per una più facile transizione degli studenti nel mercato del lavoro o ulteriore specializzazione professionale nei cicli di apprendimento superiori. Per queste due funzioni critiche allo sviluppo della società e dell'individuo, i sistemi educativi sono di vitale importanza, e il loro funzionamento deve essere garantito anche in periodi di estrema urgenza come nel caso della pandemia di Covid-19.

Problema fondamentale è che nel corso dei secoli, le pratiche adottate per lo svolgimento di tutte quelle attività che costituiscono la didattica offerta dalle scuole si sono consolidate intorno a delle metodologie precise. Vi è generale unanimità nel presupposto che l'elemento chiave dello sviluppo educativo sia la presenza didattica, e la quantità di tempo che gli studenti passano non solo nel

contesto scolastico, ma in cui ricevono conoscenza dai propri educatori, sviluppano attivamente capacità tecniche e cognitive, e interagiscono attivamente e produttivamente con i compagni e gli insegnanti. Centrale è il ruolo dell'autorità docente nell'intermediare e distribuire questi beni educativi nel contesto delle classi e ore di lezione, il che rende l'immediatezza della didattica in presenza un caposaldo della disciplina educativa, ed il tempo di esposizione agli ambienti educativi una variabile positivamente associata al risultato scolastico.

La letteratura pedagogica e sociologica ha infatti evidenziato un fenomeno che sottolinea la centralità della didattica in presenza, cioè il fenomeno del *Summer Slide* legato al più ampio concetto di perdita educativa. Con *Summer Slide* si intende la perdita di competenze scolastiche che si registra nella performance degli studenti nei test standardizzati dopo il periodo della pausa estiva, indicando quindi che la prolungata mancanza di esposizione al contesto educativo riduce gradualmente gli apprendimenti e le capacità degli studenti. Questo effetto è inoltre più marcato negli studenti che appartengono a contesti socioeconomici svantaggiati, sottolineando quindi ulteriormente l'importanza dell' istruzione pubblica nel mitigare le differenze sociali e le disuguaglianze educative. Sotto questo punto di vista, la chiusura delle scuole causata dal Covid-19 e la mancata riapertura fino alla fine dell' anno scolastico ha teoricamente raddoppiato il tempo di distaccamento dal contesto scolastico, estendendolo dalle 13 settimane tipicamente previste nei calendari scolastici a 27; l'effetto di una simile interruzione educativa risulta estremamente preoccupante, e l' attivazione della DAD ha presumibilmente attutito, sebbene in parte, tale perdita. Nel contesto italiano al momento non esistono studi ufficiali che possano confermare questa ipotesi, poiché a causa della pandemia le autorità competenti non hanno avuto modo di valutare gli apprendimenti degli studenti tra marzo e giugno 2020. Uno spunto può essere però tratto da uno studio condotto nei Paesi Bassi, in cui le competenze degli studenti sono state valutate dopo circa otto settimane di lockdown nazionale e *virtual-learning*, seguite da un mese di ritorno alle attività didattiche in presenza. È stata confermata una perdita educativa generale del 3%, che sale al 6% nei casi di svantaggio socioeconomico. Poiché in Italia il ritorno in classe non è stato possibile dall'inizio della pandemia, è ragionevole presumere che l'effetto sia stato maggiore, e che si sia combinato con la lunga interruzione scolastica delle vacanze estive. Anche laddove la DAD avesse in qualche capacità mitigato queste perdite, non ha comunque permesso il mantenimento delle pratiche e dei tempi d'insegnamento applicabili in presenza, e non ha quindi potuto servire né qualitativamente né quantitativamente da perfetto sostituto alla didattica tradizionale.

Suddette modalità non sono infatti facilmente traslabili al contesto digitale a causa degli strumenti adoperati e l'assenza di un contesto immediatamente condiviso. Due principali conseguenze ne sono

emerse; In primo luogo, è stato necessario adoperarsi per scoprire ed esplorare modalità didattiche che garantissero maggiormente il coinvolgimento degli studenti, l'essenzializzazione dei programmi didattici, e l'utilizzo razionale di strumenti innovativi nella didattica. In secondo luogo, non è stato possibile mantenere i tempi d'istruzione della didattica in-presenza: il peso economico della connessione costante, la limitatati capacità delle infrastrutture digitali a sostenere i volumi della domanda, la limitata capacità di studenti e docenti ad adoperare le dotazioni tecnologiche necessarie, la maggiore facilità a distrarsi in un contesto remoto, e anche l'affaticamento visivo della costante esposizione agli schermi sono tutte variabili che non hanno reso proponibile il mantenimento degli orari educativi. Pertanto, il sistema scolastico italiano ha visto una complessiva e sostanziale riduzione delle ore settimanali e giornaliere devolute all'apprendimento supervisionato dal docente.

Non è stata riscontrata una strategia ufficiale in merito ai Tempi d'Istruzione della DAD condivisa a livello istituzionale. Al contrario, attraverso la Nota Ministeriale 388 il Ministero dell' Istruzione ha dichiarato che le pratiche di adozione della DAD ricadevano nelle mani dei singoli istituti, dei consigli di classe, e dei docenti, in modo tale da permettere a ciascun istituto di adattare le proprie pratiche sulle caratteristiche e capacità del contesto locale. Mentre questo garantisce un significativo livello di eterogeneità tra istituti o anche le classi stesse su tutto il territorio nazionale, una forma di assistenza e coordinazione è giunta dai network "orizzontali" delle diverse associazioni professionali dell'istruzione, piuttosto che dai livelli "verticali" del Ministero, degli Uffici Scolastici Regionali, o degli Ambiti Territoriali; in una circolare dell' Associazione Nazionale Presidi (ANP), era suggerita la designazione delle seguenti tempistiche per grado d'istruzione: alle scuole primarie (o elementari, grado ISCED 1) si consigliavano dieci ore di lezione settimanali, alle scuole secondarie di primo grado (o medie, grado ISCED 2) quindici, e alle scuole secondarie di secondo grado (o superiori, grado ISCED 3) venticinque. Inoltre, era suggerita la riduzione della convenzionale ora di didattica da sessanta a quaranta o quarantacinque minuti.

La designazione della DAD come misura sostitutiva della didattica in presenza si ancora, inoltre, su una premessa non comprovata dalla realtà osservata, cioè che tutti gli studenti dispongano degli strumenti necessari per accedervi. È quindi opportuno discutere il contesto di sviluppo dell'infrastruttura tecnologica italiana e dei Digital Divide, cioè il divario tra i cittadini che hanno accesso alle ICT e coloro che invece non ne dispongono. Poiché anche le competenze e capacità di adoperare queste tecnologie sono prerequisiti fondamentali che possono influire sulla profondità dei divari, diverse variabili sociodemografiche, come l'età, il livello d'istruzione, e il reddito agiscono come determinanti. Nel contesto italiano, emerge che la relativa anzianità dei docenti rispetto agli altri paesi OSCE rende più difficoltosa l'adozione degli strumenti digitali richiesti dalla DAD, di

fronte ad una generale situazione di sottosviluppo delle capacità digitali riscontrate sull'intero territorio nazionale. Questa relazione risulta più rilevante alle elementari, poiché il livello di preparazione professionale richiesta per operare nel settore è relativamente inferiore ai docenti delle secondarie; ed è proprio a questo livello educativo che il corpo docente ha trovato più difficoltà a sviluppare pratiche didattiche in grado di coinvolgere adeguatamente gli studenti. Infine, emerge una questione fondamentale di deprivazione in termini di semplici beni digitali: più di un decimo degli studenti italiani difatti non possiede un dispositivo con il quale prendere parte alla DAD, rimanendo quindi irrimediabilmente escluso dai servizi educativi. Più della metà di questi studenti si trova nelle regioni del Mezzogiorno, dove il rischio educativo segnalato dalle rilevazioni INVALSI è significativamente più alto che al Centro o al Nord. Questo determina un effetto discriminante della DAD, con un chiaro impatto negativo sulle possibilità di sviluppo educativo degli studenti dei territori meridionali.

È opportuno prendere atto della struttura amministrativa ed organizzativa del sistema scolastico italiano. La scuola pubblica italiana prevede tre livelli d'istruzione obbligatori a partire dal compimento del sesto anno di età: cinque anni di scuole elementari, tre di scuole medie, e cinque di istruzione superiore presso i Licei, che forniscono educazione formale e teorica orientata all'ulteriore proseguimento degli studi, o gli Istituti Tecnici o gli Istituti Professionali, che con diverse modalità curano la formazione professionale e tecnica dello studente per facilitarne l'accesso diretto alla forza lavoro (VET). Le competenze amministrative sul sistema nazionale d'istruzione si ripartiscono verticalmente tra autorità centrali, regionali, e locali. Un relativo grado di decentramento enfatizza il ruolo delle autorità regionali e locali nella amministrazione dei settori pubblici, e nonostante lo stesso regime si applichi al sistema scolastico nazionale, vi è un ruolo rilevante del Ministero dell'Istruzione (di recente scorporato dal precedente Ministero dell'Istruzione e della Ricerca, o MIUR) nella designazione dei principali aspetti organizzativi e curricolari del sistema d'istruzione, dalla definizione del curriculum nazionale e delle materie obbligatorie alla ripartizione dei fondi governativi. A livello centrale il MI emette direttive, ordinanze e decreti da applicare a livello locale, Sono poi gli Uffici Scolastici Regionali (USR), a presidiare, supervisionare, e adattare l'applicazione delle direttive centrali nei singoli contesti locali. Gli USR esercitano inoltre il fondamentale compito di determinare il calendario scolastico regionale, documento in cui vengono stabile data di inizio e fine delle attività educative nel corso dell'anno scolastico, oltre alla definizione dei giorni di sospensione dovuti a feste nazionali o regionali. La singola amministrazione scolastica di ciascun istituto svolge tuttavia il ruolo più determinante nella progettazione delle prestazioni educative: ogni scuola goe di piena libertà nella configurazione delle offerte curricolari, organizzazione dei tempi di insegnamento, e sperimentazione educativa in modo tale da poter rispondere al meglio alle esigenze

del contesto locale e valorizzarne la particolarità, purché in conformità con le direttive centrali. Questo aspetto è rilevante perché nel caso esaminato ciascuna scuola gode di un'effettiva autorità ed indipendenza nella organizzazione dei principali aspetti della fornitura di beni educativi, ed è quindi possibile incorrere in contesti educativi profondamente diversi sul territorio nazionale. Qualunque sforzo analitico volto ad esaminare il sistema scolastico nazionale deve quindi tenere conto di un fondamentale grado di approssimazione che deriva dall'impossibilità di astrarre una realtà educativa uniforme. Ne deriva inoltre un certo livello di eterogeneità per quello che riguarda i traguardi educativi degli studenti; l' Istituto Nazionale per la Valutazione del Sistema Educativo di Istruzione e di Formazione (INVALSI), l'autorità pubblica competente per la verifica dei livelli di apprendimento degli studenti italiani, rileva infatti che vi è un forte tasso di dispersione implicita nelle regioni del Sud Italia. Con dispersione implicita si intende la percentuale di studenti che non raggiunge una soglia minima di competenze nelle materie principali previste dal curriculum nazionale, quali la lingua italiana, la matematica e le scienze; la proporzione di studenti in questa condizione cresce linearmente muovendosi dalle regioni del Nord a quelle del Sud, con livelli estremi di rischio educativo in Sardegna, Sicilia, Puglia, Calabria e Puglia. Va dunque notato che i rischi di perdita educativa legati alla chiusura delle scuole e alla DAD sono amplificati da una pregressa condizione di lacune formative, evidenziando la vulnerabilità degli studenti in specifiche aree del paese.

Tenendo conto di questi dati e considerazioni, è quindi opportuno elaborare un metodo che possa identificare l'entità degli effetti imprevisti che la DAD ha esercitato sulle disuguaglianze educative, e valutare l'efficacia delle misure adottate per contrastare l'interazione degli effetti causati dalla chiusura delle scuole e dall'esclusione scolastica. Data la centrale importanza che questa risorsa esercita in tutti i sistemi educativi, utilizzare il Tempo d'Istruzione come misura principale risulta appropriato per mettere in contatto le risorse introdotte dal lato dell'offerta educativa, cioè le scuole, e la capacità del lato della domanda, cioè gli studenti, di consumare i beni educativi proposti. Pertanto, l'unità di osservazione principale è rappresentata da ciascuna ora di didattica eseguita sotto la diretta supervisione dell'insegnante, sia nel contesto della didattica in presenza che per la DAD. È necessaria una precisa metodologia per stimare il Tempo d'Istruzione Perso, calcolato attraverso il totale delle ore di lezione annue che non sono state consegnate nel corso della prima fase pandemica. In primo luogo, è necessario stabilire quante ore di lezione fossero previste all'inizio dell'anno scolastico 2019-2020 per ciascun ordinamento, regime orario, e regione; con questi dati è possibile quindi calcolare il Tempo d'Istruzione Inteso convenzionalmente in un anno scolastico. In secondo luogo, stabilendo l'adozione del DPCM 5 marzo come momento in cui la didattica in presenza è stata definitivamente sospesa, è possibile moltiplicare il numero di gironi per le ore di DAD svolte e gli studenti che vi

hanno preso parte, distinguendo sempre tra regioni, livelli di istruzione e regimi orari; questo permette di determinare quindi il Tempo d'Istruzione Realizzato nella pratica. La differenza tra queste due misure costituisce quindi il Tempo d'Istruzione Perso con l'attivazione della DAD, il che può permettere da una parte di quantificare il volume di opportunità di sviluppo didattico al quale gli studenti italiani hanno dovuto rinunciare, e dall'altra parte di confrontare le varie realtà regionali e scolastici per mettere a fuoco quei gruppi che hanno subito maggiormente la chiusura delle scuole, e che sono risultati quindi più esposti a rischi di perdita educativa. Utilizzando i dati disponibili sulla deprivazione digitale in Italia, è inoltre possibile collocare gli studenti in tale condizione sull'intero sistema scolastico, e determinare l'incidenza dei *Digital Divide* sulla quantità di ore perse, al fine di verificare se e quanto le dotazioni digitali hanno determinato perdite educative. Questi risultati poi sono confrontati con i report sull'utilizzo dei fondi assegnati e dei dispositivi provvisti attraverso il Decreto Cura Italia. Presumendo che ciascuna dotazione digitale offerta garantisca poi accesso alla DAD, si può convertire il prestito di ciascun dispositivo nel numero di ore di apprendimento del quale ha permesso la fruizione, e sottrare questi risultati al totale del Tempo Perso e di valutare l'impatto della misura sull' incidenza della deprivazione digitale sulle perdite del Tempo d'Istruzione.

La dimensione geografica è una componente fondamentale nel calcolo dei Tempi d'Istruzione, poiché la dispersione della popolazione studentesca sul territorio italiano è estremamente eterogenea. Il sistema scolastico in Lombardia, per esempio, serve una proporzione notevole degli studenti nazionali, ed è pertanto chiamata a rispondere a quasi il 16,5% di tutta la domanda di Tempo d'Istruzione del paese. In relazione, la combinazione dell' Abruzzo, Basilicata, Liguria, Molise, Sardegna e Umbria costituisce meno di due terzi delle ore di insegnamento prodotte ogni anno in Lombardia. Le altre due regioni più impegnate sono la Campania ed il Lazio, le quali generano rispettivamente il 10,75% ed il 9,75% del monte ore nazionale. Analizzando le singole province, ne emerge chiaramente che un ruolo centrale è quello svolto dalle aree che circondano le città metropolitane dove si concentra la grande parte degli studenti. È quindi opportuno tenere in considerazione i pesi relativi della popolazione studentesca sul monte ore nel confronto tra diverse aree geografiche. Un ulteriore fattore è il regime di ore annuali (o settimanali) designate per ciascun ordinamento scolastico; non vi è una applicata uniformazione a livello nazionale in virtù delle normative sull'autonomia scolastica, cosicché nei fatti ciascun istituto può determinare liberamente i tempi dell'offerta educativa. Lo stesso discorso vale per la designazione della settimana scolastica, che si divide in settimana corta (cinque giorni di scuola, dal lunedì al venerdì) o settimana lunga (sei giorni in cui è compreso anche il sabato), a cui conseguentemente corrispondono diverse distribuzioni di ore di scuola giornaliere. Il Ministero dell'Istruzione ha comunque stabilito dei criteri generali per l'organizzazione dei tempi educativi, solitamente in forma di tetti minimi di ore annuali; pertanto,

nello studio vengono considerati i regimi orari minimi come se perfettamente coincidenti con quanto stabilito a livello centrale, riconoscendo tuttavia le limitazioni metodologiche di usare stime conservative che potrebbero non risultare rappresentative di quanto applicato in ciascun contesto scolastico. Per quello che riguarda le scuole primarie, il sistema centrale indica quattro regimi orari, che vanno dalle 24 alle 40 ore settimanali. Nelle scuole medie i regimi disponibile sono invece tre e con variazioni minori, offrendo quindi 30, 36 o 40 ore settimanali. Per quello che riguarda l'istruzione superiore, è l'esplicita specializzazione di ciascun indirizzo di studio ad influire sul monte ore annuo. Nel caso degli Istituti di Formazione Tecnica o Professionale, vi è un regime fisso di 32 ore settimanali nel corso di tutti e cinque gli anni previsti dal percorso di studio. Più complesso è il contesto dei Licei, dove per esempio gli studenti iscritti al primo anno dei Licei Classici o Scientifici frequentano 27 ore settimanali contro le 34 dei loro coetanei iscritti al Liceo Artistico; inoltre, la distinzione interna nel percorso liceale tra biennio (primi due anni) e triennio (ultimi tre anni fino agli esami di stato) determina una variazione nel contesto di indirizzi di studio equivalenti: nel biennio ad uno studente iscritto al Liceo Linguistico sono prescritte 27 ore settimanali, che diventano 30 nel triennio. Utilizzando i dati ministeriali sulle iscrizioni agli indirizzi superiori, è possibile stimare la distribuzione della popolazione scolastica in ciascun regime orario per ogni regione, e stabilire con maggiore precisione le soglie di fornitura dei Tempi d'Istruzione per i diversi territori nazionali.

Dalla stima del Tempo d'Istruzione Inteso emergono delle considerazioni rilevanti sulla creazione degli input educativi nel sistema scolastico italiano. Innanzitutto, le scuole elementari devono rispondere ad una domanda di ore giornaliere moderatamente maggiore che negli altri ordinamenti, poiché vi è una diffusa tendenza dei genitori a selezionare regimi settimanali che comprendono dalle 30 alle 40 ore di lezione. Questa preferenza si osserva soprattutto nelle aree urbane delle regioni con grandi città, come Roma, Milano e Napoli, e diminuisce generalmente nelle regioni del sud; Sicilia, Calabria e Puglia difatti riportano una più diffusa propensione ad iscrivere gli studenti del primo ciclo in regimi modulari piuttosto che nel tempo pieno. Il trend opposto si riscontra invece nelle scuole medie, dove la preferenza per il regime più lungo è decisamente marginale rispetto alle più brevi 30 ore settimanali. Per quanto riguarda l'istruzione superiore invece non vi è una chiara preferenza interamente spiegata da variazioni nei monti ore annuali, poiché il fattore determinante è la specifica preferenza curricolare nella selezione dell' indirizzo di studio, al quale corrisponde poi una specifica configurazione dei tempi d'istruzione. È presumibile, quindi, che l'effetto della chiusura delle scuole e l'attivazione della DAD abbiano influito maggiormente sui gradi educativi con tempi dedicati all'apprendimento relativamente più lunghi, incidendo con più forza sugli studenti iscritti ai regimi di Tempo Pieno. Questa supposizione è indirettamente supportata dal calcolo del Tempo d'Istruzione Perso: risulta infatti che le scuole elementari abbiano subito in media una perdita del 27,57% delle

ore di didattica annuali, di fronte al 22,81% delle medie ed il complessivo 27,81% degli istituti superiori. Pur avendo subito una perdita maggiore in termini assoluti, questi ultimi hanno però accusato di meno le implicazioni della DAD in termini di autonomia, capacità di utilizzo, e motivazione nel contesto del paradigma digitale sul quale le attività didattiche si sono spostate. Inoltre, la relativa preparazione dei docenti a questo livello scolastico supera quella degli insegnanti elementari, rendendo gli studenti a questo livello più vulnerabili. Allo stesso modo, sebbene non adeguatamente catturato da un'analisi quantitativa, gli studenti degli istituti Tecnici e Professionali risultano decisamente più lesi dalla DAD, poiché l'orientamento laboratoriale della didattica di questi percorsi richiede equipaggiamento, materiali, e l'esercitazione di tecniche e pratiche tangibili non adatte ad essere traslate in un ambiente rituale e remoto. Questo è un problema meno pronunciato per i programmi teorici e la relativa concentrazione dei curricoli su materie più "discorsive" negli indirizzi Liceali. La approssimazione dell' effettivo impatto di questo aspetto risulta problematica, e ulteriori studi potrebbero appurare con maggiore precisione l'entità del fenomeno.

La situazione della perdita di Tempo d'Istruzione cambia drasticamente inserendo nell'equazione gli effetti dei Digital Divide registrati nella popolazione scolastica. Considerando infatti gli 823.929 studenti che non avevano accesso ad un PC, Laptop o Tablet durante la DAD, si riscontra un aumento significativo del tempo di ore perse sul tetto annuale, che per le primarie sale al 28,66%, per le medie al 24,5% e per gli istituti superiori al 33,5%, colpendo soprattutto gli studenti in VET con una perdita del 17,56%. È evidente quindi che la DAD ha inavvertitamente approfondito la perdita di opportunità didattiche soprattutto per gli studenti ai gradi d'istruzione più alti, registrando un tasso di incidenza media dei Digital Divide sulle perdite totali pari al 5,7%. Nelle regioni del Mezzogiorno il fenomeno è particolarmente cospicuo, con tassi di incidenza vicini all' 8% in Abruzzo, Basilicata, Calabria e Campania, e superiori in Puglia (8,15%) e in Sicilia (8,09%), un trend che rimane costante su tutti i livelli d'istruzione. Dato il maggiore rischio educativo sostenuto dalla DAD in questi territori, la distribuzione di fondi, e di conseguenza di dispositivi digitali offerti dal DL 18 è stata presumibilmente destinata a queste aree in misura maggiore; osservando però la distribuzione provinciale dei €70 Milioni ne risulta che una parte relativamente marginale dei fondi ha raggiunto le provincie del Mezzogiorno, concentrandosi principalmente nelle aree urbanizzate a maggiore densità studentesca. L'effetto complessivo in termini di mitigazione delle perdite di tempo d'Istruzione risulta quasi irrilevante: nella media nazionale, con i dispositivi digitali del DL 18 è stato evitato lo 0,32% della perdita di ore di lezione alle elementari, lo 0,5% alle medie, lo 0,81% tra gli Istituti Tecnici e i Professionali, e lo 0,88% nei licei. Tuttavia, l'impatto nelle regioni digitalmente più vulnerabili appare più pronunciato, specialmente nei livelli d'Istruzione più elevati. Attraverso il prestito dei dispositivi digitali, per esempio, gli studenti della Basilicata hanno evitato il 2,18% delle

perdite totali contro circa l' 1,4% del Veneto, della Lombardia, e del Lazio, nonostante la rilevante densità della popolazione studentesca avesse di conseguenza motivato una maggiore concentrazione dei fondi in queste aree.

Dai risultati si conferma quindi l'ipotesi che la DAD abbia inavvertitamente generato dei "vincitori" e dei "vinti", e che nonostante una generale perdita educativa applicabile a tutta la popolazione studentesca, alcuni gruppi con specifiche caratteristiche socioeconomiche e geografiche hanno sofferto più intensamente la privazione delle pari opportunità educative. Gli studenti delle classi primarie sono stati più esposti a questo fenomeno per il semplice fatto che la nuova programmazione dei Tempi d'Istruzione da svolgere in DAD ha visto un taglio considerevole del monte ore normalmente frequentato; non solo il passaggio da 40 a 10 ore settimanali è profondamente rilevante, ma anche l'efficacia delle attività condotte da remoto dagli insegnanti è ostacolata da diversi fattori; gli studenti più giovani hanno innanzitutto avuto meno tempo per sviluppare familiarità e dimestichezza con gli strumenti ICT, sono tendenzialmente meno autonomi e necessitano di maggiore coinvolgimento personale per sviluppare le proprie capacità interpersonali e sociali, una prospetto difficilmente realizzabile con la DAD. Di conseguenza, la capacità dei singoli docenti di adattarsi al contesto ed improvvisare modalità d'insegnamento efficaci è stata ostacolata dai mezzi disponibili; ciò è in parte veicolato dai minori livelli di specializzazione richiesti al personale docente a livello primario, che si traducono generalmente in competenze digitali più scarse. Infine, è opportuno evidenziare che nel caso delle classi primarie, l'efficacia della fornitura di dispositivi digitali è fortemente limitata dal design progettuale dell'intervento pubblico. L'offerta di dispositivi si ancora sull'idea di dare accesso a delle opportunità educative che il sistema scolastico mette a disposizione; tuttavia, nel momento in cui l'offerta di queste opportunità è ridotta a sole dieci ore settimanali il Tempo d'Istruzione preservato dal dispositivo prestato è marginale rispetto ad uno studente liceale o alle medie, poiché in quel caso avrebbe acceso ad un maggior numero di ore di lezione.

La posizione geografica degli studenti ha a sua volta incitato disuguaglianze nelle perdite educative dovute all'attivazione della DAD; la presupposizione che tutti gli studenti avessero ugualmente modo di accedervi non si è verificata, poiché una determinante situazione di deprivazione digitale è emersa nelle regioni del Mezzogiorno, dove si concentra più della metà della popolazione studentesca in tale condizione. In questi territori l'incidenza dei Digital Divide sul monte ore perse è sostanziale, e sebbene i fondi del DL Cura Italia siano riusciti a raggiungere queste aree, la relativa distribuzione si è rivelata sproporzionata rispetto ai livelli di esclusione scolastica registrati. La coincidenza tra le aree a rischio educativo prima del Covid-19 e l'impatto marginalizzante della DAD prospettano uno

scenario fortemente preoccupante per queste aree, con il rischio di ulteriore e sostanziale approfondimento dei divari tra le competenze degli studenti del Centro-Nord e quelli del Sud.

È quindi opportuno chiedersi quali elementi abbiano determinato la limitata efficacia del DL 18, e se fossero disponibile delle alternative implementabili al suo posto. Come già discusso, un primo problema emerso dalla distribuzione dei fondi del Decreto Cura Italia giace nella destinazione delle risorse e dei criteri adottati per canalizzarli sui diversi territori. Secondo il decreto attuativo 187 del Ministero dell'Istruzione, i €70 Milioni andavano assegnati alle scuole in misura ponderale al 30% sulla base del numero degli studenti iscritti e al 70% sulla base della proporzione della popolazione studentesca appartenente al quintile più basso di status socioeconomico rilevato dall' indicatore ESCS. È stato quindi prioritizzato il fattore di svantaggio sociale, una scelta appropriata per raggiungere i soggetti più vulnerabili. Tuttavia, è plausibile che l'indicatore ESCS catturi solo in parte una condizione di deprivazione digitale, poiché basato su altri elementi che determinano la condizione di svantaggio socioeconomico; basarsi invece sui dati ISTAT dell'anno precedente, che avevano correttamente identificato e localizzato le aree più suscettibili ai Digital Divide avrebbe permesso di mettere a fuoco le famiglie con studenti senza un dispositivo digitale, e di veicolare con maggiore precisione le risorse governative dedicate. Un ulteriore lacuna implementativa è rappresentata dai criteri di accesso ai beni digitali messi a disposizione adottati da ciascun istituto. Poiché la determinazione dei criteri di selezione per fare domanda ai prestiti in comodato d'uso è prerogativa diretta dell'amministrazione scolastica, anche la pubblicizzazione dell'iniziativa spetta alla dirigenza dell'istituto che presta i dispositivi. Tuttavia, la selezione dei canali di comunicazione si è avvalsa prevalentemente dei canali digitali attraverso la pubblicazione di circolari interne in cui si promuova l'iniziativa e si incoraggiavano le famiglie interessate ad avanzare domande di accesso ai comodati d'uso; il problema in questione è che gli stessi destinatari dell'iniziativa sono anche quelli meno in condizione di venirne a conoscenza, e per i quali le procedure di partecipazione alla selezione dei riceventi risulta più ostica. Inoltre, per trasparenza le scuole pubblicano sul proprio sito ufficiale tutte le circolari interne, alle quali è possibile accedere senza restrizione; al termine della procedura di selezione, coloro che sono stati indicati come destinatari dei dispositivi in comodato d'uso sono stati pubblicati in graduatoria all'interno delle circolari scolastiche. È possibile che l'esposizione che deriva dalla pubblicazione di documenti ufficiali scoraggi il potenziale fruitore dell'iniziativa, poiché la sua condizione di disagio diverrebbe pubblicamente esplicitata. Lo stigma che deriva da questo tipo di condizione è un elemento che non può essere sottovalutato, e che può inibire la disposizione dei potenziali destinatari nel fare uso delle misure predisposte.

Quali altre misure avrebbero potuto fare fronte alle perdite educative e ridurre l'impatto negativo ed iniquo della chiusura delle scuole sullo sviluppo delle competenze? Tornando sul caso dei Paesi Bassi, è appropriato aprire una parentesi sull'importanza dei tempi educativi e sul concetto del *summer slide*; Sebbene siano state adottate forme di didattica a distanza nel periodo di lockdown, la mitigazione delle perdite educative nei Paesi Bassi gravitano rilevantemente intorno alla riapertura delle scuole e alla ripresa della didattica in presenza, che è durata almeno un mese fino alla fine dell'anno e l'inizio delle vacanze estive; questo non è stato possibile in Italia, e la chiusura delle scuole è stato un processo ininterrotto fino all'inizio del nuovo anno scolastico a settembre 2020. L'indebolimento del contesto pandemico a metà maggio avrebbe potuto permettere il rientro nelle classi per almeno tre settimane fino ai primi di giugno, se non estendere l'anno scolastico fino a luglio in modo da recuperare il tempo perduto. Da un'analisi del CNEL emerge tuttavia che la gran parte delle famiglie italiane è contraria a questa possibilità, indicando che vi è una percezione di inderogabilità del riposo estivo. Sarebbe invece opportuno, per quanto politicamente contenzioso, valutare la possibilità di ristrutturare il tipico anno scolastico italiano, e di alternare più omogeneamente i periodi di pausa con quelli di frequentazione scolastica, in modo tale da poter gestire più flessibilmente gli apprendimenti, ridurre l'intensità dei *summer slides* e adattarsi con maggiore facilità ad eventi imprevisti e difficilmente gestibili. Allo stesso modo, l'attivazione di programmi di recupero educativi all'inizio del successivo anno scolastico è un'alternativa presa in considerazione nominalmente dal sistema nazionale, e a coloro che a fine anno hanno conseguito valutazioni insufficienti in determinate materie sono stati assegnati dei programmi di recupero; la gestione di queste attività è stata comunque lasciata all'autorità del consiglio di classe, ed è molto difficile determinarne l'efficacia o l'effettiva implementazione su larga scala. In ogni caso, solo con la pubblicazione dei risultati delle prove INVALSI per l'anno scolastico 2020-2021 sarà possibile avere un quadro chiaro degli effetti della pandemia sullo sviluppo educativo degli studenti italiani, nonostante non sarà possibile isolare gli effetti della prima fase pandemica e separarli dal secondo periodo, che presumibilmente evidenzierà ulteriori eterogeneità nella dimensione geografica attribuibili al sistema di fasce di rischio adottato nell'autunno 2020.

In conclusione, da questo studio emergono due considerazioni principali sull'esperienza della DAD nel corso della prima fase pandemica da marzo a giugno 2020. Innanzitutto, che la chiusura delle scuole e l'adozione di canali virtuali per la didattica abbia causato una significativa riduzione del tempo che gli studenti hanno potuto dedicare allo sviluppo educativo in contesti formali. Il principale fattore di riduzione in questo caso è stata la riconfigurazione dei tempi della didattica da svolgere su piattaforme digitali. Gli studenti delle classi primarie ne hanno risentito con maggiore intensità, a causa di riduzione più marcata dei convenzionali tempi di apprendimento. Al contrario, gli studenti

dei gradi superiori hanno affrontato un contesto meno pregiudicante, specialmente coloro che appartenevano a regimi di ore settimanali più corti. Mentre questo fattore si applica indistintamente su tutta la popolazione scolastica, sebbene in gradi differenti, lo stesso discorso non sussiste nel caso dei Digital Divide. Ampia parte degli studenti italiani appartenenti a specifici contesti geografici e socioeconomici non ha infatti avuto accesso ai prerequisiti materiali per prendere parte alla DAD, sia in forma di beni ICT come dispositivi e connessioni, che in termini di conoscenze e abilità digitali. La coincidenza tra gli studenti nelle aree in condizione di deprivazione digitale e di maggiore rischio educativo pregresso sottolineano le forti disuguaglianze in opportunità educative associate alla DAD: in quelle stesse regioni in cui prima della pandemia si registravano carenze nello sviluppo educativo è stata poi identificata una maggiore difficoltà ad accedere alla didattica sostitutiva dell'apprendimento in presenza, approfondendo quindi indirettamente il prospetto dei divari educativi nel paese.

Come secondo punto, l'efficacia delle misure adottate dal governo centrale per controllare questo effetto indesiderato, offrendo €70 milioni alle scuole per assistere i propri studenti più svantaggiati, è discutibile. Da una parte, la misura è stata in grado di soddisfare solo un quarto della domanda effettivamente riscontrata sul territorio; dall'altra, emergono importanti lacune nella pianificazione della misura. In particolare, la selezione di criteri di distribuzione non strettamente legati agli obiettivi dell'intervento, l'esiguità delle risorse messe a disposizione e la selezione di canali di distribuzione solo parzialmente accessibili dalla popolazione intesa ne hanno minato l'efficacia. È tuttavia fondamentale fare tesoro dell'esperienza pandemica per fornire nuovi contributi alla formulazione delle politiche pubbliche nel sistema d'istruzione nazionale, e alla creazione di interventi validi ed incisivi nel contesto di emergenze senza precedenti storici. Questo studio ambisce a collocarsi nella letteratura di settore, e ispirare ulteriori sforzi accademici volti all'esplorazione del fenomeno delle perdite educative.