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Balancing speed and effectiveness: smoothing income volatility through COVID-19 social policy responses in Belgium

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Balancing speed and effectiveness: smoothing income volatility through COVID-19 social policy responses in Belgium

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Abstract

With the ever-changing COVID-19 situation and social distancing measures globally, policy makers were confronted with the challenge of organising timely measures that would protect households against income shocks and volatile incomes. As they generally have fewer alternatives, low-income households are especially vulnerable to the long-term scarring effects caused by volatile incomes. As such, the rise in income volatility due to the dynamic nature of the pandemic calls into question the adequacy of welfare states and additional social support measures implemented. Concurrently, researchers are challenged particularly by the scarcity of data in these circumstances. In this working paper, we contribute to the existing literature by presenting an analysis of a substantially broad range of social support measures implemented in Belgium during the COVID-19 pandemic in 2020 as a case study. We use a non-parametric approximation of monthly incomes and monthly changes in employment based on aggregate administrative data, allowing us to estimate within-year income volatility. We evaluate the effectiveness of federal and regional measures in Belgium in mitigating income volatility and shocks and their timeliness for those who were economically affected by the social distancing measures. We find that differences in the targeting design of the main COVID-19 social policies in Belgium resulted in varying effectiveness in reducing income volatility as well as differences in targeting and poverty reduction efficiency. We observe large heterogeneity in efficiency, especially among regional COVID-19 support measures.

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1 Introduction

The COVID-19 crisis gave rise to far-reaching social distancing measures, putting a halt to economic activity globally. In response, governments were quick to implement measures designed to support the incomes of those affected (Béland et al., 2021). In this endeavour, policy makers were confronted with uncertain information in unknown circumstances, as well as with an urgent need to act, in light of the vast disruption that was ongoing. This led to a profoundly different policy making context, in which it was difficult to foresee the adequacy, effectiveness, budgetary cost and the timeliness of the social support policies implemented. As the COVID-19 situation, together with the related social distancing measures, changed substantially several times throughout 2020, policy makers were confronted with the question of how to organize timely income protection measures.

At the same time, scholars studying the impact of COVID-19 throughout 2020 had to incorporate the ever-changing nature of both the pandemic and social measures. Evidently, these circumstances posed a challenge to researchers, above all with regard to the availability of data in evaluating the effectiveness of new and existing social support measures. As such, researchers throughout the world have extensively engaged in developing and optimizing methods to monitor the varying effectiveness and mitigating impact of a wide array of such measures on the income distribution (Almeida et al., 2020; Beirne et al., 2020; Brewer & Tasseva, 2021; Cantó et al., 2022; Capéau et al., 2021). Often building on nowcasted data, these studies have found the combined impact of the social policy measures taken in Western welfare states to be effective in mitigating the COVID-19 shock, limiting increases in poverty and inequality. A large proportion of the literature analyses the effect of these policies on living standards by examining changes in various concepts of income, as well as income inequality (most frequently the Gini coefficient) and poverty rates (Almeida et al., 2021; Beirne et al., 2020; Brewer & Tasseva, 2021; Brum & De Rosa, 2021; O'Donoghue et al., 2021; Li et al., 2021; Figari & Fiorio, 2020).

Using Belgium as a case study, we add to this growing literature by using *monthly* nowcasted data for 2020 in order to examine to what extent the social measures taken in 2020 mitigated the income volatility and shocks experienced by those economically affected as a result of the social distancing measures in Belgium. An extensive literature shows that income volatility is especially challenging to people at the bottom of the income distribution, and may have long term scarring effects. The COVID-19 social distancing measures were likely to have affected workers with less personal savings that may aid in overcoming lean times – also in Belgium, although there were some indications that large income shocks were for the most part prevented (Horemans et al., 2020). This puts forth the question of whether the various COVID-19 support measures were both sufficient and timely. In this working paper, we delve deeper into the extent to which different types of income support measures in Belgium aided in limiting income shocks, and whether their combined impact throughout 2020 was sufficient to limit income volatility stemming from repeated labour market status changes. In addition, we also consider the efficiency from these different social policy measures, by relating their poverty reducing effectiveness to their allocated budget.

We argue that our working paper adds to various substantive and ongoing debates in the literature, in spite of its descriptive nature referring to the specific COVID-19 year of 2020. First, we contribute to the existing literature through our focus on intra-year income volatility in a continental welfare state, rather than inter-year income volatility – research which to our knowledge has been relatively scarce in Europe. Secondly, we relevantly explore how a sudden economic shock in times of crises translates into experienced intra-year income volatility, since income shocks were more likely to occur within the year rather than between years. In addition, the wide variety of ad hoc COVID-19 measures in Belgium as a case study allows for an interesting comparison among different types of measures, with regard to size, timing and intended target groups. This enables us to obtain a greater understanding of how certain policies are designed, and how this in turn affects their responsiveness and efficiency in reducing poverty.

Nevertheless, an obvious limitation of our paper is that we explore the aforementioned issues on nowcasted data. This means that our data, as well as our analysis, build heavily on a number of assumptions. These assumptions will also have an impact on the extent of volatility found, in the sense that we provide a lower bound measure of income volatility that is driven by allocated labour market status changes, rather than by observed changes in monthly incomes. Still, this exercise does allow us to explore the extent of the mitigating impact of the COVID-19 measures taken in limiting income volatility and poverty through 2020 in Belgium.

This policy note is structured as follows. In the next section, we discuss in greater depth the main literature on income volatility as well as the impact of COVID-19 and the social policy response in Belgium in 2020. Thereafter, section 3 presents the data and methodology that we use in order to assess the impact of the welfare state response on experienced income volatility throughout the COVID-19 shock in 2020. Section 4 summarizes our main results. In Section 5, we further discuss our analyses. Finally, in section 6, we conclude with our key findings and highlight the main limitations of our paper as well as avenues for future research.

2 Literature review

2.1 Income volatility

The study of income volatility itself began gaining traction within the field of income dynamics and income mobility following the notable work of Gottschalk and Moffitt (1994), with an initial focus on the annual variability of male earnings in the United States (US) and the decomposition of this volatility into the persistence of earnings inequality and earnings instability. They find that overall earnings volatility increased in the US between the 1970s and 1980s. Yet, there has been no consensus on the recent volatility trends in the US, stemming from the different datasets and methods used, as well as differences in income concepts and units of analysis (Moffitt et al., 2022; Morrissey et al., 2020; Ziliak et al., 2011).

The lack of consensus within the literature highlights the ambiguity surrounding income volatility and the usage of overlapping but subtly distinct terminologies. Therefore, we define income volatility here as the variation in one's income within a given period and make a clear distinction between income volatility and economic instability. Economic instability, more precisely, is a complex concept that can be understood from four dimensions – the size of income change, its direction (i.e. loss or gain), the frequency of changes as well as whether or not income changes are predictable (Gennetian et al., 2015; Morrissey et al., 2020; Wolf et al., 2014). These different dimensions also interact with each other. For example, frequent swings in income may not necessarily be harmful if changes are positive. Additionally, frequent yet small and predictable income losses that families can pre-emptively manage could be less adverse than a large and sudden negative income loss. Even though income volatility is part of a broader and more nuanced picture, we can measure income volatility as a separate element of economic instability to give us an idea of how the pandemic could potentially affect standards of living.

Generally, the literature in both the US and Europe finds that households at the top and bottom of the income distribution tend to have the most volatile incomes (Bartels & Bönke, 2010; Hardy & Ziliak, 2013; Van Kerm, 2004). More importantly, however, low-income households, single-parent families as well as minority and disadvantaged communities, generally experience the highest levels of income volatility, which tend to be significantly higher than volatility experienced at the top (Bania & Leete, 2009; Cai, 2021; Gennetian et al., 2015; Hardy & Ziliak, 2013; Venn, 2011). Further, low-wage and less educated workers have been experiencing increasing volatility and more income losses than gains, widening the income inequality gap (Menta et al., 2021; Morris et al., 2015; Western et al., 2016; Wolf & Morrissey, 2017). This could be due to the increasing erratic nature of low-wage jobs and the increased take-up of temporary and non-standard forms of employment (Hill & Ybarra, 2014; Trlifajová & Hurrle, 2019). In particular, workers who frequently transition in and out of employment are more likely to experience higher volatility rates, which are correlated with substantial income losses (Wolf et al., 2014). Therefore, the youth are also another vulnerable group that experiences high levels of volatility from frequent job changes at the beginning of their careers (Ayllón & Ramos, 2019; Bartels & Bönke, 2010; Farrell & Greig, 2016; Tomelleri, 2022). These groups become increasingly vulnerable to the potential negative effects of volatility found in a growing body of literature. For example, several scholars find that greater variability in income may adversely affect well-being, especially for families with children (Gennetian et al., 2015; Hill et al., 2013; Morris et al., 2015). There has also been evidence that higher levels of income volatility may lead to increased food insecurity (Schenck-Fontaine et al., 2017; Wolf & Morrissey, 2017). As such, higher income volatility, and thus economic instability, is often believed to create higher levels of stress because uncertainty during periods of hardship may generate a heightened sense of vulnerability and insecurity.

The unprecedented COVID-19 pandemic and its economic consequences hence raises concerns about the implications crises would have on vulnerable subpopulations. In particular, low-income individuals may not be able to rely on their savings or have sufficient assets to borrow, and are further hindered by the unpredictability of job and income losses during crises (Ayllón & Ramos, 2019; Han & Hart, 2021; Morrissey et al., 2020; Wolf & Morrissey, 2017). In this regard, the social safety net could play an important role during difficult times as a buffer against income volatility and its potentially adverse effects. Dolls, Fuest, and Peichl (2012) find that most welfare states in Europe act as good stabilizers against volatility. Examining the effects of within-job income instability in the US, Cai (2021) finds that benefits, and more specifically, in-kind benefits, can help smooth earnings volatility and lower the risk of child poverty. Similarly, Morduch and Siwicki (2017) observe that episodic poverty was significantly reduced by public benefits. Avram et al. (2021) and Chen (2009) find that on top of public transfers, taxes also stabilize household income in the UK and Germany respectively, albeit to a less significant extent than transfers. As with estimates of income volatility, the ability of the welfare state to protect against income shocks is heterogenous across countries, and largely depends on cross-national differences in demographics and institutions (Van Kerm, 2004).

Yet, the literature is far concentrated on examining volatility at an inter-year level, which is arguably less relevant for crises such as the COVID-19 pandemic that involved sweeping changes to the economy and lives of people within the year that it emerged. Intra-year volatility arises from changes in working hours or schedules (within-job fluctuations) as well as transitions in and out of employment (between-job fluctuations), which become more prominent in crises (Venn, 2011; Wething, 2020; Ziliak et al., 2011). Some studies indeed find that intra-year income volatility levels tend to be higher than annual volatility levels (Bania & Leete, 2009; Hannagan & Morduch, 2015; Wething, 2020; Wolf et al., 2014). However, there is almost no intra-year study that examines income volatility during crises. Studies that estimate inter-year volatility trends inclusive of periods after the Great Recession, generally find earnings volatility to be increasing (Ayllón & Ramos, 2019; Li et al., 2021; Menta et al., 2021; Tomelleri, 2022). Therefore, it is paramount to examine intra-year volatility in such periods, as they could reflect higher volatility levels than in inter-year measurements. The scarcity of monthly or quarterly data on income is the main reason why such intra-year studies are scarce, especially in Europe. As long panel data on intra-year income and employment is either difficult to access or is widely unavailable, the majority of intra-year studies uses more descriptive methods in assessing income volatility.

While the literature is predominantly US-centric, studies on income volatility in Europe and in other countries[1] have also started to emerge, alongside the increasing flexibility of European labour markets (Schmid, 2011). Comparative studies that examine differences between the US and Europe generally find that the levels and incidence of volatility in the US are higher than in European countries (Menta et al., 2021; Sologon & Van Kerm, 2018; Venn, 2011), and that in comparison, social safety nets as well as tax systems in Europe act as stronger buffers against income shocks (Chen, 2009; Dolls et al., 2012). Yet, there is considerable heterogeneity in the patterns and levels of earnings/income volatility within Europe (Ayllón & Ramos, 2019; Sologon & O'Donoghue, 2009; Van Kerm, 2004; Venn, 2011). In the 1990s up till the Great Recession, Cappellari and Jenkins (2014) find that earnings volatility in the United Kingdom (UK) declined. Since this period, Avram et al. (2021) see a continuing declining trend in both earnings and disposable income volatility in the UK. In Denmark, male earnings have remained relatively stable between the 1980s and the early 2000s (Bingley et al., 2012). On the contrary, during the same period, there was a notable increase in earnings volatility in Germany as well as in Spain, Sweden, Italy and a small increase in Luxembourg.[2] Belgian volatility figures appear to be limited to a scant number of cross-national studies that are confined to older periods, such as in the 1990s to before the Great Recession, or to limited demographics, such as the youth. Based on this limited research, Belgium has had a relatively low to average level of earnings volatility and incidence of volatility compared to the rest of Europe (Venn, 2011), with increasing variance in earnings and volatility attributable to shocks (Sologon & O'Donoghue, 2009), and since the Great Recession, young Belgians have experienced increasing income volatility (Ayllón & Ramos, 2019). To date, however, no paper has recently measured (intra-year) income volatility in Belgium together with the role of the social safety net and during periods of crisis.

Although the buffering effect of the social safety net has been promising, several studies have concurrently shown that welfare states in some countries are becoming less responsive to volatility (Avram et al., 2021; Garcia-Medina & Wen, 2018; Hardy, 2016). In addition, public transfers may on the other hand contribute to income volatility if benefit receipt is intermittent or if the benefit itself is inadequate, forcing some vulnerable households to turn to informal social nets (Bania & Leete, 2009; Morduch & Siwicki, 2017; Schenck-Fontaine et al., 2017). For less fortunate households, however, informal support systems may be limited or difficult to access, and are used as a last resort (Hill et al., 2017). As such, social safety nets remain essential in protecting the living standards of vulnerable subpopulations. Yet, as benefit receipt becomes increasingly reliant on employment history, highlighted by the prominence of a rising 'work must pay' discourse in Europe, the adequacy of modern welfare states comes into question (Trlifajová & Hurrle, 2019). We therefore examine if the different measures in Belgium, rolled out during the year of the COVID-

[1] See *inter alia* Beach, Finnie and Gray (2006, 2010), Garcia-Medina and Wen (2018) for Canada; Li, La and Sologon (2021) for Australia; Moore (2017) for New Zealand, Beccaria et al. (2021) for Latin America.

[2] See Bartels and Bönke (2010); Bönke, Lüthen, and Berlin (2019) for Germany. Cervini-Plá and Ramos (2012) for Spain. Domeij and Flodén (2010); Hällsten, Korpi, and Tåhlin (2010); Friedrich, Laun, and Meghir (2021) for Sweden. Jappelli and Pistaferri (2010); Cappellari and Leonardi (2016); Menta, Wolff and D' Ambrosio (2021); Tomelleri (2022) for Italy. Sologon and Van Kerm (2018) for Luxembourg.

19 outbreak, were able to reduce earnings and income volatility arising from fluctuations in their employment. Due to the several lockdown measures imposed within the year, we relevantly study monthly fluctuations in earnings and disposable income in Belgium, contributing to this growing literature.

2.2 The effects of COVID-19 and the welfare state response in Belgium

As in other nations, the social distancing measures taken in March 2020 quickly brought the social and economic life in Belgium to a standstill (Marchal et al., 2021). Public life was gradually re-opened only from May 2020 onwards. Renewed periods of social distancing (so-called "lockdown lights") would follow throughout 2020 in August in parts of Belgium, and from October until December in the same year. Although virtually no sector escaped from the economic impact of the crisis at the early onset of the COVID-19 pandemic, a number of sectors – mainly those whose core business was bringing people together, or where the organisation of telework was impossible – were especially hard hit. Previous research for Belgium shows in particular, that the sectors of hospitality and food services, wholesale and non-food retail, and of arts, entertainment and recreation were severely hit (Decoster et al., 2020). Early explorations by Belgian scholars found these affected sectors to disproportionately employ workers with relatively vulnerable profiles in terms of income levels, workers with a particular family composition (more often young and single) and lower education level as well as lower savings (Decoster et al., 2020; Horemans et al., 2020). This was recently confirmed by Vinck et al. (forthcoming), who moreover showed, based on ex post administrative data, that these risks were generally amplified at the household level. Throughout the course of 2020, the federal and regional Belgian governments took various measures in order to mitigate the socio-economic impact of the COVID-19 pandemic, and of the social distancing measures that were introduced to counteract it. In the following, we provide an overview of these social support measures. A table summary of the measures and their timing are provided at the end of the chapter.

Federal COVID-19 support measures

One of the earliest measures to be implemented was the **temporary unemployment benefit**. In principle, this benefit already existed. It is designed to allow employers to retain employees when they are, for limited periods in time, unable to provide work. Instead of having to fire experienced employees, this benefit allows employers to temporarily transfer them to the unemployment insurance scheme. Usually, employers can transfer employees to this measure for reasons of *force majeure*, such as weather conditions in the construction sector that make it unable to carry out work and large disasters such as floods that make the work premises inaccessible; or for *economic reasons*, in order to cope with short-term lapses in demand. Access to temporary unemployment for force majeure is less conditional than access to temporary unemployment for economic reasons, which requires a prior contribution record from the covered employees. However, it could only be accessed in case of full time closure of the company and hence required full time unemployment, whereas temporary unemployment for economic reasons allows for the receipt of temporary unemployment benefits on a part time basis.

The COVID-19 extension of the temporary unemployment benefit made temporary unemployment more accessible: prior contribution records were no longer needed, only the existence of a valid labour contract during the period of temporary unemployment. This brought in a whole range of new potential beneficiaries, such as young workers and those with temporary contracts. Concurrently, the benefit was increased to 70% of previous – topped-off – wage instead of 65%, and included a daily supplement of €5.63. On top of that, sectoral or company bonuses were possible. It was also made significantly easier for employers to apply for temporary unemployment benefits for their employees. The precise conditions changed over 2020, depending on the severity of the pandemic and the social distancing measures (Eurofound, 2021).

Apart from changes to access and benefit levels, the taxation of the temporary unemployment benefit was also amended. The temporary unemployment benefit is taxed under the personal income tax regime. As an advance on the final personal income tax due on the overall annual income, a withholding tax is withdrawn on most income types at the source. Until the 1st of May 2020, the advance levied on temporary unemployment benefits was 26.75%. Afterwards, this was reduced to 15%. This has an impact on the amount that will be due or reimbursed at the final personal income tax declaration on annual incomes, but obviously also affects the net monthly disposable income already available to affected employees in 2020 (Cantillon et al., 2020; Marchal et al., 2021).

Further, as the COVID-19 crisis lasted longer than originally anticipated, an **additional bonus** was awarded to those who had been **long-term temporary unemployed**. An individual was considered as long-term temporary unemployed if he or she received at least 53 payments under the temporary unemployment scheme from March 2020 until October 2020. Every employee who received 53 to 67 temporary unemployment payments received a lump-sum bonus of €150. Those who were long-term unemployed for a significantly longer period (i.e. those who received more than 67 daily payments in total throughout 2020) were awarded an additional €10 per day of temporary unemployment, which were added on top of this base amount of €150. For those who worked part-time, and consequently received half the temporary unemployment benefits of full-time employees, the bonus for long-term temporary unemployment is also halved (i.e. a minimum bonus amount of €75) and they received an additional €5 for each received payment above the 67-payments threshold. The first part of the long-term temporary unemployment benefit was paid out in December 2020 for the above-mentioned period. The second payment happened during May/June 2021, where the extra days of temporary unemployment in November 2020 were accounted for (RVA, 2020).

The federal government also expanded another existing measure: the **bridging right for the self-employed[3],** which provides monthly replacement income in exceptional situations. Access to the bridging right was initially quite restrictive and limited to very specific cases prior to the pandemic: being subject to an excessive debt procedure, official halting of activities due to economic difficulties, bankruptcy, or a forced interruption of activities for at least one month due to *force majeure*. On top of these restrictive access conditions, the benefit could only be claimed for up to a total of 12 months in an individual's entire career as a self-employed individual. As many self-employed had to interrupt their economic activities due to the social distancing measures, the access conditions for the COVID-19 bridging right were substantially loosened. New claims during this period would not count towards the lifetime limit of 12 months and self-employed individuals who had previously reached this limit were still eligible. Further, at that time (i.e. 2020), neither the closure of the company nor the complete interruption of activities was required for eligibility[4].

The classic bridging right awarded eligible beneficiaries a replacement income corresponding to their family burden as well as days of interruption in the affected month. The crisis bridging right, however, consists of a benefit in full – €1,291.60 (no dependents) or €1,614.10 (with dependents) – for the affected

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[3] As well as helpers and assisting spouses.

[4] The requirement of a minimum of seven days of interruption only applied to self-employed activity in sectors not mandated to forced closures by the authorities during the pandemic.

month (Eurofound, 2020b). In cases where self-employment is a secondary occupation or if an individual is a pensioner, only half of the aforementioned amount can be claimed, depending on their reference income and social security contributions[5]. Between October and December 2020, when certain sectors were required to once again fully close, the lump sum benefit from the **bridging right was doubled** for the affected self-employed in these sectors. In addition, the self-employed and companies were further supported by regional benefits aimed at businesses, in order to cover fixed costs. As these benefits were not targeted towards individual self-employed, but served to support the companies themselves, they are not included in this paper[6].

Standing in stark contrast to the increased generosity and expansion of existing schemes for the newly temporary unemployed affected by the COVID-19 crisis, was the treatment of regular social protection schemes, in spite of numerous observations that the protection levels they offered were unfit to cover against the risk of poverty (see Cantillon et al., 2020; Marchal et al., 2020). For one, the unemployment scheme remained relatively unchanged. Unemployment benefits in Belgium are not limited by time. Access is based on being unemployed (i.e. having no employment income) and on prior contributions. However, the benefit amount disbursed does get decreased over time, in order to encourage people to look for employment. This **degressivity of unemployment benefits was temporarily halted**, initially from April 2020 until the 31st of August 2020. Ultimately, because of the persistence of the COVID-19 crisis, this measure was prolonged until the 31st of December 2020 (and later to 2021 as well). Access was also made somewhat easier for specific groups, such as artists, by extending the period over which they could collect the required number of work days in order to access the unemployment benefit system (RVA, 2021).

Even though it was well-known that social assistance benefits were insufficient to cover basic expenses (Cantillon et al., 2020) and in spite of signals that food banks had trouble coping with the increased demand (De Wilde et al., 2020), means-tested minimum income protection benefits of last resort came only relatively late into the remit of COVID-19 support measures. Only from July 2020 onwards, **a COVID-19 premium of €50 monthly was introduced to support beneficiaries of means-tested minimum income protection**, including those who receive a living wage, disability allowance or an income guarantee for the elderly (Eurofound, 2020a)[7].

[5] Further, the amount from the bridging right and any other income from other benefits cannot exceed the amount specified in the full bridging right. Beneficiaries are then only awarded the maximum amount minus any exceeding amount.

[6] However, see Capéau et al. (2022) for a more precise modelling and assessment of the extent to which earnings from self-employed activity were affected, taking account of these regional business compensation benefits.

[7] It should however be noted that budgets were disbursed to the local government in order to cover additional needs that may have arisen due to COVID-19. Due to the discretionary local (and varied) uses of these budgets, we cannot provide an overview of the design of these budgets, nor can we take account of their impact in this paper.

Overall, the federal government, in first instance, focused on protecting the living standards of those who were directly affected by job or activity loss because of COVID-19-driven social distancing measures: those who became temporarily unemployed, or the self-employed who had to (partially) interrupt their activities. Those without a contract at the onset of the COVID-19 crisis were covered only by the regular unemployment system, where only small compensations were made for a longer job search, or had to take recourse to the social assistance scheme. At the same time, there are indications that those already covered by these systems were less likely to exit these schemes, at least in Spring 2020 (POD MI 2020)[8].

Regional COVID-19 support measures

The regional governments also introduced a number of income support measures, within their competences. It is noteworthy that the benefit levels, as well as the preferred target groups, differ among the different regions. An overview of the regional measures considered in this paper are also provided in Table 1, alongside the federal measures.

The Flemish government was quick to announce an **water and energy premium to further support the incomes of those who became temporary unemployed** for at least one day from the 20th of March until the 17th of July 2020. It was a one-off lump sum benefit of €202,68 given at the individual level, based on the amount of the average energy and water bill at the time. Even though it was branded as a contribution to utility costs, it was automatically disbursed to the accounts of all temporary unemployed individuals in Flanders (Eurofound, 2020c). Due to the need for administrative data streams, the benefit could be received from May onwards at the earliest in 2020.

Later, the Flemish government also introduced a **corona child benefit supplement for vulnerable families**. While this was first dependent on having experienced a drop in income of at least 10% due to COVID-19 in the months of March, April, May or June in 2020, having a low income as well as a specific claim filed by the affected families, low take-up rates led to a revision of this policy (Vlaams Parlement, 2020). Ultimately, every family who had at least one eligible child for whom they received a child benefit related to the Growth Package in November 2020 and had a yearly gross taxable household income of maximum €31.605,89, was automatically awarded the benefit of €35 per eligible child in December 2020 (Vlaamse Overheid, 2020).

The Walloon government introduced **a one-off water premium targeted towards the temporary unemployed**, rather than an energy premium as in Flanders. The amount was limited to €40 per household in which at least one household member had become temporary unemployed. The benefit was distributed as a reduction of the water invoice, upon application by the potential beneficiary. The first payments took place in May 2020 and ended in November 2020. As beneficiaries needed to apply for the benefit themselves, non-take-up of the benefit is an issue to consider. We received the total amount of beneficiaries from the Société Publique de Gestion de l'Eau (SPGE). Subsequently, we calculated the amount of Walloon households where at least one member was temporary unemployed during that period, resulting in a

[8] In this working paper, we do not take account of a number of other income compensatory benefits. Importantly, those who needed to go into quarantine (or got ill) were covered by health benefits. We do not model (or discuss) the impact of these benefits. In addition, for parents who had to take care of their own children, following the repeated closure of schools, income replacement was possible under a COVID-19-related parental care benefit. This benefit is also not included in our nowcasted data.

take-up rate of 24.79% which we used to approach the real amount of beneficiary households in our analysis. This water premium was ultimately renewed in December of 2020, in which Walloon residents could make a claim to their respective water company. As the repeated reduction was applied on their next water bill, and therefore likely occurred in 2021, we did not include this second reduction in our 2020 assessment.

At the same time, an **energy premium** was also introduced in Wallonia, but it was heavily targeted towards **persons experiencing financial difficulties in general**, which were not necessarily caused by COVID-19. Specifically, households with a pre-paid budget counter were targeted to receive an additional one-time credit upon reloading their energy budget of maximum €175: €75 for gas and €100 for electricity. The premiums were granted from April 2020 until November 2020. There are five cases in which a budget counter will be installed in a Walloon accommodation: 1) most commonly when the residents are unable to pay their energy bills or have arrears on them; 2) at the explicit request of the resident; 3) at the request of the residents' local welfare agency; 4) when the resident has the status of 'protected customer' who are supplied by a social energy supplier and 5) when a household moves to another accommodation when they had one in their previous dwelling. Since there is no information available about the profile of the households, we decided to award these premiums to Walloon households in which at least one member received a means-tested social benefit in our analysis. As the total number of households with a budget counter is well below the total number of households receiving a means-tested social assistance benefit, we randomly allocated the Walloon gas and electricity premium (CWaPE, 2022; TotalEnergies, 2022).

Finally, Brussels introduced two COVID-19 income support measures that were both targeted towards vulnerable families. A one-off **rental premium** amounting to €214.68 was targeted at families who **rented their dwelling on the private market** and in which one member of the household was either **temporary unemployed** for a total of at least 15 days **or received a bridging right** in the previous months (Brussel Fiscaliteit, 2020). Beneficiary families were also not allowed to be a usufructuary of an immovable asset. Different income thresholds were used depending on the household situation. The threshold of the yearly net taxable household income was €34,924.76 for a single household, €38,805.30 for a single-earner household and €44,348.97 for a household with multiple incomes. These were elevated by €3,326.16 for each non-handicapped child in the household and by €6,652.32 for each handicapped person in the household. The rent premium was paid out from July 2020 until December 2020.

Besides the rent premium, a **corona child benefit supplement for vulnerable families** was also implemented in Brussels. It consisted of €100 for each eligible child and was paid out during the month of September 2020. To be eligible for this supplement, the household had to be eligible in August to receive a social supplement within the child benefit system and the yearly gross taxable household income had to be below €31,936.20, or €46,359 in households with two or more children.

In the following page, Table 1 provides a general overview of the income support measures introduced throughout 2020 and their design, while Table 2 summarizes the timing of these benefits. In particular, we indicate the months during which they could be received at their earliest.

Table 1. COVID-19 social support measures in Belgium, 2020.

	Amount	Level	Procedure	Main eligibility conditions	Main targeting mechanism(s)	Aim
Federal						
Temporary unemployment benefit COVID-19	Base amount equivalent to 70% of previous capped wage plus supplement of €5.63 per affected day	Individual	Employer application	Employment contract and partial unemployment	Categorical	Living standards
Bridging right for self-employed	Full amount of €1,291.69 without family responsibilities; €1,614.10 with family responsibilities; halved amount depending on status	Individual	Self-application	Interruption to self-employed activity	Categorical	Living standards/ protection against poverty
Double bridging right	Double of the above amount (Oct-Dec)	Individual	Self-application	Interruption to self-employed activity in specific sectors	Categorical	Living standards
Temporary halt of the degressivity in the regular unemployment benefit scheme	N/A	Individual	Automatic	Unemployment	Categorical	Living standards
Bonus for social assistance beneficiaries	€50 per month (July-Dec; total €300 in 2020)	Household	Automatic	Receiving means-tested assistance benefit	Categorical (proxy means tested)	Protection against poverty
Premium for long-term temporary unemployed	Lump sum of €150; supplement of €10 per affected day (only for above 67 temporary unemployed days)	Individual	Automatic	At least 53 days of temporary unemployment	Categorical	Protection against poverty/living standards
Flanders						
Water and energy premium	Lump sum of €202.68	Individual	Automatic	Receiving temporary unemployment benefits	Categorical	Living standards
Corona supplement for vulnerable families in the child benefit system	Lump sum of €35 per eligible child	Household	Automatic	Income below threshold	Means-tested	Protection against poverty

Table 2. COVID-19 social support measures in Belgium, 2020. (Cont.)

	Amount	**Level**	**Procedure**	**Eligibility conditions**	**Main targeting mechanism(s)**	**Aim**
Wallonia						
Water premium	Lump sum of €40	Household	Self-application	One household member receiving temporary unemployment benefits	Categorical	Living standards
Energy premium	Lump sum of maximum €175 (€100 gas, €75 electricity)	Household	Automatic	Family using a budget meter	Categorical (Proxy means-tested)	Protection against poverty
Brussels						
Rental premium for vulnerable families	Lump sum of €214.68	Household	Self-application	One household member receiving temporary unemployment benefits or bridging right AND income below threshold	Categorical and means-tested	Protection against poverty
Corona supplement for vulnerable families in the child benefit system	Lump sum of €100 per eligible child	Household	Automatic	Income below threshold	Means-tested	Protection against poverty

Notes – Aim is a provisional assessment by the authors, based on the design of the benefit.

Table 3. Overview of the timing of income supporting COVID-19 measures, taken in 2020.

	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Federal										
Temporary unemployment benefit COVID-19	x	x	x	x	x	x	x	x	x	x
Bridging right for self-employed*	x	x	x	x	x	x	x	x	x	x
Double bridging right*								x	x	x
Temporary halt of the degressivity in the regular unemployment benefit scheme		x	x	x	x	x	x	x	x	x
Bonus for social assistance beneficiaries					x	x	x	x	x	x
Premium for long-term temporary unemployed*										x
Flanders										
Water and energy premium*			x	x	x	x	x			
Corona supplement for vulnerable families in the child benefit system*										x
Wallonia										
Water premium for temporary unemployed*			x	x	x	x	x	x		
Energy premium for families with a budget counter*				x	x	x	x	x		
Brussels										
Rental premium for vulnerable families*					x	x	x	x	x	x
Corona supplement for vulnerable families in the child benefit system*							x			

Notes – The table indicates the earliest months (x) these benefits could in theory be received.

*One-off lump sum payment that can be received in any one of the indicated months.

3 Data and methodology

3.1 Data

Data to monitor the impact of COVID-19 on the household income distribution in Belgium has been relatively scarce over the past few years. Within the COVIVAT project, in order to monitor the impact of the social distancing measures, we have built on parametric (Marchal et al., 2021) and non-parametric nowcasted data (see Capéau et al., 2021, 2022; also used in Derboven et al., 2021; and Neelen et al., forthcoming)[9].

In this context, nowcasting relies on the identification of observations that were likely affected by the pandemic using the most recent available microdata. At the moment of the onset of the COVID-19 crisis, this refers to the 2018 European Union Statistics on Income and Living Conditions (EU-SILC) survey data. In order to estimate the likelihood of being affected, researchers imputed parametric models building on standing or ad hoc surveys (Brewer & Tasseva, 2021; Bronka et al., 2020; Marchal et al., 2021). The underlying microdata are subsequently adjusted for wage trends and inflation, and microsimulation models are used to calculate the tax-benefit policies introduced to cushion affected employees. Alternatively, those affected can also be identified non-parametrically, by randomly selecting observations across subpopulations, until the share of affected individuals in the underlying microdata reflects the share in available population statistics. These external population statistics could be derived from administrative data on beneficiaries or the best possible approximations based on assumptions in line with the lockdown regulations (Capéau et al., 2021; Christl et al., 2021, 2022; Figari & Fiorio, 2020; Gallo & Raitano, 2020; Thuy et al., 2020).

Unsurprisingly, the quality of the available external aggregate population statistics improved over time. Capéau et al. (2022) showed that allocations over more detailed subpopulations lead to more accurate estimates. For Belgium, it has been demonstrated that the precise assumptions made in the process of nowcasting, depending on the external information available to simulate the impact of the COVID-19 shock, have a large impact on the size (but not the direction) of the obtained results.

In this paper, we assess income volatility throughout 2020 building on the non-parametrically nowcasted data developed in the course of the COVIVAT project (see Capéau et al., 2022; Derboven et al., 2021; Neelen et al., forthcoming). We have updated the previously used nowcasted data as new aggregate administrative measures have become available, in line with Neelen et al. (forthcoming). As we are interested in the (mitigation of) income volatility, and hence the timeliness and effectiveness of income support policies, throughout 2020, we focused on the nowcasting of monthly data[10].

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[9] In addition, we built on hypothetical household simulations (Cantillon et al., 2020; Marchal et al., 2020), pre-COVID-19 survey data (Decoster et al., 2020; Horemans et al., 2020), the labour force survey that was quick to track changes in labour market statuses (Lens et al., 2020), and, as soon as it was available, administrative data (Vinck et al., forthcoming).

[10] In this, we were aided by previous efforts (initially made out of necessity) in the COVIVAT project. Most microsimulation models are designed to calculate annual incomes, as many important elements of the tax benefit system also have an annual horizon. However, this means that the first timely simulations had to make assumptions on the situation near the end of 2020 (e.g. Gallo & Raitano, 2020; Thuy et al., 2020), which sometimes obfuscated the

The underlying 2018 EU-SILC data comprises annual wages and incomes. In order to convert this data to a monthly data set, fit for nowcasting towards the monthly situation throughout 2020, as well as to allow for the simulation of the eligibility criteria and timing of the COVID-19 social policy measures, we had to make a number of assumptions.

For one, we converted the 2018 annual EU-SILC data to reflect monthly wages and incomes with the conversion rules outlined in Marchal et al. (2021). EU-SILC respondents report for each month their main labour market status, whereas they report their different income components annually. We converted these annual income components to our best possible proxy of the monthly income for each month, by assigning the annual income component to the months in which it could conceivably be received, in line with the reported labour market status. Evidently, annual incomes were adjusted for the number of months for which the labour market status was reported.

Second, we received aggregate administrative data on the share of employees and self-employed in temporary unemployment, unemployment and the bridging right for self-employed, by gender, age group, wage or income level, sector, and status in the previous month. We applied these rates to randomly (i.e. non-parametrically) allocate those affected in this sense by COVID-19 in each month[11]. We used aggregate administrative information on the overlap between being affected in April 2020 and being affected in November 2020, in order to recalibrate the allocation in line with repeated affectedness. We adjusted the gross monthly incomes of those affected in line with the duration of their temporary unemployment. The monthly gross labour incomes of regularly unemployed and self-employed were set equal to zero if they had been identified as affected[12]. For those affected, we simulated the level of temporary unemployment benefit, unemployment benefit and bridging right for the self-employed to which they were entitled in that month, taking account of their personal characteristics and the applicable eligibility criteria. The receipt of other benefits is fully simulated based on the applicable eligibility criteria.

We make the assumption that beneficiaries receive the additional benefits as soon as they fulfil all eligibility criteria, i.e. we assume that beneficiaries receive benefits as soon as it was legally possible (cf. the theoretical timing shown in Table 2 in Section 2.2). We hence do not take account of delays in implementation. Given the size of the beneficiary population, and the rapid onset of the crisis, this may be a relatively optimistic assumption. In addition, some expenditure-related benefits were payable at the moment the expenses were actually paid. As we have no information on when this moment occurs for individual households, we again assumed this to be the earliest possible, given the eligibility criteria and the moment of actual regional implementation.

actual impact experienced in the first months. In order to assess the impact in April 2020 (see Marchal et al., 2021), we therefore adjusted the underlying microsimulation model to calculate monthly incomes, rather than annual incomes. Main changes at the time were the incorporation of the monthly withholding tax, and the swift reaction of the means-tested social assistance benefit to current incomes. In later COVIVAT work, we alternated between annual and monthly assessments. Still, the nowcasting itself builds on monthly aggregated administrative data on the number of beneficiaries affected in a specific month, rather than the number of people affected throughout the year. This more precise allocation of persons affected allows the timing of being affected in different months to be taken into account in the simulation, which has repercussions for the eligibility for specific benefits (see section 2.2).

[11] In line with the practices in previous COVIVAT nowcasting, we apply these rates on the 2018 EU-SILC, inflated by a factor of 10 (with a similar reduction in weights), in order to limit the impact of rounding errors.

[12] Note that especially for the self-employed, this is a stark assumption. Capéau et al. (2022) show alternative annual estimates in which they use a fine-grained model of the income loss of the self-employed.

Limitations of nowcasted data

Evidently, nowcasted data in general, and the data used in this paper specifically, face a number of challenges relative to timely survey data. For one, they heavily depend on the availability of external statistics to calibrate the population against. The level of available detail and the timeliness of these external statistics greatly affect the accuracy of the estimates. There is, however, an additional problem; it means that nowcasted data are by definition limited to assessments of the impact on the population captured in these external statistics, which in this case refers to those captured in recipiency statistics. Those not covered by benefits are left outside of the scope of these exercises by necessity. This means that we miss part of the COVID-19 impact. People who faced reductions in hours worked, who were not covered by the (temporary) unemployment insurance scheme or the measures for the self-employed (but instead were left without benefits, or had to file for social assistance), or those who were affected in another way[13] are left outside the scope of our analysis.

We hence mainly provide an analysis of the COVID-19 shock for those who were covered by the social insurance system[14]. Some of the measures discussed above were meant to help those not covered by the social insurance system, or even those not experiencing decreases in income.[15] We do include these measures in our analyses of income volatility and effectiveness, but we (implicitly) assume that there were no changes in the underlying target population and on the demographics of the population.

Second, a common challenge to microsimulation models is that it shows the effect of the system as it is supposed to work in theory. They assume a swift reaction of the available tax benefits, and only some benefits are simulated to take account of non-take-up estimates that are moreover derived from non-take-up models developed in "regular" times. By assuming that benefits were received as soon as legally possible (cf. supra), we are obviously confronted with this caveat.

These disadvantages of nowcasted data should be taken into account. However, at a time when survey nor administrative data are available on the time period under consideration, they have an obvious advantage. As over the past months, both survey and administrative income data on 2020 have started to become available, this advantage is currently decreasing. For now, we still consider the nowcasted data to be the best fit to answer the research questions proposed in this paper, specifically because of the efforts made to nowcast net incomes on a monthly basis, information that is not immediately available from the administrative data (see Vinck et al., forthcoming), nor in the most recent version of the EU-SILC – at least, not without renewed simulation efforts. As the 2021 EU-SILC is currently being prepared for microsimulation exercises, it will in the very near future be possible to challenge our findings to survey-based (but still simulated) monthly data.

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[13] For instance, those already unemployed or on social assistance with less opportunity to find employment, or those confronted with additional but not-labour market related challenges due to COVID-19.

[14] In addition, we do not assess the adequacy, timeliness and effectiveness of two specific social insurance-based types of COVID-19 social policy measures. We disregard the effect of health insurance benefits, as we have no information on those who contracted COVID-19. Also, and for a similar reason, we do not assess the impact of the COVID-19 parental leave benefit, that was implemented in order to allow those with young children that had to stay home from school or childcare, because of quarantine or outright school closures, to temporarily take a leave of absence from work (see also footnote 5).

[15] Such as the additional help for those on social assistance, meant to cover additional costs related to lockdown living, even when they saw no change in their labour market status.

A more general point is that the EU-SILC data, whether they are nowcasted or not, are not designed to be fully representative at the monthly level (see also Neelen et al., forthcoming for a discussion of some of the implications). We therefore focus on the mitigating role of the simulated social policy response for the affected individual, rather than on the population statistics.

3.2 Measures of income volatility

There are a number of approaches used in the literature to estimate earnings and income volatility. According to Venn (2011), these approaches can be classified into three broad categories: (1) time-series methods, (2) cross-sectional methods, and (3) categorical methods. As mentioned previously, the use of time-series models, based on the seminal works of Moffitt and Gottschalk, is a preferred approach when large historical data is available because it allows for the transitory and permanent (i.e. structural) components of volatility to be estimated separately (Moffitt & Gottschalk, 2011; Sologon & O'Donoghue, 2009). However, a caveat of this approach is that it relies heavily on assumptions applied to these models. Cross-sectional methods, on the other hand, involve using measures of dispersion, such as the variance and standard deviation of percent changes or the coefficient of variation. This approach is more descriptive, providing just an overview of volatility, as the long-run driving factors of volatility cannot be determined using these measures. However, exploiting the additive properties of variances, a number of studies have decomposed volatility into its different sources for a given period. The last approach, categorical methods, involves setting a threshold for a substantial shock to earnings/income to define volatility. As we are interested in intra-year income volatility during the pandemic in Belgium, we do not consider the time-series approaches and consider instead cross-sectional methods to measure volatility.

$$CV_t = 100 \times \frac{\sqrt{\frac{\sum_{m=1}^{12}(Y_\mathrm{m} - \overline{Y}_t)^2}{11}}}{\overline{Y}_t} \tag{1}$$

A measure frequently used by intra-year studies using such methods is the coefficient of variation (CV) (Hannagan & Morduch, 2015; Wolf et al., 2014). The coefficient of variation, CV_t, is the ratio of the standard deviation of incomes to the average income within time period t, $\overline{Y}_t$. More specifically, we define the coefficient of variation as the percentage of the ratio of the standard deviation of monthly incomes to the average income in the year[16]. The advantage of using the coefficient of variation is that it is scale-invariant, and thus, can be conveniently used for cross-comparisons such as subgroup comparisons. The coefficient of variation acts as a summary measure for volatility within a time period, and therefore is easier to interpret at a glance compared to the arc percent change, another often-used measure of income volatility (Bania & Leete, 2009; Gennetian et al., 2015; Wething, 2020). However, the coefficient of

[16] There are a small number of observations with negative disposable incomes, a number of which are due to EUROMOD's averaged mechanical assignment of the Flemish care contribution, leading to some observations having negative disposable incomes that are exactly equal to this averaged contribution. For these observations, we set their disposable incomes to zero (N = 441, 0.71% of working age sample). For the remaining observations with negative disposable incomes, we omit them from our volatility analyses (N = 516, 0.83% of working age sample). We do not expect the adjustments and omissions to affect our results since these observations form a very small group relative to the sample (1.54% of working age sample). In addition, we set the coefficient of variation to zero for observations where average income is zero.

variation does not indicate directionality of income shocks due to its scale-invariant properties (Wolf et al., 2014). In this paper, we focus purely on the volatility of earnings and disposable income.

To analyse the effects of the different COVID-19 support measures on income volatility, we measure and compare income volatility of gross income (i.e. earnings) and disposable income for both individuals and households, restricting the sample to individuals who are of working age, that is, individuals who are between 25 and 59 years old, to omit youths who are just entering the labour market as well as pensioners. The sample of households is also restricted to households with a household head of working age. To further investigate the extent by which certain subpopulations were affected, we also report results for a smaller subsample which includes only individuals that received at least one COVID-19-related public transfer, and households where at least one member received a COVID-19-related public transfer[17]. We refer to this subsample hereafter in the paper as "affected working age" for individuals and "affected households". We further disaggregate the effects of federal and regional measures in reducing income volatility by mechanically decomposing the changes in the CV (i.e. its numerator and denominator) as in Morduch and Siwicki (2017), which we explain in more detail in Section 4.3. Lastly, we determine the targeting efficiency and poverty reduction effectiveness of these measures in Section 4.4.

4 Results

4.1 Summary statistics

Table 3 shows various relevant descriptive statistics for our two samples of interest. The first column shows the descriptive statistics for all individuals of working age, whereas the second column shows the same summary statistics for individuals of working age, who received a COVID-19 social policy benefit in our nowcasted data (i.e. "affected working age"). This means that they were either identified in the nowcasting exercise as being temporarily unemployed (and hence receiving temporary unemployment benefits), newly unemployed because of COVID-19, or likely to receive a bridging right, or that they fulfilled the eligibility conditions for the additional simulated federal (i.e. the social assistance premium) and regional benefits (in particular the various energy, water and rent premiums, and child benefit supplements).

Between the two sample definitions described previously, the characteristics of individuals do not differ substantially apart from their employment characteristics. The affected subsample, *by definition*, contains a considerably higher proportion of individuals that experienced a change in labour market status due to becoming temporarily unemployed and fully unemployed, as well as a slightly higher number of social assistance beneficiaries than in the full working age sample. Therefore, we also see a higher proportion of individuals in the first and second income quintile and a lower proportion of wage earners in the top 20%. At baseline, the affected subsample has a slightly higher proportion of individuals at risk of poverty.

Individuals in the affected working age sample also appear to be lower educated and to be situated more often in Brussels and Flanders than in the full working age sample. The latter observation is also made in Vinck et al. (forthcoming) for temporary unemployed individuals. In particular, they find an overrepresentation of Flemish people among the short-term temporary unemployed relative to the

[17] Specifically, one of the COVID-19 transfers included in Table 2 in Section 2.2.

working population, as well as an overrepresentation in Brussels of the temporary unemployed among those who are long-term temporary unemployed. Also in line with Vinck et al. (forthcoming), we find that those affected are more often male.

Finally, a slightly higher percentage of individuals in the affected working age sample experienced a change in labour market status at baseline relative to the full working age sample. This implies that certain characteristics, such as income level and sector of employment, which were used in determining those who are more likely to become temporarily unemployed due to COVID-19 in our nowcasted data, are concurrently general risk factors leading to more frequent employment changes also outside of the pandemic.

Table 4. Summary statistics for the sample of individuals.

	Sample	
	Working age (N = 61705)	**Affected working age* (N = 22707)**
Socio-economic characteristics		
Age		
Mean (SD)	42.47 (10.17)	40.93 (10.00)
Gender		
Female	49.8%	43.4%
Region		
Brussels	11.5%	13.7%
Flanders	56.6%	58.1%
Wallonia	31.9%	28.1%
Highest education level attained		
Not completed Primary	5.7%	6.4%
Primary	4.1%	4.3%
Lower Secondary	12.1%	13.4%
Upper Secondary	33.2%	38.6%
Post Secondary	1.3%	1.3%
Tertiary	43.7%	35.9%
Income quintiles**		
Bottom 20%	15.0%	15.9%
20-40%	15.9%	17.0%
40%-60%	19.7%	21.0%
60%-80%	22.4%	22.9%
Top 20%	26.9%	23.2%
Household size		
Mean (SD)	3.05 (1.49)	3.05 (1.49)
Below the poverty risk*** line (baseline)	9.9%	11.1%
Receives social assistance	3.7%	10.1%

Table 5. Summary statistics for the sample of individuals. (Cont.)

	Working age (N = 61705)	**Affected working age* (N = 22707)**
Employment characteristics		
Became fully unemployed due to COVID-19	2.9%	7.9%
Became temporarily unemployed due to COVID-19	27.0%	74.0%
Received bridging right due to COVID-19	3.6%	9.9%
Change in labour market status at baseline	7.4%	9.2%
Change in labour market status (including due to COVID-19)	35.6%	86.3%

Notes – N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. 'Baseline' refers to the fictional 2020 year without COVID-19. 'COVID-19' refers to the simulated nowcasted data for 2020.
*Working age individuals who received any COVID-19-related public transfer.
**Based on annual equivalised household disposable income at baseline.
***Poverty risk lines are constructed as 60% the median of annual equivalised household disposable income at the baseline.

4.2 Income volatility

Overall volatility

Table 4 presents the coefficient of variation as a measure for volatility. The higher the coefficient of variation, the higher the volatility (i.e. the more and the more severe the fluctuations in monthly income) experienced by the individuals and households under consideration. We show the average coefficient of variation for working age individuals and households, and for affected (cf. the definition mentioned above) individuals and households.

The first rows of Table 4 show the average coefficient of variation for the different groups under consideration, in both earnings and disposable income for the baseline, that is, a fictional year 2020 in which there would have been no COVID-19 crisis. For this (fictional) baseline, we calculate monthly incomes based on actual reported monthly labour market statuses in the 2018 EU-SILC, in the same fashion as we do for the nowcasted monthly data (see Section 3.1 for a precise description). Note that our estimates of earnings volatility are solely driven by monthly labour market status changes, and on our assumptions on how these labour market status changes translate to monthly incomes. The volatility in disposable income reflects the volatility in earnings, as well as the (simulated) reaction of the tax-benefit system to these labour market (and related earnings) changes.

Table 6. Overall volatility of individuals and households.

	Working age		Affected working age	
	Individuals	**Households**	**Individuals***	**Households****
A. Baseline				
Mean CV (%)				
Earnings	5.2	5.0	7.0	6.0
Disposable income	2.4	2.0	2.7	2.1
B. COVID-19				
Mean CV (%)				
Earnings	16.3	15.4	37.5	25.6
Disposable income	5.2	4.5	10.2	6.7
N	61705	36044	22707	19235

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. 'Baseline' refers to the fictional 2020 year without COVID-19. 'COVID-19' refers to the simulated nowcasted data for 2020.
*Working age individuals who received any COVID-19-related public transfer.
**Households with a head of working age and with at least one member that received any COVID-19 related public transfer. Disposable income for households reflect equivalised households disposable income using the OECD-modified equivalence scale.

The mean coefficient of variation for earnings is 5.2 among the full sample of working age individuals. It is somewhat higher, at 7.0, when we zoom in on the "affected group" of individuals, as defined above. This is in line with our observation from Table 3, that this group in a non-COVID-19 situation (i.e. our fictional baseline) already experienced a higher risk to experience a change in labour market statuses, and the related changes in earnings as well. For both groups, disposable income volatility is lower than earnings volatility at the baseline. Clearly, in normal times, the tax-benefit system reduced experienced earnings volatility. The welfare state in Belgium is indeed designed in such a way that it has a clear capacity to smooth large variations in earnings. Taxes are generally progressive, meaning that hikes (but also drops) in gross earnings are mitigated. Complete losses of earnings are generally partially compensated by a variety of benefits. While these benefits generally do not offer a full income replacement, they do substantially limit the experienced loss in income.

Compared to the baseline, average volatility levels in both earnings and disposable income in the COVID-19 scenario are higher, highlighting the disruptive nature of the pandemic. In addition, the average earnings volatility of individuals in the "affected" group in the COVID-19 scenario (37.5) is more than twice that of the average overall volatility level (16.3). This suggests that individuals with volatile employment experience greater volatility in their earnings, as we would intuitively expect. Pre-emptively, we observe that the inclusion of benefits and taxes significantly cushions individuals from volatility as the average volatility levels in disposable income are much smaller than that of earnings. Additionally, in Table 4, household earnings are somewhat less volatile than individual earnings, especially for the "affected" group and in the COVID-19 scenario. This is indicative of a resource pooling effect as the earnings of other household members are able to offset the volatility of individual earnings. We found similar results in Marchal et al. (2021) where they reported that the monthly relative drop in household disposable incomes in April 2020 was smaller than the relative drop in individual disposable income, as a result of the other adult(s) in the household still having labour market earnings. The results of our nowcasting exercise (performed at the individual level), indeed only showed a relatively limited overlap of temporary unemployment risks between different adult household members. Interestingly, recent analyses by Vinck et al. (forthcoming), that were performed on *ex post* linked administrative data that have very recently become available, do show a more increased pooled risk at the household level.

Volatility by poverty risk

In Table 5, we repeat the information from Table 4, but further distinguish our groups of interest by poverty status. In both the baseline and the COVID-19 nowcasted scenario, we generate poverty risks based on equivalised household disposable income at the annual level. We first create a poverty line for both scenarios that is equal to 60% of median equivalised disposable household income of the entire available sample. If an individual falls below these thresholds, we classify them as being at risk of poverty. As those classified as being at risk of poverty may consist of individuals who are not necessarily active in the labour market, such as social assistance beneficiaries, we further zoom in on the volatility of at-risk-of-poverty groups who are also actively employed. This active group of individuals include those who have either an "employee" or "self-employed" status for at least one month within the year. In addition, for the following subsections of the paper, we focus specifically on the subsample of affected individuals as we arrive at similar conclusions for all working age individuals and for households. The volatility tables and the decomposition of the coefficient of variation for households and for the broader working age sample of individuals can be found in Appendices A and B.

Earnings volatility is generally higher for individuals that are at risk of poverty than those who are not. In particular, individuals at risk of poverty experience earnings volatility that is almost twice as much than individuals who are not at risk at the baseline. In panel A of Table 5, the average mean coefficient of variation of those with incomes above the poverty line at both the aggregate level and in the actively employed subgroup do not differ substantially. However, we see that for those who are at risk of poverty and who are concurrently actively employed, their average earnings volatility (24.9) is almost twofold that of the overall average at-risk-of-poverty volatility level (13.1) and roughly fourfold that of individuals not at risk (6.1). Moreover, the volatility of disposable income of individuals at risk of poverty remains higher than those not at risk, especially for individuals who are active in the labour market. This shows that the tax-benefit system can indeed dampen volatility levels but at the same time, individuals who are actively employed and at risk of poverty remain highly vulnerable.

In fact, we see this precisely when we look at average volatility levels in our simulated COVID-19 scenario, as reflected in panel B of Table 5. At an aggregate level, the average earnings volatility of those at risk of poverty (24.4) appears to be lower than those not at risk (39.0). The average volatility of disposable income between these two groups do not differ substantially, which seemingly suggests that the population would be equally hit by the pandemic regardless of their poverty risk. However, the overall group of individuals with disposable incomes below the poverty line also includes a higher proportion of individuals who are not working. When we look into the volatility levels of working individuals, we see a different picture. Individuals at risk for living below the poverty line *and* who are actively employed experience a higher level of volatility (49.2) than those not at risk and who are actively employed (41.0). Notwithstanding, it is important to note that this subgroup is small (inflated N = 1166 and 1152 in the baseline and COVID-19 scenarios respectively). Looking at disposable incomes, there is an overall encouraging and significant reduction of earnings volatility via the tax-benefit system but nevertheless, the at-risk-of-poverty-and-active subgroup maintains generally higher volatility levels than the other subgroups. These results thus highlight poignantly the increased vulnerability of employed individuals living under the poverty line during crises such as the COVID-19 pandemic.

Table 7. Volatility of affected individuals by poverty risk.

	All		**Active***	
	Not at risk of poverty	**At risk of poverty**	**Not at risk of poverty**	**At risk of poverty**
A. Baseline				
Mean CV (%)				
Earnings	6.2	13.1	6.1	24.9
Disposable income	2.4	4.6	2.3	8.1
N	20128	2579	18891	1166
B. COVID-19				
Mean CV (%)				
Earnings	39.0	24.4	41.0	49.2
Disposable income	10.1	10.6	10.3	15.9
N	20452	2255	18905	1152

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. Results shown for working age individuals who received any COVID-19-related public transfer. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. 'Baseline' refers to the fictional 2020 year without COVID-19. 'COVID-19' refers to the simulated nowcasted data for 2020. Poverty risk is determined by annual equivalised household disposable income falling below 60% of the median of the full sample.
*Individuals who are either employed or self-employed in at least one month.

Volatility by income quintile

In this subsection, we disaggregate overall average volatility levels by income quintiles[18]. We present our results in a similar fashion to our poverty risk analysis, by also providing the average volatility levels for a subgroup that is active in the labour market (as we defined previously).

[18] Income quintiles are constructed based on baseline and simulated COVID-19 equivalised annual disposable household incomes respectively.

Table 8. Volatility of affected individuals by income quintile.

	Income quintile*				
	0-20	**20-40**	**40-60**	**60-80**	**80-100**
A. Baseline (all)					
Mean CV (%)					
Earnings	14.1	10.2	6.7	2.9	3.8
Disposable income	4.4	3.9	2.8	1.2	1.8
N	4002	4333	4683	4940	4749
*B. Baseline (active**)*					
Mean CV (%)					
Earnings	22.6	10.5	6.7	3.0	3.6
Disposable income	7.0	3.8	2.6	1.3	1.7
N	2138	3834	4519	4843	4723
C. COVID-19 (all)					
Mean CV (%)					
Earnings	28.8	38.3	40.2	38.0	40.4
Disposable income	10.5	10.0	9.7	9.7	11.1
N	4055	4585	4796	4812	4459
*D. COVID-19 (active**)*					
Mean CV (%)					
Earnings	48.8	41.9	41.7	39.5	39.8
Disposable income	14.5	10.5	9.7	9.8	10.8
N	2397	4039	4603	4671	4347

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. Results shown for working age individuals who received any COVID-19-related public transfer. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. 'Baseline' refers to the fictional 2020 year without COVID-19. 'COVID-19' refers to the simulated nowcasted data for 2020.

*Income quintile based on equivalised household disposable income (using OECD-modified equivalence scales) in the different respective scenarios.

**Individuals who are either employed or self-employed in at least one month.

At the baseline, the lower income quintiles generally have more volatile earnings than the higher income quintiles on average. There appears to be a declining trend of higher incomes with the average level of volatility experienced until the fourth income quintile, with incomes at the fifth quintile being generally more volatile than incomes at the fourth quintile. Although the average volatility levels from Table 6 for the top 20% are not substantially higher than those in the fourth or third quintiles, incomes at the top of the income distribution tend to generally be more volatile than these quintiles in the literature (Hardy & Ziliak, 2013). In panel C of Table 6, the average level of earnings volatility (as well as disposable incomes) seems to be consistent over all income quintiles, with the first income quintile having somewhat lower volatility levels on average. Again, this suggests that everyone would be equally hit by the pandemic in terms of disrupting standards of living, regardless of socio-economic status. However, similar to our analysis of volatility by poverty risk, the picture changes when we restrict the sample to those who are active in the labour market. In doing so, we find that at both baseline and in the COVID-19 scenarios, the first income quintile experiences the highest average volatility in earnings. The tax-benefit system appears to be performing well overall in buffering against income shocks as we see a significant reduction in average volatility levels of earnings to disposable incomes. However, for the bottom 20%, their disposable incomes still remain higher than the rest of the income distribution.

4.3 The stabilizing effect of transfers and taxes on income volatility

To determine the effect of each transfer on the volatility of other income, we breakdown the changes to the coefficient of variation of disposable income when removing a source of income, component *k*, one at a time. Recall that the coefficient of variation is calculated in our analysis as the ratio of the standard deviation of monthly income to the mean of income within the year. Therefore, a reduction in the coefficient of variation can either occur through a reduction of the standard deviation of income or through an increase in the average income within the year.

If the effect of component *k* on the coefficient of variation of disposable income is predominantly through a reduction in the standard deviation, this implies that component *k* acts as a direct buffer against volatility. On the other hand, if the predominant effect is through the mean, component *k* indirectly reduces volatility by providing more income[19]. In other words, benefits that reduce the coefficient of variation mainly through a reduction in the standard deviation rather than the mean in income can be said to be (more) timely because they directly counter the drops in other sources of income. We calculate thus, for each income component k, the mean coefficient of variation without each component[20] and the percentage change in the mean coefficient of variation. We then calculate the average percentage change in the standard deviation and in the mean of the coefficient of variation to analyse these mechanisms.

[19] For taxes and social insurance contributions, they would buffer against income spikes and therefore reduce volatility by reducing income instead.

[20] To do so, we calculate disposable incomes without each component *k*, which does result in a number of negative incomes (about 20.8% of the working age sample has at least one $(Y\text{-}Y_k) < 0$). For these hypothetical incomes that are negative, we set them to zero. In addition, in the calculation of the percentage changes in the standard deviation and the mean of income, we encounter large percentage values due to small values that are close to zero. To correct for these mechanically large values, we limit the percentage changes in the mean and standard deviation of the coefficient of variation at 100%. Further, if the mean or the standard deviation of income is zero, we set the percentage change to zero.

In addition, we group the income components into four broad categories – federal COVID-19 transfers, regional COVID-19 transfers, federal non-COVID-19 transfers as well as taxes[21] and social insurance contributions – and analyse the changes in the coefficient of variation for each category. Following Morduch and Siwicki (2017), we also use three different sample definitions to observe the effect of public transfers on volatility: the full working age sample, the affected working age sample, and the sample which shows conditional effects on each component *k* separately. The analysis for this last sample involves isolating the effect sizes for each component by calculating the mean coefficients only for the group that receives a particular component. We therefore refer to these effects as conditional effects. For example, the conditional effects on the coefficient of variation of temporary unemployment benefits would reflect the average only within the group that received temporary unemployment benefits.

Table 7 (below) shows the underlying changes on the coefficient of variation for the full working age sample. The percentage change in the coefficient of variation is calculated against the average coefficient of variation of disposable income for the whole sample, which is 5.15. Overall, federal COVID-19, non-COVID-19 transfers, taxes and social insurance contributions reduce income volatility, while most of the regional COVID-19 transfers have an almost negligible effect on the mean coefficient or even led to a very slight increase in volatility. This is unsurprising as most of the regional benefits were one-time disbursements that were small relative to other benefits and were also disbursed later in the year. We also see this similarly for the temporary unemployment premium that was disbursed in December. For both federal non-COVID-19 transfers and taxes as well as social insurance contributions, the reduction in volatility is driven by changes in average income rather than changes in the standard deviation of income. This is an expected result given that we do not make changes to the federal non-COVID-19 transfers in our microsimulation[22]. Federal COVID-19 transfers, on the contrary, reduce the coefficient of variation predominantly via a reduction in the standard deviation of income. These discretionary transfers therefore act as direct buffers against income volatility as opposed to other sources of income, suggesting that they were well-targeted and timely.

[21] We only consider withholding taxes.
[22] Unemployment benefits that are simulated based on the allocation of affected in our nowcasting exercise, which includes the removal of the degressivity of the benefit, are considered as federal COVID-19 benefits. Unsimulated unemployment benefits, as seen in Tables 7 to 9 are included under 'other non-means-tested benefits' in 'Federal non-COVID-19 transfers'.

Table 9. Decomposition of the coefficient of variation of working age individuals.

Component *k*	**Mean CV without *k***	**% Change in Mean CV**	**Mean % change in SD**	**Mean % change in mean**
Federal COVID-19 transfers	13	-60	-19	6
Temporary unemployment benefits	11	-52	-17	4
Long-term temporary unemployment premium	5	1	1	0
Bridging right	7	-25	-2	1
Unemployment benefits	6	-8	-1	0
Social assistance premiums	5	1	0	0
Regional COVID-19 transfers	5	3	5	0
Flanders	5	2	4	0
Water and energy premium	5	2	4	0
Child benefits supplement	5	0	0	0
Wallonia	5	0	0	0
Water premium	5	0	0	0
Energy premium	5	0	0	0
Brussels	5	1	1	0
Rental premium	5	0	0	0
Child benefits supplement	5	1	0	0
Federal non-COVID-19 transfers	13	-60	-3	17
Other means-tested benefits	7	-27	-2	7
Other non-means-tested benefits	7	-27	-1	8
Pension, disability and health benefits	6	-20	0	4
Taxes and social insurance contributions	6	-19	-14	-24
Taxes	6	-9	-7	-16
Withholding tax	6	-9	-7	-16
Social insurance contributions	6	-12	-8	-11

Notes – CV = coefficient of variation. SD = standard deviation. Mean CVs are weighted by EU-SILC cross-sectional weights. N = 61705. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. Weighted mean CV of disposable income = 5.15. Unemployment benefits under 'Federal COVID-19 transfers' are simulated according to our nowcasting model. Unsimulated unemployment benefits are considered under 'Other non-means-tested benefits'.

In Table 8 (below), we zoom into the mechanical decomposition of the volatility of affected working age individuals, which we define as individuals who received any COVID-19-related benefits. In this restricted sample, the average coefficient of variation (10.2) and the average coefficient without each income component are intuitively higher than in the full working age sample. The conclusions we derived earlier regarding the different categories of benefits and income remain largely the same for the affected working age individuals. More importantly, we see with greater clarity that federal COVID-19 transfers, and more precisely the temporary unemployment benefits, significantly reduce volatility directly (a mean percentage reduction in standard deviation of 19% in the working age sample compared to 67% in the affected working age sample). Interestingly, taxes and social insurance contributions for this group appear to directly buffer against volatility but this is driven mainly by social insurance contributions.

Table 10. Decomposition of the coefficient of variation of affected working age individuals.

Component *k*	**Mean CV without *k***	**% Change in Mean CV**	**Mean % change in SD**	**Mean % change in mean**
Federal COVID-19 transfers	31	-67	-53	17
Temporary unemployment benefits	25	-60	-46	12
Long-term temporary unemployment premium	10	2	3	0
Bridging right	15	-31	-5	4
Unemployment benefits	11	-11	-4	0
Social assistance premiums	10	2	1	0
Regional COVID-19 transfers	10	4	13	0
Flanders	10	3	11	0
Water and energy premium	10	3	10	0
Child benefits supplement	10	0	0	0
Wallonia	10	0	1	0
Water premium	10	0	0	0
Energy premium	10	0	1	0
Brussels	10	1	1	0
Rental premium	10	0	0	0
Child benefits supplement	10	1	1	0
Federal non-COVID-19 transfers	28	-64	0	23
Other means-tested benefits	15	-33	0	12
Other non-means-tested benefits	13	-21	-1	9
Pension, disability and health benefits	12	-16	0	4
Taxes and social insurance contributions	13	-21	-36	-23
Taxes	11	-10	-17	-15
Withholding tax	11	-10	-17	-15
Social insurance contributions	12	-15	-21	-11

Notes – CV = coefficient of variation. SD = standard deviation. Mean CVs are weighted by EU-SILC cross-sectional weights. Results shown for working age individuals who received any COVID-19-related public transfer. N = 22707. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. Weighted mean CV of disposable income = 10.2. Unemployment benefits under 'Federal COVID-19 transfers' are simulated according to our nowcasting model. Unsimulated unemployment benefits are considered under 'Other non-means-tested benefits'.

Lastly, we look at the effect of transfers on volatility conditional on receiving each benefit (see Table 9 below). As such, the average coefficient of variation is calculated separately for each component (column 'Mean CV') and we report the number of observations (column 'N') where each component is positive. While temporary unemployment benefits drove the reduction in average volatility in the previous analyses, we see here that bridging rights and (simulated) unemployment benefits helped to directly and substantially buffer against volatility and were thus arguably, timely for their recipients. Meanwhile, regional COVID-19 transfers, especially the Walloon energy premium and child benefits supplement in Brussels, added more clearly to volatility. Despite this, they are arguably not qualitatively disruptive since these amounts are small and the average coefficients without these components are also closer to the sample average. Additionally, we see that federal non-COVID-19 transfers more evidently act as indirect buffers against volatility.

Table 11. Conditional decomposition of the CV of affected working age individuals.

Component *k*	**Mean CV without *k****	**Mean CV***	**% Change in Mean CV**	**Mean % change in SD**	**Mean % change in mean**	**N****
Federal COVID-19 transfers	33	11	-68	-57	18	20,545
Temporary unemployment benefits	31	9	-72	-67	17	14,991
Long-term temporary unemployment premium	11	12	10	14	1	4,115
Bridging right	68	20	-70	-50	37	2,267
Unemployment benefits	26	17	-37	-30	4	3,037
Social assistance premiums	8	10	25	7	3	2,205
Regional COVID-19 transfers	8	8	11	25	1	11,385
Flanders	8	9	9	26	1	8,187
Water and energy premium	8	9	8	29	1	6,968
Child benefits supplement	7	7	8	5	0	1,470
Wallonia	6	6	6	18	0	871
Water premium	7	7	1	8	0	713
Energy premium	3	4	43	40	1	180
Brussels	6	8	32	24	1	2,327
Rental premium	12	13	7	20	1	807
Child benefits supplement	4	6	61	22	1	1,780
Federal non-COVID-19 transfers	43	10	-76	-1	42	13,283
Other means-tested benefits	20	9	-56	0	27	10,867
Other non-means-tested benefits	17	9	-45	-3	27	8,839
Pension, disability and health benefits	44	15	-67	-4	53	1,645
Taxes and social insurance contributions	13	10	-22	-39	-24	21,027
Taxes	12	11	-11	-19	-17	19,943
Withholding tax	12	11	-11	-19	-17	19,943
Social insurance contributions	12	10	-15	-23	-12	20,793

Notes – CV = coefficient of variation. SD = standard deviation. Results shown for working age individuals who received any COVID-19-related public transfer. Unemployment benefits under 'Federal COVID-19 transfers' are simulated according to our nowcasting model. Unsimulated unemployment benefits are considered under 'Other non-means-tested benefits'.

*Mean CVs are weighted based on EU-SILC cross-sectional weights and reflect average values conditional on receipt of component *k*.

** N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting.

4.4 Poverty reduction, budget and targeting

To analyse the targeting efficiency and poverty reduction effectiveness of the different social policies implemented in Belgium during COVID-19, we calculate efficiency ratios developed by Beckerman (1979). The Beckerman ratios allow for a more nuanced understanding of social policies with regard to poverty reduction and different policy objectives. We express these ratios as percentages for each benefit, namely, the temporary unemployment benefit (inclusive of the long-term premium), the bridging right for the self-employed, (simulated) unemployment benefits, social assistance premiums and the regional income support COVID-19 benefits for Brussels, Flanders and Wallonia respectively. In addition, we calculate the efficiency ratios collectively (i.e. the combination of federal COVID-19 benefits altogether, and the combination of regional COVID-19 benefits altogether).

The first ratio we calculate is the vertical expenditure efficiency (VEE) – the proportion of benefits received by the pre-transfer poor. It is also known as the targeting efficiency. To identify the pre-transfer poor, we first obtain pre-transfer incomes for each benefit by subtracting gross benefits[23] from equivalized household disposable incomes in the simulated COVID-19 scenario. Subsequently, we construct poverty rates as well as poverty gaps, based on annual pre-transfer incomes compared to the poverty line in this scenario.[24] For each benefit, the total benefit amount received by the pre-transfer poor (based on the aforementioned poverty rates) and the total budget is then calculated[25]. We calculate the VEE as a ratio of these two amounts, as shown in the equation below. In Table 10, the amount received by the pre-transfer poor is shown as item (1), the total budget is shown as item (2) and the VEE is shown as item (6).

$$VEE = \frac{\text{Sum of benefits received by pre-transfer poor}}{\text{Total budget of benefit}} * 100 \qquad (2)$$

On top of the targeting efficiency of benefits, we are also interested in their poverty reduction efficiency (PRE), that is, how efficient the benefits are in reducing poverty through a reduction in the poverty gap in relation to their budget. This differs from the VEE, as the sum of benefits received by the pre-transfer poor also includes additional income that raises the income levels of the pre-transfer poor beyond the poverty level, what is referred by Beckerman (1979) as spillover income. In contrast, the PRE concerns the proportion of the benefit that contributes only in reducing the poverty gap (i.e. bringing income levels up to the poverty level). To obtain the PRE ratio, we can in principle calculate the difference in the post-transfer poverty gap and the pre-transfer poverty gap, and then divide this sum by the total budget amount of the benefit (equation (3)). The PRE can alternatively be expressed as the VEE multiplied by the

[23] In doing so, we calculate the efficiency of benefits in a hypothetical scenario since we do not consider the distributional effects of taxes on taxable benefits. Therefore, the poverty gaps that we estimate are somewhat bigger. Further, we do not take into consideration behavioural effects and equilibrium effects.

[24] The poverty gaps and poverty rates are calculated based on the post-transfer poverty line, which we define as 60% of the median of annual equivalized household disposable incomes in the simulated COVID-19 scenario.

[25] We use *pweights* in Stata with the EU-SILC cross-sectional weights to calculate totals to reflect the population totals. We hence use estimated budgets, based on our allocated and simulated COVID-19 benefits (see section 3.1 and Neelen et al., forthcoming), rather than the budgets reported to have been actually disbursed. A comparison of the simulated budgets reported in Table 10 to the amounts reported by the Court of Audit (2022) and by Rekenhof (2021) shows that these amounts – at least for the benefits that can actually be compared, and with the exception of the bridging right (see also Neelen et al., forthcoming) - to be generally within the same order of magnitude.

proportion of total amount of benefits that are not due to spillover. We show the spillover amount (item 4) for each benefit and express this spillover as a percentage of the benefit's budget (item 5) and use the expression in equation (4) to obtain the PRE in our calculations. This is nevertheless equivalent to equation (3), as previously explained. The poverty gap reduction for each benefit is reflected in item 3 and the PRE ratios are reflected in item 7 in Table 10. However, the benefit of expressing the PRE in terms of the amount of spillover is that it highlights the relationship between targeting (and thus also spillover) and poverty reduction. For instance, if a particular policy is designed to be more broadly targeted, we would expect a high spillover amount and therefore, lower efficiency in poverty reduction.

$$PRE = \frac{\text{Poverty gap reduction}}{\text{Total budget of benefit}} * 100 \tag{3}$$

$$= \frac{VEE}{100} * \left(1 - \frac{\text{Spillover}}{\text{Total budget of benefit}}\right) * 100 \tag{4}$$

The two ratios previously discussed – the VEE and PRE – do not actually measure how effective policies are in reducing poverty. They only measure the efficiency of policies in *targeting* the poor, and reflect *vertical* efficiency (Creedy, 1996). We therefore also use a measure of *horizontal* efficiency, known as the poverty gap efficiency (PGE), defined as the proportion of the pre-transfer poverty gap that is reduced by a benefit (Matsaganis et al., 2007). Like the two efficiency ratios, we express this proportion as a percentage in item 8 of Table 10. It is calculated as follows, in equation (5) below. It is important to note that, by definition, policies with a higher number of beneficiaries would be more effective at poverty reduction, because the gap reduced would be greater due to a larger pre-transfer poverty gap. This is why the PGE figures presented in Table 10 for the combined measures (i.e. federal and regional) are much bigger than the individual measures.

$$PGE = \frac{\text{Poverty gap reduction}}{\text{Pre-transfer poverty gap}} * 100 \tag{5}$$

Table 12. Targeting efficiency, poverty reduction efficiency and effectiveness of the different COVID-19 benefits.

	Federal COVID-19 benefits				**Regional COVID-19 benefits**			**Combined COVID-19 benefits**	
	Temporary unemployment	**Bridging right**	**Unemployment**	**Social assistance premiums**	**Brussels**	**Flanders**	**Wallonia**	**Federal**	**Regional**
Pre-calculations									
(1) Benefits received by pre-transfer poor	€ 424.86	€ 411.01	€ 77.01	€ 60.35	€ 7.89	€ 4.20	€ 3.74	€ 1,235.34	€ 15.58
(2) Total budget	€ 5,228.81	€ 1,301.83	€ 279.42	€ 130.19	€ 27.98	€ 161.64	€ 10.00	€ 6,940.24	€ 199.61
(3) Poverty gap reduction	€ 191.15	€ 193.42	€ 57.13	€ 47.56	€ 3.97	€ 2.27	€ 3.13	€ 432.41	€ 9.41
(4) Amount of spillover [(1)-(3)]	€ 233.70	€ 217.58	€ 19.88	€ 12.79	€ 3.93	€ 1.93	€ 0.60	€ 735.32	€ 6.21
(5) Spillover as percentage of (1)	55.01%	52.94%	25.81%	21.19%	49.75%	45.93%	16.13%	59.52%	39.86%
Beckerman ratios									
(6) Vertical expenditure efficiency [(1)/(2)]	8.13%	31.57%	27.56%	46.35%	28.21%	2.60%	37.38%	17.80%	8.35%
(7) Poverty reduction efficiency [(3)/(1)]	3.66%	14.86%	20.45%	36.53%	14.17%	1.41%	31.35%	7.20%	4.96%
(8) Poverty gap efficiency	6.68%	6.75%	2.09%	1.75%	0.15%	0.08%	0.12%	15.77%	0.35%

Notes – Monetary values are displayed in million euros. The total budget and benefit amounts received by the pre-transfer poor are calculated using *pweights* in Stata with EU-SILC cross-sectional weights. The poverty line is fixed at 60% of median annual equivalized disposable household income (inclusive of all transfers) in the COVID-19 scenario. Pre-transfer incomes are calculated by subtracting gross benefits from this disposable income. Pre-transfer poverty gaps are determined using pre-transfer incomes compared to the fixed poverty line. Poverty gap efficiency refers to the poverty reduction effectiveness of a benefit.

In terms of vertical efficiency, we see more generally from the VEE figures in Table 10 that some of the COVID-19 social measures were not necessarily designed to be targeted towards the poor[26], although they were able to significantly reduce the experienced volatility of low-income individuals and individuals with incomes below the poverty line.

Among the federal COVID-19 benefits, social assistance premiums combined have the highest VEE ratio (46.35%), followed by the bridging right and unemployment benefits (31.57% and 27.56% respectively) and lastly, temporary unemployment benefits (8.13%), as seen in row (6) of Table 10. Social assistance benefits are means-tested in Belgium, and are granted to those whose means fall below the minimum level of income. Therefore, the income of most social assistance beneficiaries are expected to be below 60% of median income. It is unsurprising that the COVID-19 social assistance premiums would perform the best, if not exceedingly well, in terms of this sort of targeting efficiency. In contrast, the targeting mechanisms of the other federal COVID-19 benefits are mostly categorical in nature (i.e. beneficiaries are temporarily unemployed, self-employed meeting the conditions of the bridging right, or unemployed). The spillover rates (row (5) in Table 10) for the temporary unemployment benefit (55.01%) and the bridging right (52.94%) are especially high. This again relates to how these benefits were designed and adapted during the pandemic, as eligibility only depended on having a valid labour contract for the temporary unemployment benefit and access to the bridging right was also expanded. The PRE ratio (row (7) of Table 10) of the bridging right is significantly higher than that of the temporary unemployment benefit. This is primarily driven by the total budget of the benefits. As seen in row (2) of Table 10, the budget for the temporary unemployment benefit is roughly four times larger than that of the bridging right, while the degree of poverty gap reduction (row (3)) is about the same in absolute terms for both benefits. In addition, among bridging right beneficiaries (as well as among the self-employed in general), and even more so among unemployment benefit and especially social assistance beneficiaries, the proportion of pre-transfer poor individuals is greater, which is why the spillover rates of these benefits are lower and their VEE rates are higher than for the temporary unemployment benefits.

In terms of regional benefits, the targeting efficiencies of the benefits in Brussels and Wallonia are a lot higher than that of Flanders, despite the substantially smaller budgets in these regions than in Flanders. The total budget for regional benefits in Flanders consists primarily of the energy premium (about 96% of the budget). This premium is targeted towards individuals that receive temporary unemployment benefits. The remaining budget consists of the child benefit supplement in Flanders – an income-tested benefit that was relatively small in amount and distributed at the household level. Thus, the overall VEE (2.60%) and PRE (1.41%) rates are very low for the regional benefits in Flanders. In contrast, the rental premium and the child benefit supplement in Brussels are both income/means-tested and specifically targeted at vulnerable households. Similarly, about two-thirds of the budget in Wallonia consists of the electricity and gas premiums received by families with a budget counter, and are taken to be means-tested in our simulation. The rest of the budget in Wallonia includes the water premium targeted towards the temporarily unemployed.

As expected from the relatively modest targeting efficiencies of the COVID-19 benefits, the benefits are also generally not very effective at poverty reduction. Taking into consideration the amount of spillover, the vertical efficiency across all COVID-19 benefits are low, with the highest poverty reduction efficiency (i.e. PRE) rates seen in social assistance premiums (36.53%) and the regional benefits in Wallonia (37.38%). Even with higher PRE rates, we see that the poverty *gap* efficiency (i.e. PGE) rates for these two groups of benefits are substantially lower than the other benefits that are not as targeting-efficient (1.75%

[26] However, this does not necessarily mean that these benefits have a lower targeting *accuracy* with respect to their eligibility criteria. Due to data limitations, we can only assess targeting efficiency with respect to redistribution.

for social assistance premiums; 0.12% for regional benefits in Wallonia). The PGE rates for the temporary unemployment benefits and bridging right are still higher at 6.68% and 6.75% respectively. This means that while the social assistance benefits and regional benefits in Wallonia are highly targeted towards the poor, they were not generous enough to be effective in reducing poverty. In comparison, the temporarily unemployment benefits and bridging right were generous, as reflected in their total budgets, which contributed to greater poverty reduction effectiveness.

5 Discussion

Overall, we find that the federal benefits (both the general measures, as well as those measures that were taken in response to COVID-19) have the largest impact on mitigating income volatility. This was especially the case for the temporary unemployment benefits, but also, to a more limited extent, for the COVID-19 bridging right and the unemployment benefits awarded to those that became unemployed due to COVID-19. Uncoincidentally, all these benefits were designed to replace the loss of incomes caused by the social distancing measures. In addition, in the case of the temporary unemployment benefit, various measures were taken to raise replacement rates, including increasing the replacement ratio from 65% to 70% of the (admittedly capped) previous wage, and the daily supplement. This stands in contrast to the regular unemployment benefit that remained relevant for those who became unemployed and did not have access to the temporary unemployment scheme: replacement rates were not increased, with the exception of the temporary halting of degressivity. The bridging right was even more indifferent to previous earnings levels. As is common in the social security scheme for the self-employed, it offered a lump sum benefit, that may have offered a very good income replacement to those self-employed with previously low earnings, but far less so for self-employed with higher earnings (see also Marchal et al., 2021). Also, the other federal (non-COVID-19) benefits have primarily served to replace lost incomes, even when they are means-tested. These benefits, therefore, have evidently a large impact on experienced income volatility in case of labour market status changes.

There are two exceptions to this general pattern. Both the long-term temporary unemployment benefit supplement, as well as the COVID-19 supplement to means-tested benefits (including the living wage and the income guarantee for elderly) had only a very limited – and positive – impact on income volatility. Both benefits were far smaller than the regular income replacing benefits, aiming specifically to additionally support the incomes of the most vulnerable with limited supplements. In addition, they were generally only distributed after the worst crisis impact had passed, from the summer onwards in case of the social assistance supplement[27], and in December in the case of the long-term unemployed.

Similarly, the regional COVID-19 benefits were not designed to act as full income replacements, and were as a consequence far smaller in terms of benefit level and budget size, resulting in only very limited (and positive, if any) impacts on income volatility. Still, there were some important differences in the definition of the target groups of interest. The Flemish water and energy premium was targeted at all individuals that became temporary unemployed in the first months of the COVID-19 crisis, and can as such be understood to be primarily intended to contribute to protecting the living standards of this group. The additional support measures introduced in Wallonia and Brussels, while still often targeted at the temporary unemployed,

[27] And in that case also to a target group that did not so much experience an increase in earnings volatility, but rather was confronted with navigating the increased expenses related to lockdown living and disturbed supply chains.

focused on household level measures, and further calibrated the target group by indications of prior low incomes, or a somewhat longer duration of temporary unemployment.

We do see these different choices reflected in the targeting and poverty reduction efficiency, that are relatively low in Flanders, and higher in Brussels and Wallonia. The poverty reduction effectiveness of the regional COVID-19 benefits is low in all three regions, in line with the overall small amounts and budgets. Overall, we find that the regional benefits, mainly because of their size, and in combination with their targeting design in the case of Flanders, had no substantial impact on either poverty reduction nor stabilization of incomes.

Finally, we also looked into the targeting efficiency, poverty reduction efficiency and effectiveness of the *federal* COVID-19 measures. Bear in mind that these measures were mainly intended to cover temporary losses in incomes, rather than protect against poverty. As a consequence, their overall targeting efficiency was generally limited. Of the three main income replacement benefits, the temporary unemployment benefit, the bridging right and the regular unemployment benefit, the targeting efficiency was the highest for the latter two, mainly as the groups catered for by these benefits have lower (reported) incomes to begin with. The social assistance supplements scored evidently very high on targeting and poverty reduction efficiency, meaning that large part of the allocated budget ended up below the poverty line, but overall, benefit levels and budget size were far too low to effectively bring poverty rates down.

6 Conclusion

This working paper set out to assess the extent to which the Belgian COVID-19 social policy measures reduced the earnings and income volatility caused by the COVID-19 shock and the related social distancing measures in 2020. In addition, we calculated the relative targeting and poverty reduction efficiency of both federal and regional (COVID-19) benefits, as well as their poverty reduction effectiveness.

Interruptions to economic activity brought upon by social restrictions to prevent disease transmission led to drastic changes in employment during the pandemic and resultingly, increased volatility in incomes. The earnings volatility of individuals who were affected - in the sense that they became unemployed or temporarily unemployed as well as vulnerable families who received income support - were generally higher than the rest of the Belgian population. Individuals with lower income tend to experience higher volatility levels and we find that the average level of volatility decreases with higher income levels. Particularly, working individuals with higher poverty risk experienced the highest volatility levels on average. This highlights not only the increased vulnerability of those facing in-work poverty prior to the pandemic, but also of those who plunge into poverty *from* such crises. The income support measures in Belgium, however, were able to mitigate a substantial portion of the earnings volatility induced by the pandemic, supplemented by support pooled from other household members.

The efficacy of these social support measures in reducing volatility and poverty relied primarily on their design in terms of targeting, timing, generosity and (adapted) eligibility conditions. In this regard, the federal COVID-19 benefits in Belgium were the most effective in directly countering within-year volatility, given their generosity and timely disbursement, coupled with the loosening of eligibility conditions. The increased accessibility to these support measures and their generosity also resulted in more effective poverty reduction, even when compared to benefits that were means-tested.

While low-income workers were hit the hardest, substantial shocks to income were experienced over the entire range of the income distribution. In such contexts, measures with a broader or more universal coverage seem not only to be the most viable politically, but are also preferred by policymakers for their administrative simplicity in times of crises. This is also reflected in some of the regional COVID-19 benefits that additionally required receipt of the temporary unemployment benefit or the bridging right, highlighting the focus in reducing and preventing in-work poverty. With the use of administrative payment streams, the eligibility of beneficiaries could be swiftly determined for smaller lump-sum benefits and could thus be automatically disbursed.

In addition, even though the generous income replacement measures required (self- or employer) application, the substantial loosening of eligibility conditions enabled increased take-up of these measures. Yet, the advantages of increased coverage entail obvious significant budgetary costs, as we have exemplified from our analysis of the targeting efficiencies of the different support measures. Policymakers are hence confronted with various trade-offs in decision-making during crises with many interactive elements and objectives at play: budgetary constraints, coverage, redistribution and responsiveness.

While our study does give important insights into the interplay of different benefit designs with diverse objectives, it self-evidently also suffers from a number of limitations. By necessity, we performed our analyses on nowcasted monthly data. Rather than analysing the situation as it actually occurred in 2020, we analyse our best approximation of how the situation might have been. The data used for this note are nowcasted using external aggregate data on the number (and transitions of) of temporary unemployed, new unemployed and affected self-employed. That means that the data are solely calibrated against changes in labour market status from those that were actually covered by one of these three schemes. Persons not covered may have equally been affected by job or income loss, but these sources of income volatility (nor the reaction of the welfare state to it) are not included in our analysis. In the near future, this problem may be partially overcome by analysing the actual situation in 2020, as EU-SILC data is currently being prepared for use with our monthly EUROMOD microsimulation model.

A more general limitation is that the EU-SILC data, whether they are nowcasted or not, are not designed to be fully representative at the monthly level (see also Neelen et al., forthcoming), for a discussion of some of the implications), nor do they fully capture within-year income volatility. In this paper, we infer likely earnings volatility from monthly changes in labour market status, for which we necessarily make a number of heroic assumptions (see Section 3.1). We therefore focus on the mitigating role of the simulated social policy response for the affected individual, rather than on the population statistics. As microsimulation models show the impact of the tax benefit system as it is supposed to work, rather than how it actually works, this is bound to give an overly positive image of the mitigating role of the tax benefit system.

Further research into these highly relevant questions will therefore benefit tremendously from the availability of within-year earnings and income data, especially from administrative sources that would provide a more accurate picture of experienced volatility. Such should allow to zoom in on target groups that may have been more vulnerable throughout a crisis, such as those in atypical employment and hence without or with only limited access to the broad COVID-19 social security protection measures. Future research should ideally also look into alternative survival strategies – bar the working of the tax-benefit system and government measures – that were relevant during the pandemic, such as the effect of household structures on experienced volatility, as well as less optimal coping strategies, such as the impact on de-saving or an increased reliance on private transfers. Thus, the usage of consumption and financial data would be a welcome avenue for future research. In addition, while our study measures estimated volatility levels during the pandemic, the impact of volatility on well-being in times of crises is an area of research that is still particularly scarce, compounded by the lack of available data. Future research, especially research situated in Europe, on how volatility interacts with other elements of economic instability, such as the predictability, direction and magnitude of shocks, would therefore be particularly salient.

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Appendix A. Disaggregated volatility tables for the full working age sample and for households

Table A.1. Volatility of working age individuals by poverty risk.

	All		Active*	
	Not at risk of poverty	At risk of poverty	Not at risk of poverty	At risk of poverty
A. Baseline				
Mean CV (%)				
Earnings	4.9	7.9	5.3	23.9
Disposable income	2.2	3.9	2.4	10.6
N	55552	6153	47217	1763
B. COVID-19				
Mean CV (%)				
Earnings	16.8	11.6	19.1	39.7
Disposable income	5.0	6.4	5.6	15.3
N	56159	5546	47301	1679

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. 'Baseline' refers to the fictional 2020 year without COVID-19. 'COVID-19' refers to the simulated nowcasted data for 2020. Poverty risk is determined by annual equivalised household disposable income falling below 60% of the median of the full sample. *Individuals who are either employed or self-employed in at least one month.

Table A.2. Volatility of households by poverty risk and by labour market status.

	All		Active*	
	Not at risk of poverty	At risk of poverty	Not at risk of poverty	At risk of poverty
A. Baseline				
Mean CV (%)				
Household earnings	4.3	10.1	4.5	26.9
Disposable income**	1.8	3.7	1.9	9.4
N	31911	4133	29421	1515
B. COVID-19				
Mean CV (%)				
Household earnings	15.5	14.3	16.5	42.7
Disposable income**	4.3	5.9	4.6	14.1
N	32276	3768	29555	1381

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. Results shown for households with a head of working age. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. 'Baseline' refers to the fictional 2020 year without COVID-19. 'COVID-19'

refers to the simulated nowcasted data for 2020. Poverty risk is determined by annual equivalised household disposable income falling below 60% of the median of the full sample.
*Households with a head who is either employed or self-employed in at least one month.
**Equivalised household disposable income using the OECD-modified equivalence scale.

Table A.3. Volatility of affected households by poverty risk and by labour market status.

	All		**Active***	
	Not at risk of poverty	**At risk of poverty**	**Not at risk of poverty**	**At risk of poverty**
A. Baseline				
Mean CV (%)				
Households earnings	4.9	14.9	5.0	28.4
Disposable income**	1.9	3.9	1.9	7.7
N	16989	2246	16317	1143
B. COVID-19				
Mean CV (%)				
Household earnings	25.6	25.3	26.5	49.3
Disposable income**	6.5	8.9	6.7	14.5
N	17278	1957	16402	1058

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. Results shown for households with a head of working age and with at least one member that received any COVID-19-related public transfer. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. ‘Baseline’ refers to the fictional 2020 year without COVID-19. ‘COVID-19’ refers to the simulated nowcasted data for 2020. Poverty risk is determined by annual equivalised household disposable income falling below 60% of the median of the full sample.
*Households with a head who is either employed or self-employed in at least one month.
**Equivalised household disposable income using the OECD-modified equivalence scale.

Table A.4. Volatility of working age individuals by income quintile.

	Income quintile*				
	0-20	**20-40**	**40-60**	**60-80**	**80-100**
A. Baseline (all)					
Mean CV (%)					
Earnings	8.3	7.7	6.5	3.0	2.9
Disposable income	3.6	3.5	2.6	1.3	1.7
N	9993	10672	12164	13598	15278
*B. Baseline (active**)*					
Mean CV (%)					
Earnings	20.9	10.3	6.7	3.2	2.9
Disposable income	8.7	4.5	2.8	1.4	1.7
N	3353	7527	10654	12808	14638
C. COVID-19 (all)					
Mean CV (%)					
Earnings	13.2	18.1	20.3	15.4	14.7
Disposable income	6.1	5.5	5.7	4.3	4.7
N	9835	10947	12397	13464	15062
*D. COVID-19 (active**)*					
Mean CV (%)					
Earnings	36.6	25.0	22.2	16.6	14.7
Disposable income	13.0	7.4	6.2	4.5	4.7
N	3595	7600	10919	12526	14340

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. ‘Baseline’ refers to the fictional 2020 year without COVID-19. ‘COVID-19’ refers to the simulated nowcasted data for 2020.

*Income quintile based on equivalised household disposable income (using OECD-modified equivalence scales) in the different respective scenarios.

**Individuals who are either employed or self-employed in at least one month.

Table A.5. Volatility of households by income quintile.

	Income quintile*				
	0-20	**20-40**	**40-60**	**60-80**	**80-100**
A. Baseline (all)					
Mean CV (%)					
Household earnings	9.3	6.5	5.7	2.3	2.6
Disposable income	2.9	2.4	2.2	1.3	1.7
N	6683	6596	7189	7578	7998
*B. Baseline (active**)*					
Mean CV (%)					
Household earnings	21.3	7.5	5.7	2.3	2.6
Disposable income	6.4	2.7	2.2	1.3	1.7
N	2805	5636	7009	7528	7958
C. COVID-19 (all)					
Mean CV (%)					
Household earnings	15.7	19.0	18.2	12.7	12.4
Disposable income	5.4	4.5	4.7	3.4	4.5
N	6548	6814	7458	7377	7847
*D. COVID-19 (active**)*					
Mean CV (%)					
Household earnings	37.4	22.1	18.2	12.9	12.3
Disposable income	10.9	5.2	4.7	3.5	4.5
N	2898	5706	7259	7287	7786

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. 'Baseline' refers to the fictional 2020 year without COVID-19. 'COVID-19' refers to the simulated nowcasted data for 2020. Results shown for households with a head of working age. Disposable income refers to equivalised household disposable income using the OECD-modified equivalence scale.

*Income quintile based on equivalised household disposable income in the different respective scenarios.

**Households with a head who is either employed or self-employed in at least one month.

Table A.6. Volatility of affected households by income quintile.

	Income quintile*				
	0-20	**20-40**	**40-60**	**60-80**	**80-100**
A. Baseline (all)					
Mean CV (%)					
Household earnings	14.0	7.4	6.9	2.0	2.6
Disposable income	3.3	2.6	2.4	1.2	1.6
N	3511	3732	3876	4127	3989
*B. Baseline (active**)*					
Mean CV (%)					
Household earnings	23.2	7.9	6.9	2.0	2.6
Disposable income	5.6	2.7	2.4	1.2	1.6
N	2033	3465	3856	4117	3989
C. COVID-19 (all)					
Mean CV (%)					
Household earnings	28.2	29.5	28.7	21.4	21.4
Disposable income	8.4	6.6	6.6	5.4	7.0
N	3508	4011	3990	3942	3784
*D. COVID-19 (active**)*					
Mean CV (%)					
Household earnings	46.3	31.9	29.0	21.6	21.1
Disposable income	12.1	7.0	6.6	5.5	6.9
N	2172	3638	3958	3919	3773

Notes – CV = coefficient of variation. Mean CVs are weighted by EU-SILC cross-sectional weights. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. ‘Baseline’ refers to the fictional 2020 year without COVID-19. ‘COVID-19’ refers to the simulated nowcasted data for 2020.
Results shown for households with a head of working age and with at least one member that received any COVID-19-related public transfer. Disposable income refers to equivalised household disposable income using the OECD-modified equivalence scale.
*Income quintile based on equivalised household disposable income in the different respective scenarios.
**Individuals who are either employed or self-employed in at least one month.

Appendix B. CV decomposition tables for households

Table B.1. Decomposition of the coefficient of variation of working age households.

Component *k*	**Mean CV without *k***	**% Change in Mean CV**	**Mean % change in SD**	**Mean % change in mean**
Federal COVID-19 transfers	11	-60	-27	6
Temporary unemployment benefit	10	-53	-24	4
Long-term temporary unemployment premium	6	-24	-3	1
Bridging right	4	2	1	0
Unemployment benefits	5	-8	-2	0
Social assistance premiums	4	1	1	0
Regional COVID-19 transfers	4	3	7	0
Flanders	4	2	5	0
Water and energy premium	4	2	5	0
Child benefits supplement	4	0	0	0
Wallonia	4	0	0	0
Water premium	4	0	0	0
Energy premium	4	0	0	0
Brussels	4	1	1	0
Rental premium	4	0	0	0
Child benefits supplement	4	1	1	0
Federal non-COVID-19 transfers	13	-66	-2	25
Other means-tested benefits	6	-25	-1	8
Other non-means-tested benefits	6	-28	-1	10
Pension, disability and health benefits	6	-21	-1	10
Taxes and social insurance contributions	6	-22	-21	-25
Taxes	5	-12	-11	-17
Witholding tax	5	-12	-11	-17
Social insurance contributions	5	-14	-13	-11

Notes – CV = coefficient of variation. SD = standard deviation. N = 36044. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. Weighted mean CV of disposable income = 4.49. Mean CVs are weighted by EU-SILC cross-sectional weights. Unemployment benefits under ‘Federal COVID-19 transfers’ are simulated according to our nowcasting model. Unsimulated unemployment benefits are considered under ‘Other non-means-tested benefits’.

Table B.2. Decomposition of the coefficient of variation of affected working age households.

Component *k*	**Mean CV without *k***	**% Change in Mean CV**	**Mean % change in SD**	**Mean % change in mean**
Federal COVID-19 transfers	20	-66	-51	11
Temporary unemployment benefit	16	-59	-45	8
Long-term temporary unemployment premium	9	-28	-6	2
Bridging right	7	2	3	0
Unemployment benefits	8	-10	-4	0
Social assistance premiums	7	1	2	0
Regional COVID-19 transfers	6	4	12	0
Flanders	7	3	10	0
Water and energy premium	7	2	9	0
Child benefits supplement	7	0	1	0
Wallonia	7	0	1	0
Water premium	7	0	0	0
Energy premium	7	0	1	0
Brussels	7	2	2	0
Rental premium	7	0	0	0
Child benefits supplement	7	1	1	0
Federal non-COVID-19 transfers	21	-68	-3	29
Other means-tested benefits	9	-28	-2	11
Other non-means-tested benefits	9	-22	-2	11
Pension, disability and health benefits	8	-17	-1	9
Taxes and social insurance contributions	9	-24	-37	-24
Taxes	8	-12	-19	-16
Witholding tax	8	-12	-19	-16
Social insurance contributions	8	-16	-22	-11

Notes – CV = coefficient of variation. SD = standard deviation. Results shown for working age individuals who received any COVID-19-related public transfer. N = 19235. N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting. Weighted mean CV of disposable income = 6.74. Mean CVs are weighted by EU-SILC cross-sectional weights. Unemployment benefits under ‘Federal COVID-19 transfers’ are simulated according to our nowcasting model. Unsimulated unemployment benefits are considered under ‘Other non-means-tested benefits’.

Table B.3. Conditional decomposition of the coefficient of variation of affected working age households

Component *k*	**Mean CV without *k****	**Mean CV***	**% Change in Mean CV**	**Mean % change in SD**	**Mean % change in mean**	**N****
Federal COVID-19 transfers	21	7	-67	-55	12	17,424
Temporary unemployment benefit	20	6	-68	-64	11	13,076
Bridging right	37	12	-66	-52	22	2,124
Long-term temporary unemployment premium	8	8	9	12	1	3,943
Unemployment benefits	18	10	-46	-45	3	1,752
Social assistance premiums	4	5	16	15	1	2,523
Regional COVID-19 transfers	6	6	9	22	0	10,546
Flanders	6	6	7	23	0	7,211
Water and energy premium	6	6	6	24	1	6,104
Child benefits supplement	6	6	8	11	0	1,395
Wallonia	5	5	4	14	0	1,091
Water premium	5	5	0	6	0	934
Energy premium	3	3	25	35	0	180
Brussels	7	8	24	29	1	2,244
Rental premium	12	12	5	17	1	783
Child benefits supplement	4	6	41	30	1	1,730
Federal non-COVID-19 transfers	27	6	-76	-5	41	14,407
Other means-tested benefits	10	6	-43	-3	18	12,313
Other non-means-tested benefits	10	6	-35	-3	19	11,996
Pension, disability and health benefits	15	7	-52	-4	50	3,462
Taxes and social insurance contributions	9	7	-24	-39	-25	18,261
Taxes	8	7	-13	-20	-17	18,261
Witholding tax	8	7	-13	-21	-18	17,441
Social insurance contributions	8	7	-16	-23	-12	18,006

Notes – CV = coefficient of variation. SD = standard deviation. Results shown for working age individuals who received any COVID-19-related public transfer. Unemployment benefits under 'Federal COVID-19 transfers' are simulated according to our nowcasting model. Unsimulated unemployment benefits are considered under 'Other non-means-tested benefits'.
*Mean CVs are weighted by EU-SILC cross-sectional weights and reflect average values conditional on receipt of component *k*.
** N values are EU-SILC observations inflated by a factor of 10 to correct for rounding errors in nowcasting.