

Labor market tightness in pandemic times: A diagnosis for the Belgian labor market

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Labor market tightness in pandemic times: a diagnosis for the Belgian labor market

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Abstract

I study the evolution of labor market tightness in Belgium during the first year of the COVID-19 crisis. As the descriptive evidence for this period shows that tightness levels decreased mainly due to the unemployment component, I study a broader measure of labor market under-utilization, the Aggregate Hours Gap. Such a measure allows me to examine whether the resulting level of under-utilization is the same as what the unemployment rate would predict on the evolution of tightness. This analysis is relevant insofar as the labor market was subject to far-reaching changes during the pandemic. Its main indicators diverged from their expected path and government measures were implemented to restrict the impact of the lockdown on the economy as a whole. In this respect, the Aggregate Hours Gap is well suited to analyze what drove labor market under-utilization during this period. It identifies changes along both the extensive and intensive margins of hours using individuals' desired hours as a measure of potential labor supply and actual hours as a result of both labor supply and demand. I use the Labor Force Survey data provided by Statbel to compute the Aggregate Hours Gap for Belgium in 2017-2020. My findings report that, along with a decrease in the extensive margin of labor supply, the Aggregate Hours Gap increased for the most part due to the intensive margin of labor demand. More precisely, the peak of this measure, in the second quarter of 2020, is due to a decline of the labor force participation rate (the extensive margin) but the main driver is the drop of actual work hours of employed individuals (the intensive margin). Resort to short-time work schemes contributed to this drop.

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1 Introduction

1.1 Motivation and research question

The aim of this Master's thesis is to understand whether measures alternative to the unemployment rate deliver the same predictions regarding the evolution of labor market tightness in Belgium during the COVID-19 pandemic. Tightness of a labor market is defined as the ratio of the number of vacant jobs to the number of unemployed persons (Carcillo, Cahuc, & Zylberberg, 2014). The Beveridge curve represents this measure in a visual manner as it describes the relationship between the number of vacant jobs and the number of jobseekers. This downward sloping curve indicates a negative relationship between the two and gives information on the efficiency of the matching of workers to jobs. Indeed, the closer to the origin of the axes the Beveridge curve is, i.e. vacant jobs are quickly filled by an unemployed person, the more efficient the matching process is (Carcillo et al., 2014). Workers are constantly losing their job and being reassigned to jobs and since frictions arise from this matching process, it is not possible to reduce unemployment to zero (Michaillat & Saez, 2022). Efficiency on the labor market instead requires that the non-productive use of labor, i.e time spent searching for jobs or employees, be reduced to a minimum.

The labor market during the coronavirus crisis requires special attention in that, due to the lockdown measures imposed by the Belgian government, alongside many other European countries, a portion of workers were forced to diminish their working time or stop working altogether. Bodart and Van der Linden (2022) analyze the impact of the coronavirus crisis on recruitment issues in Belgium. They give evidence of vacancy rate and unemployment rate, as well as the impact the crisis had on activities from different sectors in Belgium. They find that, after a slight decline between 2018 and the end of 2020, the vacancy rate rose by 47% in the second trimester of 2021 compared to the same trimester of 2019. As for the unemployment rate, it very much fluctuated between 2018 and 2021, reducing between 2018 and 2019 and undergoing an increase as of the second trimester of 2020.

¹ Graphically, the Beveridge curve moved to the right in 2020, revealing an increase in unemployment, and overall experienced an outward shift over the course of the first half of 2021 compared to 2018-2019 levels. The employment rate decreased in 2020 but to a lesser extent due to government-enhanced support measures such as short-time work schemes. The authors also show the pandemic hit industries in a heterogeneous manner, with insurance and financial activities, and services being the ones which suffered the most.

As such, the objective is to grasp what led to such movements in key labor market indicators with a particular attention to measures related to tightness. I will restrict my attention to changes that occurred in year 2020 compared to pre-pandemic times. Since in that year, the Beveridge curve shifted to the right, displaying a higher unemployment rate but less variation along the vacancy rate, I will study how the labor market became less tight in 2020 focusing on the unemployment dimension of tightness. In particular, I will study whether a broader measure of labor market under-utilization

¹The overall picture shows no difference between unemployment in 2018 and 2021.

(or slack) than the unemployment rate yields the same predictions. This measure is the Aggregate Hours Gap (AHG), detailed in the next subsection. I will draw my inspirations from the recent paper of Faberman, Mueller, and Şahin (2022) in which they analyze the US labor market during the pandemic using this AHG. The aim is to conduct a similar analysis for Belgium. Such a study has, to my knowledge, never been conducted for the Belgian labor market during the pandemic. While many papers have focused on a descriptive analysis of the labor market (the employment, unemployment, labor force participation rates) or on the extent to which government measures affected the different labor force states, an analysis involving a broader measure of under-utilization than the unemployment rate is missing. What is more, the AHG makes it possible to precisely identify what drove the evolution of under-utilization. Unlike traditional measures, it does not concentrate only on the number of unemployed individuals in the active population.

To carry this out, I use a database provided by Statbel. It gives information relative to various demographics along with precise work-related and job search characteristics that will be essential in the AHG calculation, namely individual's desired and actual hours as well as their labor force status. I construct this AHG to show that labor market under-utilization increased in 2020 compared to pre-pandemic times and that this increase is mainly driven by a decrease in actual work hours as well as, to a lesser extent, by an increase of the share of individuals out of the labor force.

1.2 Literature review

In this literature review, I emphasize the role of the intensive margin of labor supply -that is, the number of hours of work that are supplied on the labor market- in the study of labor market under-utilization. I then explain the role of the AHG in capturing such margin. To measure labor market slack, focus has primarily been on the unemployment rate (Faberman, Mueller, Şahin, & Topa, 2020). By concentrating on the total number of people who are jobless and searching for a job, this measure considers only the extensive margin of labor supply and misses individuals who do not meet the requirements to be considered as unemployed but might still contribute to labor market under-utilization. By giving an equal weight to each individual meeting the definition of unemployment, it ignores the changes along the intensive margin (Faberman et al., 2020). It also misses out on the issue of underemployment: the fact employed individuals may wish to work more than they currently do. Yet, this issue is gaining importance in the literature. Bulligan, Guglielminetti, and Viviano (2019) acknowledge that traditional measures of slack, expressed in heads, fail to capture other forms of under-utilization. In particular, they study whether employers prefer to adjust the labor input along the extensive or intensive margin of hours, as slack can also take the form of insufficient number of hours demanded by firms. Bell and Blanchflower (2018) consider the issue of underemployment: the willingness of employees to increase their working time without increasing their real wage rate. This concept goes against the classical assumption that workers select from a continuum of hours regardless of firms' role in determining the number of hours to offer. This implies underemployed workers do not lie on their labor supply curve as they do not work the exact number of hours they

would like to. Gee Hee Hong and Nabar (2023) also show that considering additional indicators such as involuntary part-time employment yields a more complete picture of labor market slack. Tuda (2020) studies labor supply² through the discrepancy between actual and desired hours of work.

To capture best all components of labor market under-utilization, Faberman et al. (2020) propose an aggregate measure to grasp changes along both the extensive and intensive margin. They argue this measure captures the potential slack in the labor market more broadly than the unemployment rate. Their AHG focuses on the difference between potential labor supply and hours worked. The former comes from self-reported desired work hours. Faberman et al. (2022) show that the number of hours individuals are willing to spend working (reported desired hours) reflects their potential labor supply, which is at the heart of the notion of under-utilization. Unlike traditional measures, what they propose includes, among others, individuals who do not meet the official definition of unemployment but might still be attached to the labor force, or those underemployed. Moreover, rather than capturing only changes along the extensive margin, using data on desired work hours as a measure of potential labor supply makes it possible to capture the intensive margin. Indeed, measures like the unemployment rate present the number of people searching for a job over those who either have a job or are looking for one, thereby assigning them a weight of one in the determination of their contribution to labor market under-utilization. The AHG, on the other hand, considers this variation along the intensive margin of hours (Faberman et al., 2022). This also supports an analysis of the heterogeneity indubitably present among job seekers, unemployed *or not*, in their potential labor supply (Faberman et al., 2020).

Faberman et al. (2022) use their AHG estimates to examine the effect the COVID-19 crisis had on the willingness to work in the United States. Overall, their results give evidence of a decline in desired work hours during the pandemic, that is driven by part-time workers and individuals out of the labor force who wished to work less. To see whether this is the factor that most contributed to changes in the AHG, they perform a counterfactual exercise. They estimate the AHG for the pandemic holding desired hours constant and find that the observed decline in desired hours gave rise to a reduction in the AHG compared to its baseline value.

The rest of this master's thesis is structured as follows. Section 2 describes the evolution of the business cycle in Belgium before and during the pandemic along with the current literature's contributions to this matter. It then presents potential explanatory factors for the Beveridge curve evolution in 2020 and the reasons for focusing on the AHG in particular for the study of changes that occurred during Covid. Section 3 exposes the data and methodology. In section 4, I analyze the behavior of the AHG in Belgium. Section 5 quantifies the role that actual played in AHG changes, compares the Belgian case with the US case and presents a sensitivity analysis. Section 6 concludes.

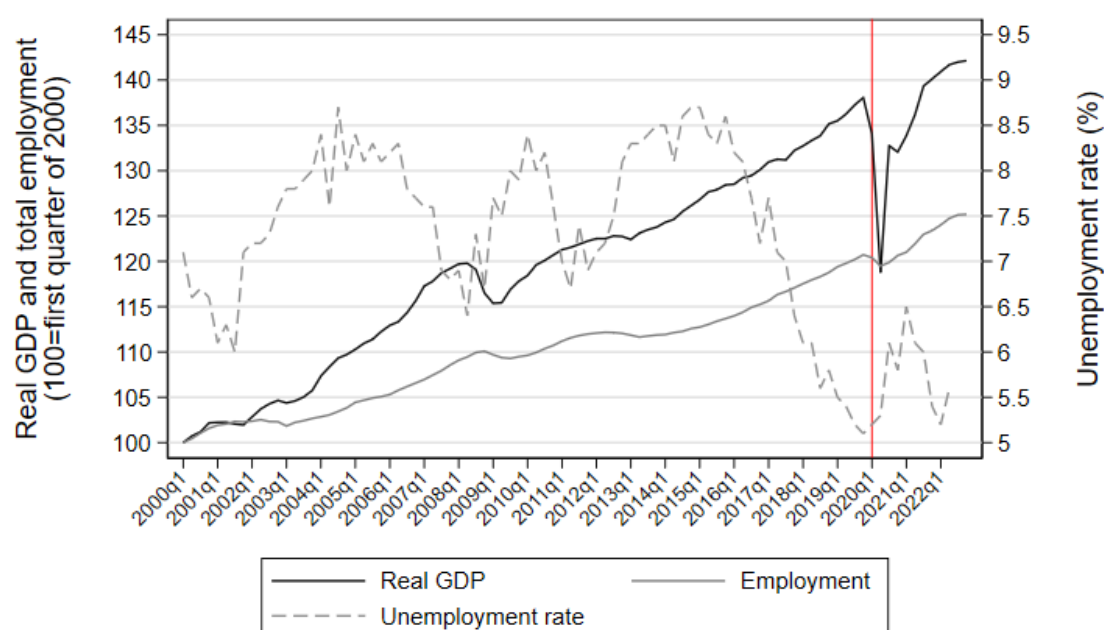
²While actual hours are constrained by labor demand, Tuda (2020) shows the underemployment gap rises due to increased desired hours which she considers as "true labor supply".

2 Descriptive analysis

2.1 Evidence on the business cycle

The aim of this subsection is to contribute to the body of descriptive evidence on the evolution of the business cycle during the COVID-19 crisis. The indicators studied are the gross national product (GDP), employment and unemployment indicators as well as the vacancy rate.

Figure 1: Real GDP, employment, and unemployment



Notes: The unemployment rate comes from Eurostat statistics. Online at <https://ec.europa.eu/eurostat/en/>. The GDP and employment come from NBB statistics. Online at <https://stat.nbb.be/#>. Calculations done by the author.

Figure 1 plots the evolution of the real GDP, the employment rate and the unemployment rate over the period 2000-2022. As far as the GDP is concerned, the lockdown measures imposed by the Belgian government in the second quarter of 2020 hit the economic activity hard. In this sense, the crisis was brought by an exogenous shock³ rather than by an endogenous shortcoming in the economy (Coppens, Minne, Piton, & Warisse, 2021). Belgium's economic integration in international trade had already impacted GDP growth before the first lockdown measures were introduced. As Coppens et al. (2021) point out, the GDP had already declined by 2.9% in the first quarter of 2020 since part of the economy had effectively been brought to a standstill. The sharp decrease it experienced is distinctly noticeable on Figure 1. In the second quarter of 2020, the Belgian GDP reached a minimum: it stood only 19 percentage points above its 2000 value. From that period on, it increased to attain pre-pandemic levels in the third quarter of 2021 (139 percentage points compared to 138 at the end of 2019), and underwent a slow but steady increase up to the most recent period. Looking

³The coronavirus crisis is an exogenous shock in that it came from outside of the economic system, as opposed to an endogenous shock that arises from within the economic system.

at the 2000-2022 span, this downward peak shows the economic activity, as measured by the GDP, recovered quickly, compared to other crises: the financial crisis of 2008 was characterized by a much smaller drop, yet it took the same amount of time for the economy to reach its pre-crisis level. The COVID-19 crisis, on the other hand, is particular in that, less than a year after the beginning of the decline, GDP increased to reach its pre-crisis level in 2021. According to the Conseil supérieur de l'emploi (CSE, 2021), unlike crises caused by endogenous shocks, the removal of the blocking of the economy through relaxations of restrictions enabled firms and workers to resume their activities. Economic agents managed to organize their working life to make do with the subsequent sanitary restrictions. The recovery is also due, according to Coppens et al. (2021), to the public support measures undertaken to protect firms' revenue and households' income.

This global picture calls for an analysis of the sectoral breakdown as the sanitary restrictions were applied differently according to the industry. In the Appendix, Figure 8 provides the variation of GDP in key sectors over the 2020-2022 period compared to the second quarter of 2019 and Figure 9, the value added by sector since 2016. In the second quarter of 2020, activity in every sector decreased compared to the same quarter in 2019. Agriculture and services are the sectors that suffered the most, with agriculture still being over 5% below its pre-Covid level. Industry, on the other hand, saw its activities growing as of 2021. In 2022, it is more than 5% above its pre-Covid level. As for construction, despite being the sector to be hit the most in 2020, with a loss of more than 20%, it managed to sustain a slight growth as of 2021.

The employment rate experienced a drop in 2020 but of a smaller magnitude than that of GDP and recovered soon after. It attained its lowest level -a decline of 1 percentage point- in the second quarter of 2020 and reached its pre-crisis level by the beginning of 2021. The resort to short-time work schemes to limit job destruction is not to be disregarded. These programs provide income support to workers whose hours are reduced in firms experiencing a temporary downfall of their business activities. Their purpose is to avoid the layoffs of workers whose job would otherwise be viable in the long-run (Hijzen & Venn, 2011). In April 2020, almost 40% of employees in the private sector received temporary unemployment benefits, five times as much as during the Great Recession (Coppens et al., 2021). Half of self-employed workers also had recourse to the bridging right (Coppens et al., 2021)⁴. The analysis of employment in different sectors shows a different image from that of GDP according to sector. Figures 10 and 11 in the Appendix present this evidence. Agriculture, despite being hit the most in terms of economic activity, saw its employment rate increase by more than 1% compared to 2019, each year between 2020 and 2022. The variation in employment in the construction sector is the highest compared to its pre-Covid level, standing 5% above in 2022. Services were hit in 2020 but gained ground as of 2021. Industry, on the other hand, experienced a decline in variation of employment compared to 2019. In 2022, it is only 1% above its pre-Covid level.

⁴These support measures thus hide an underlying characteristic of the coronavirus crisis: the fact that total hours of work fell during the core of the lockdown measures in the second quarter of 2020 (Eyméoud, Petrosky-Nadeau, Santaaulàlia-Llopis, & Wasmer, 2021)

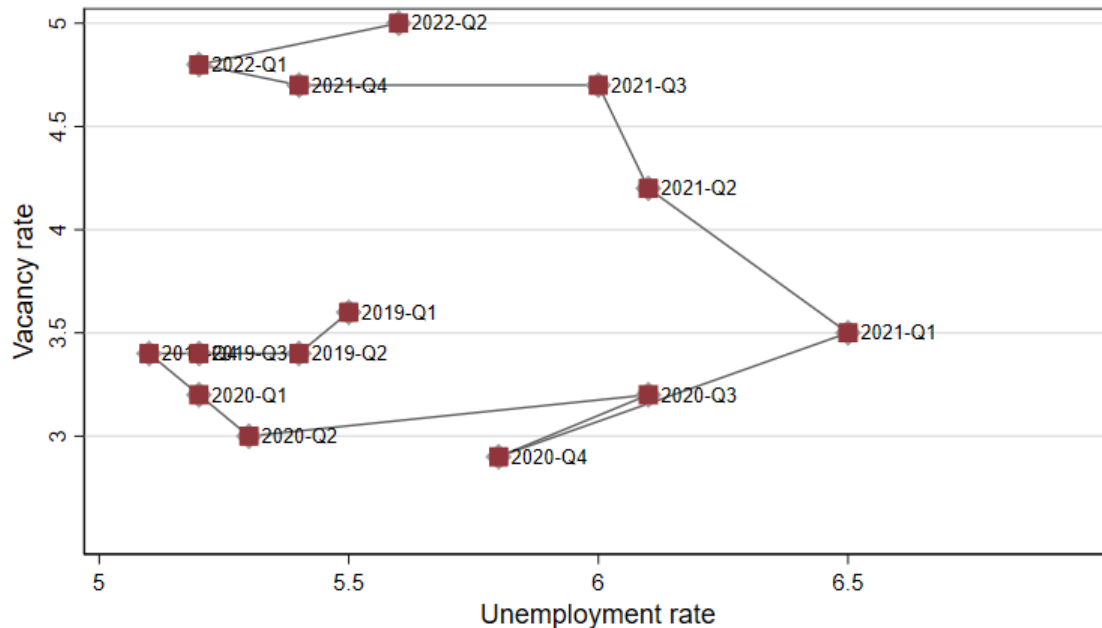
As for the unemployment rate, it was on a descending path for three years and had reached its lowest level over the entire period studied in the last quarter of 2019. At the beginning of 2020, it rose to reach a local maximum in the first quarter of 2021. Note that, although the unemployment rate increased in 2020, even at its peak, it stood lower than during the Great Recession (CSE, 2021). After this peak, it gradually decreased while still not attaining its pre-pandemic level. According to ONEM data analyzed by the CSE (2021), the increase in the unemployment rate was due to a lower outflow rate rather than an increase in the entry rate into unemployment. That is, the unemployed individuals left unemployment at a slower pace and the rate at which individuals entered unemployment did not increase.

Figure 12 plots the unemployment rate in Belgium along with the net percentage of manufacturing firms reporting a shortage of skilled workers. This indicator comes from the National Bank of Belgium website and can be used as a measure of tightness levels like Van der Linden, Bodart, and Dejemeppe (2018) do. The patterns of both indicators on the graph are evidently inversely related to one another. The shortage of skilled workers indicator experienced a decline during 2020. At that time, the unemployment rate was rising. The same can be said when plotting the vacancy rate during the COVID-19 crisis although the decline is smoother. Economic downturns, such as the one experienced during the pandemic, can increase matching inefficiency on the labor market, thereby lowering the quality of the matching process connecting unemployed workers and unfilled vacancies (Brunello & Wruuck, 2021). This may increase the level of slackness of the labor market as such a worsening of the matching process shifts the Beveridge curve outward. Shortage of skilled workers quickly rose from 2021 on to reach a level never attained over the last decades. When using the vacancy rate, the same increase in 2021 is observed. Duval et al. (2022) suggest unfilled vacancies result from mismatches, with specific demographic groups being hit more than others in terms of barrier to returning to work or shifts in worker preferences.

The same intuition goes for the Beveridge curve in Figure 2. It experienced a clear outward shift between the 2019-2020 and 2021-2022 periods. During 2020, unemployment rose up to 6.1% compared to 5.1% in the last quarter of 2019, resulting in a move of the curve towards the right. Overall, the vacancy rate fluctuated less even if it declined in the second quarter of 2020. Job offers dried up when lockdown measures came into effect: firms stopped their recruitment procedures (CSE, 2021). From 2021 on, the labor market became tighter: the vacancy rate increased as the unemployment rate decreased.

2.2 Potential explanatory factors

To understand what led to changes in the main labor market indicators described above, a variety of explanatory factors can be considered. During the core of the pandemic, government-enhanced support measures such as temporary unemployment and bridging rights were resorted to on a large scale, surely impacting the evolution of the employment and unemployment rate during this period. Workers benefiting from such measures were still regarded as employed and thus, not assigned to the

Figure 2: Beveridge curve

Notes: The unemployment and vacancy rate come from Eurostat statistics. Online at <https://ec.europa.eu/eurostat/en/>.

unemployed category. In this sense, this may have prevented to some extent the Beveridge curve from sliding to the right.

The very nature of the coronavirus crisis disrupted the labor market in a specific way. As the economy was forced to a standstill, individuals looking for work saw their opportunities shrink, recruitment procedures were on standby. For part of the short-term unemployed in 2020, long-term unemployment as of 2021 was difficult to avoid leading in this manner to a subsequent decrease in job finding probability⁵. Contrary to the previous paragraph, such a decrease in the exit rate out of unemployment would result in a shift of the Beveridge curve to the right.

The apparent tightness that appeared over the course of 2021 can also be studied through multiple mechanisms. Brunello and Wruuck (2021) state that skill mismatches occur when the supply and demand for a specific skill do not meet optimally. At the micro level, it is when workers have distinct set of skills from what is required for the job (Brunello & Wruuck, 2021). In this respect, Coppens et al. (2021) mention, among others, the fact the labor demand for jobs requiring Information and Communication Technology specialists rose since the beginning of the COVID-19 crisis. In a multilingual country such as Belgium, geographical and linguistic mismatches are bound to take place to some extent as well. These mismatches damage the efficiency of the matching process and might make the Beveridge curve move outward. Finally, the perspective of lower re-employment wages and stable career prospects should also be taken into account (Cockx, Declercq, Dejemepe, Inga, & Van der Linden, 2020).

⁵The average probability of finding a job declines with the incidence of long-term unemployment (Carcillo et al., 2014)

To appreciate the behavior of labor market indicators during Covid, I focus my analysis on the evolution of the AHG (Faberman et al., 2022), presented below. While the elements described hereinabove are relevant, the AHG, as a measure of labor market under-utilization, seizes in a precise manner how the labor market reacts when sudden changes are imposed with respect to the number of hours worked and desired and when parts of the population move to a distinct labor force state. Combining desired hours with actual hours worked provides this intuitive measure of labor market under-utilization.

In the present case, I have evidenced the fact that the pandemic disrupted the labor market through restrictions and lockdowns and that government measures were applied to cope with this. A portion of employed individuals saw their working time drastically reduced while still keeping their jobs and the unemployment rate rose. Through the way it is constructed, the AHG allows to disentangle the impact of each of these specific mechanisms on its evolution. As it incorporates a wide-ranging concept of labor market under-utilization, this method is relevant to deal with the coronavirus-specific circumstances the labor market faced (Faberman et al., 2022).

3 Data and methodology

3.1 Data

3.1.1 The Labor Force Survey

The Labor Force Survey (LFS) database was provided by Statbel. It is representative of the Belgian population and provides sample weights. Individuals are pooled across surveys and information relative to their demographics (age, gender, education, region, type of household, etc.) as well as specific labor market characteristics such as labor force status, occupation within main/second job, industry and various questions relative to characteristics of the job and job search can be found. The last categories are crucial to the definition of the AHG as they include desired and actual work hours. In terms of labor force status, the three exclusive categories are defined as follows until 2020⁶.

A person is employed if they are aged 15 or more and in one of the following categories:

- worked during the reference week for at least 1 hour for pay or profit, including contributing family workers;
- has a job or a business and is temporarily not at work during the reference week.

A person is unemployed if they are between 15 and 74 and

- not employed during the reference week according to the definition above;
- currently available for work, i.e. available for paid employment or self-employment before the end of the 2 weeks following the reference week;

⁶In 2021, the LFS changed these definitions to account for the fact people on furlough, leave, or other, for more than 3 months do not form part of the employed population. Conditions to meet the definition of unemployment also change. I briefly discuss this below in the reasons for studying period 2017-2020

- actively seeking work, i.e. had either carried out activities in the four-week period ending with the reference week to seek paid employment or self-employment or found a job to start within a period of at most 3 months from the end of the reference week.

A person is out of the labor force, or inactive if they are neither employed nor unemployed.

Because the LFS provides a rich set of variables, it allows us to have information on individual preferences through desired hours of work, to identify potential patterns among individuals with similar characteristics and conversely, to spot observations that may stand out. A drawback of using survey data arises when respondents do not answer specific questions. The issue that this behavior represents a form of selectivity therefore emerges. I discuss this in more details below.

3.1.2 Variable selection and measurement

I focus on individuals aged 15 to 64. If the original intention was to find a value of AHG for each quarter of period 2008-2021, attention had to be restricted to 2017-2020. This still provides a baseline pre-pandemic period (2017-2019) in the comparisons. Moreover, year 2020 is especially interesting in that the most severe lockdown measures imposed by the Belgium federal government took place from the end of the first quarter until the course of the second quarter of 2020 (18th March - 4th May for strict lockdown). This choice is due to two main reasons. First, in 2017, the survey experienced an in-depth modification of the way it is conducted, rendering comparisons between pre- and post-2017 periods unreliable (Termote & Depickere, 2018). In 2017, a panel is used: respondents are not interviewed just once, they stay for a longer period within the sample. On top of that, the panel is rotary, that is, a part of the sample needs to be replaced in each interrogation wave. Data are also collected in a different manner, combining different modes of interrogation while before 2017, the main method was Computer Assisted Personal Interview (CAPI). The wave approach, whereby variables considered as structural (i.e. not likely to change in the coming waves, such as gender or reasons for wanting certain job features) are asked during the first wave in order to reduce response burden and costs. Finally, the calibration method used in the computation of respondents' sample weights also changed. Seeing as the reform generated far-reaching changes, the break in the chronological series for all indicators makes Statbel, in a report on this reform, advice against carrying out any direct comparisons between the two periods (Termote & Depickere, 2018). Second, as set forth in the previous section, the strength of the AHG as defined by Faberman et al. (2020) is its account of distinct labor force states. Through this measure, one gets a view of the potential labor supply *across all of these states*. Yet, in 2021, the dataset also underwent an adjustment and presents values for the number of hours one wishes to work -crucial to AHG calculation- only for the employed, rendering the computation of the AHG very limited compared to the complete information available before that period. Besides, the definitions of employment and unemployment also changed in 2021 (Statbel, 2022). Are not considered employed anymore the individuals on temporary unemployment or on parental leave for more than three months, or seasonal workers in the off-season who do not regularly carry out tasks for their job and individuals are not considered as unemployed if they do not perform an active job search.

For all of the above, I compute the AHG in each quarter of period 2017-2020. The key variables are desired work hours and actual hours per week for all labor force states, namely, employed, unemployed and inactive. For the employed, desired hours are given by variable *HWWISH* which had many missing values before 2020 due to the fact this question was only asked to those who declared wanting to work more, rather than -as Eurostat requested- to those who have a job. Eurostat's recommendation is to impute missing values of *HWWISH* with hours usually worked. However, usual hours concern the main job and potentially a second job. Since usual hours in the second job are missing in one of the follow-up waves, I used Eurostat's technique for those who reported having no second job only. For those having a second job, I set their difference between desired and actual hours to 0. This yields 6.4% missing values. For the unemployed and inactive, I used another variable, designed to those who do not have a job, asking the number of hours per week they wish to work. They report a higher share of missing values (66.2% and 96.6% respectively). In numbers, I have data on desired hours for 5 232 of the unemployed and 4 246 of the inactive whereas I have 231 819 values for the employed. To deal with this issue, I check if specific patterns can be identified among unemployed and inactive respondents who did not answer this question. To do so, I compare the share of demographics available in the dataset (gender, age, and education) among the individuals for whom desired hours are missing with the share of those demographics in the population.⁷ For both labor force statuses, the shares of each demographic group among the missing values correspond to a considerable extent to the shares of these group within unemployed and inactive, respectively. This allows to rule out the hypothesis that a specific demographic group refrained from answering the question on desired hours. Finally, missing values of desired hours for both labor force states are equally distributed among years so that no year stands out for having a particularly high number of missing values compared to the others.

Actual hours only concern the employed individuals and include hours worked in the main job and possibly in a second one. Missing values concern 7.8% of the reference population. I use actual hours rather than usual hours following the reasoning developed in Faberman et al. (2022)'s paper. The authors argue that actual hours capture many transitory changes specific to the pandemic that are not seized by usual hours. If, in other periods, usual hours smooth out idiosyncratic shocks due to the worker or the firm, such as labor stoppages and vacation, they are nevertheless unable to address misclassifications closely related to the Covid crisis and the lockdown measures it brought about. Indeed, actual hours differ from usual hours if, for instance, due to specific government restrictions, a worker is prevented from working and put on temporary unemployment for a period of time. Their actual hours will reflect this variation, whereas usual hours would not. Consequently, thanks to the use of actual hours, this individual will contribute to the AHG the same way an unemployed or inactive would: their desired hours gap will be equal to their desired hours. This is particularly important in a context such as the COVID-19 crisis in which many employed people were on short-time work schemes. Thanks to the structure of the AHG, the fact these employed individuals do not actually work in a given period will affect the degree of labor market under-utilization.

⁷Tables 2 and 3 in the Appendix compare the shares of demographics among missing values and these shares in the population.

Also following their method, I impose a constraint of non-negative hours gap, that is, whenever an individual wishes to work less than they actually do, their gap is set to zero. Leaving it negative would imply these individuals contribute to an increase of labor market tightness, because suggesting a smaller level of potential labor supply. Yet, in their 2020 papers, the authors find that those individuals are prone to significant search effort, thereby indicating a desire to work and thus no sign to support a reduction in labor market slack. In the Statbel dataset, this concerns 12.3% of the employed who responded. I relax this constraint in the sensitivity analysis of section 5.3.

Finally, the data include information that can matter for the interpretation of the behavior of the AHG during the pandemic. If short-time work schemes are not explicitly stated in the questions, a possible answer to “reasons for working less (or not working at all) in main job” is “for technical/economic motive”.⁸

3.2 Deriving the Aggregate Hours Gap

With the variables described above, I construct a quarterly measure of the AHG following Faberman et al. (2022)’s methodology. Let ω_{jt} be the share of the population in labor force state j in quarter t so that the sum of these shares in each quarter adds up to one, $\sum_j \omega_{jt} = 1$. Note j takes values "employed", "unemployed", or "inactive" (or e, u, i). The AHG measure is expressed as

$$AHG_t = \frac{\sum_j \omega_{jt} DHG_{jt}}{\sum_j \omega_{jt} PH_{jt}} \quad (1)$$

where DHG_{jt} is the average Desired Hours Gap for labor force state j in quarter t and PH_{jt} is Potential Hours within labor force state j in quarter t . The first is defined as

$$DHG_{jt} = L_{jt} - h_{jt} = \sum_{i \in j} \frac{\omega_{ijt}}{\omega_{jt}} (L_{ijt} - h_{ijt}), \quad (2)$$

and potential hours is

$$PH_{jt} = L_{jt} = \sum_{i \in j} \frac{\omega_{ijt}}{\omega_{jt}} L_{ijt} \quad (3)$$

where ω_{ijt} is the respondent i 's sample mean, L_{ijt} is their number of desired hours (after adjustments for zero minimum hours gap and missing values detailed above) and h_{ijt} is their number of actual hours. The numerator of the AHG will vary with time due to the demographic, actual hours, desired hours, and changes in the population share of each labor force state j . The denominator will vary with time due to the demographic, desired hours, and changes in the population share of each labor force state j .

Note for individuals in unemployment and out of the labor force, their desired hours gap is exactly their potential hours. Consequently, if not a single individual in the working-age population was employed, the AHG would be equal to 1. In fact, it always lies between 0 and 1. Put in a

⁸A specific category for short-time work schemes was added to the LFS in 2021 only.

different way, unemployed and inactive individuals who wish to work add to labor market under-utilization based on the amount of hours they wish to supply; for those who are employed, if they prefer to work more hours than they currently do, they contribute to under-utilization based on the difference between their desired and actual hours (Faberman et al., 2020).

To derive such AHG measure, Faberman et al. (2022) use variables from two data sources, parts of which are directly comparable. Desired hours come from a question asked only to individuals who reported looking for work. Consequently, if an employed person had no value for desired hours, usual hours worked were allocated in order to create a zero hours gap in accordance with their previous response, namely to reflect their nonexistent desire to change their current work situation. For the other individuals whose answer was missing, they impute zero desired hours to also create a zero hours gap. A constraint of minimum zero hours gap is imposed on the ground that individuals who wish to work less than they actually do (actual hours larger than desired hours) exert significant search efforts, thereby making it inappropriate to include them among individuals who contribute to an increase of tightness.

3.3 A counterfactual exercise

To quantify the effect of a component of the AHG on its evolution, Faberman et al. (2022) propose to conduct what they call a counterfactual exercise. Namely, when the AHG follows a different pattern than expected, as is the case during the Covid crisis, it must be that at least one of its components underwent a change as well. To grasp the extent of the contribution of this specific component, the counterfactual exercise holds this component constant at its pre-Covid level and compares the AHG obtained through this exercise with the baseline AHG. Both AHG's are identical in the pre-Covid period and are expected to diverge after on. The magnitude of this discrepancy between the two is what this exercise proposes to estimate.

For instance, to assess whether desired or actual hours had a significant impact, I can fix their value in 2020 to their mean pre-Covid value and see how this would change the behavior of the AHG. I choose to conduct this exercise for actual hours only. This is because desired hours are shown to have stayed rather constant throughout 2017-2020. The counterfactual exercise would then lose its meaning. To have some explanatory power, it must be conducted using a component of the AHG that significantly changed during 2020. I will show that actual hours meet this criterion. Thus, in section 5.1, I present the results of such counterfactual analysis to quantify the effect of actual hours of the employed. I compute the counterfactual employed's AHG by holding actual hours fixed at their average 2017-2019 level.

To make this counterfactual AHG as precise as possible, I compute the average value of actual hours in 2017-2019 according to various demographic characteristics. I construct 264 cells that consider sex, age, education, type of contract (full-time or part-time), and province. I assign, for all quarters of 2020, to each individual belonging to cell k who reported a value for actual hours, the average actual hours in cell k in period 2017-2019. Consequently, values of each respondent's actual

hours before 2020 are left unchanged but as of 2020, respondents' value of actual hours is replaced by their cell-specific mean actual hours value in 2017-2019. Every other element that makes the AHG in 2020 is left untouched, thereby still allowing it to considerably vary. This makes the value before 2020 perfectly comparable with the baseline AHG (for which nothing is kept fixed) and enables to see how baseline and counterfactual differ during the whole of 2020. The use of cells guarantees a certain degree of plausibility of the counterfactual measure since each person is assigned an average actual hours value according to some characteristics specific to them. It makes it realistic to believe: "at the aggregate level, in the absence of the effect the crisis had on actual hours, this is what the AHG would look like". The counterfactual AHG therefore only captures the effect the pandemic had on all components except actual hours, namely, desired hours, the sample weights and shares of each labor force state.

4 Evidence on the AHG in Belgium

4.1 The behavior of desired and actual hours

For the analysis of the intensive margin, the evolution of desired and actual hours during the COVID-19 crisis is relevant since they influence the behavior of the AHG and indicate the extent to which individuals would want to work more than they were actually working during that period. Intuitively, compared to pre-pandemic times, desired hours could decrease due to potential Covid exposure at work as Faberman et al. (2022) find for the US. They could also increase due to precautionary labor supply: workers may want to increase their working time to insure themselves against bad realizations (Jessen, Rostam-Afschar, & Schmitz, 2018); or due to an income effect: desired hours may increase due to a desire to increase earnings (Tuda, 2020). During the pandemic, actual hours are likely to have decreased due to the lockdown measures imposed by the federal government. In this section, I present the behavior desired and actual hours undertook in the 2017-2020 period and in particular, the changes that occurred at the onset of the pandemic. In the tables, the last quarter of each year is chosen in the comparison between 2017-2019 and 2020 to include the most recent non-Covid period (the last quarter of 2019).

Table 4 in the Appendix describes the behavior of desired hours per week. It shows that before the pandemic, full-time workers and men are the categories to desire the most work hours. The largest difference observed between categories concerns types of contract and sex. Individuals on a full-time contract wish on average almost 14 hours more than part-time workers and men almost 7 hours more than women. The other differences are less pronounced, settling around a two-hour difference. On average, employed individuals prefer more hours than unemployed and unemployed more hours than inactive. Individuals whose highest degree is in higher education wish to work more than those with no degree in higher education and younger people prefer working more than older people. In 2020, desired hours are slightly above their 2017-2019 average. Overall, they increased by 0.18 hours, or less than 11 minutes, which is insignificant over a week. Only part-time workers and women want

Table 1: Actual hours by contract type and demographics.

Last quarter of...	2017-2019	2020	Difference '20 - '17-19
A. All employed			
All employed individuals	32.46 (0.07)	29.93 (0.14)	-2.53 (0.16)
B. By type of contract			
Full-time	36.22 (0.08)	33.14 (0.17)	-3.08 (0.18)
Part-time	21.72 (0.11)	20.58 (0.22)	-1.13 (0.25)
C. By gender, sex and education			
Women	28.85 (0.10)	26.80 (0.20)	-2.05 (0.22)
Men	35.82 (0.10)	32.88 (0.20)	-2.94 (0.23)
Prime age (25-54)	33.34 (0.08)	30.81 (0.16)	-2.52 (0.18)
Older (55-64)	30.23 (0.19)	27.68 (0.34)	-2.56 (0.39)
No degree in higher education	31.44 (0.10)	28.44 (0.20)	-2.99 (0.23)
Highest degree in higher education	33.63 (0.11)	31.47 (0.20)	-2.16 (0.23)

Notes: This table reports mean seasonalized actual work hours retrieved from Statbel LFS for each demographic group. They include hours in first and main job. The last column presents the difference between the mean of the last quarters for 2017-2019 and the last quarter of 2020 for each category. Standard errors are in parentheses.

to work on average 50 minutes and 25 minutes more, respectively. For every other category, their desired hours stayed close to their pre-Covid value ranging from a couple of minutes to 22 minutes of variation.

Table 1 displays the mean estimates of actual hours in the last quarter for periods 2017-2019 and 2020 by type of contract and demographics. For this variable, significant changes are observed. The table shows that, in comparison with 2017-2019, actual hours were reduced by more than two hours and a half in 2020. Prior to 2020, men work on average almost 7 hours more than women and, not surprisingly, full-time workers work 15 hours more than those in part-time. Similarly to the behavior of desired hours in the same period, some variations are observed according to categories: the younger workers and the more educated work on average more. The table shows actual hours fell, on average, in 2020. Some disparity is observed according to categories. Full-time workers saw their weekly working time the most reduced, with a decline of more than three hours and women were the least affected, after part-time workers, with a decline of two hours compared to pre-pandemic times. Note the last quarter of 2020 is six months after the worst of the COVID-19 crisis' effects on the labor market (Faberman et al., 2022), so the drop in actual hours may have been more important early on.

As such, the results of this subsection already convey an idea of which component of the AHG experienced a change at the onset of the Covid crisis. Desired hours did not significantly vary but actual hours declined for each category studied.

4.2 The Aggregate Hours Gap over the business cycle

I report here the variations observed in the time-series evidence for the Aggregate Hours Gap, defined in equation (1), and Potential Work Hours, the denominator of equation (1), which can be seen as potential labor supply.

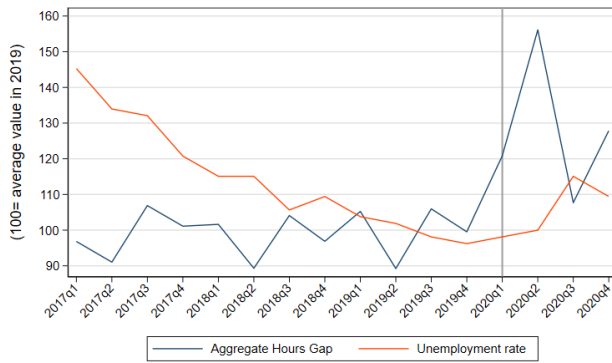
Before the Covid period, the behavior of the AHG is relatively uneventful. Over the whole of 2017-2019, it fluctuates around 0.19. From the first quarter of 2020, it experiences an increase to reach a peak in the second quarter. The rest of year 2020 shows lower levels but it still stands above pre-pandemic values.

Figure 3 analyzes the differential behavior of the AHG and the unemployment rate before and during the COVID-19 crisis, normalizing each measure to its 2019 average. Given that the AHG captures an additional margin of labor market under-utilization compared to the unemployment rate, studying how both measures vary with time is particularly relevant to try and grasp the mechanisms at play. Until the third quarter of 2019, the unemployment rate is persistently higher than the AHG. In 2020, the AHG increases to more than 150 percent of its 2019 mean value. The pattern of the AHG during the Covid pandemic highlights a larger level of under-utilization than implied by the unemployment rate even if the latter also experiences an increase at the onset of the crisis compared to 2019 levels. This implies the labor market in 2020 is not tighter than predicted by the unemployment rate⁹. Note the unemployment rate attained its lowest value right before 2020. It started to increase as of the first quarter of 2020 but reached a peak only in the third quarter, i.e. with a three-month delay compared to the AHG. These discrepancies in the behavior of both measures confirm the validity of exploring the channel of the AHG to understand how the labor market evolved.

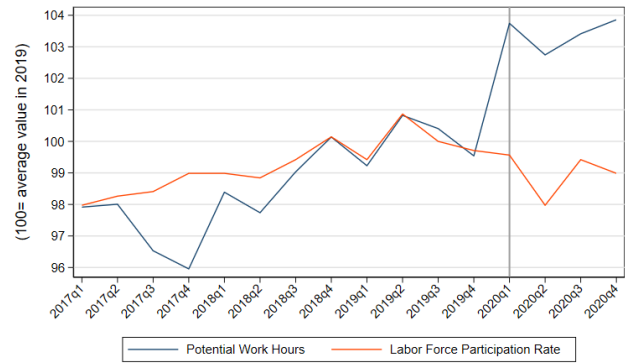
In particular, the two facts this graph reveals, namely the larger level of under-utilization of the labor market in 2020 evidenced by a higher AHG and a lag in the unemployment's reaction to the start of the pandemic, can be interpreted as follows. The larger AHG is proof that the intensive or extensive margins (or both) drove this increase. That is to say, either the gap between desired and actual hours increased, and/or the share of inactive or unemployed increased. The former was shown previously: actual hours did decrease, yielding a decrease of the intensive margin of labor demand and thereby increasing the gap. The latter would mean there is a larger weight of individuals whose AHG contribution is exactly 1. Indeed, the unemployed and inactive have actual hours equal to 0 yielding an individual contribution of 1.

Figure 4 compares the behavior of potential work hours with the labor participation rate. Studying the way these measures change allows us to understand whether changes in the AHG are driven by the extensive margin. Throughout 2017- 2019, both measures follow each other closely -except for the second half of 2017- compared to their 2019 average and experience an increase during the whole of this period. At the beginning of 2020, they diverge. Potential work hours, seen as potential labor supply, rise by almost 4 percentage points and the participation rate falls by 2 percentage points

⁹The vacancy rate did not fluctuate much during 2020, as evidenced by the Beveridge curve in Figure 2. I therefore consider changes along the potential labor supply only, in the tightness analyses.

Figure 3: The AHG and the Unemployment Rate.

Notes: The AHG estimates come from the author's calculations using Stabel LFS for individuals aged 15 to 64. The unemployment rate comes from Eurostat (online at <https://ec.europa.eu/eurostat/en/>). Both measures are de-seasonalized. The graph reports each series' deviation from their 2019 average, normalized to 100.

Figure 4: PWH and the Labor Force Participation Rate.

Notes: The PWH estimates come from the author's calculations using Stabel LFS for individuals aged 15 to 64. The LF participation rate comes from Eurostat (online at <https://ec.europa.eu/eurostat/en/>). Both measures are de-seasonalized. The graph reports each series' deviation from their 2019 average, normalized to 100.

compared to their 2019 average. As such, the graph underlines an increase in the intensive margin of potential labor supply simultaneously with a decrease in its extensive margin. This unsettling finding calls for an interpretation. Since it suggests that the extensive margin, defined by the labor force participation rate, follows a different path from the intensive margin, I analyze how the AHG changed for each one of the three labor force states.

Figure 5 plots the behavior of the AHG in period 2017-2020 by its labor force components. As Faberman et al. (2022) do, the AHG component for state j is equal to its share in the population, ω_{jt} , multiplied by its desired hours gap, DHG_{jt} , all divided by potential work hours across all individuals, i.e. the denominator of the AHG. This ensures that the sum of each component adds up to the overall AHG estimate¹⁰ defined in equation (1). The evolution of the AHG for each labor force status shows significant disparities between the employed, unemployed, and inactive. The clearest pattern emerges for the employed as their AHG reaches a precise peak in the second quarter of 2020. Since, as evidenced by Table 4, their desired hours did not significantly change, this behavior must be due to a change in actual hours and potentially in the share of employed in the population. I further analyze this point in the next section.

Note also that the changes in each labor force state's respective AHG are of different magnitudes. If employed individuals' under-utilization measure went from 0.16 to more than 0.26 between the end of 2019 and the second quarter of 2020, inactive individuals' AHG somewhat increased from more than 0.014 to less than 0.017. It seems the pattern inactive's AHG follows during the period studied resembles somewhat that of the share of inactive in the working-age population (Figure 21 in the Appendix). This is a sign that for those out of the labor force, their AHG is mainly driven by the size of their share in the population. As for the unemployed, their AHG experiences a decrease of about 0.02 at the onset of the pandemic. It was already on a decreasing trend before, making it hard

¹⁰Formally, $AHG_{et} + AHG_{ut} + AHG_{it} = \frac{\omega_{et}DHG_{et}}{\sum_j \omega_{jt}PH_{jt}} + \frac{\omega_{ut}DHG_{ut}}{\sum_j \omega_{jt}PH_{jt}} + \frac{\omega_{it}DHG_{it}}{\sum_j \omega_{jt}PH_{jt}} = AHG_t$

Figure 5: Components of the AHG over time.

Notes: The AHG estimates come from the author's calculations using Statbel LFS for individuals aged 15 to 64. The graphs report each AHG component by labor force state so that each component adds up to the overall AHG.

to believe this decrease is only due to the Covid crisis and the lockdown measures it brought about. Yet, the unemployed's AHG is not uninteresting in that this apparent lack of reaction may reflect the large uptake of short-time work schemes in Belgium during the first half of 2020.

5 Quantifying the role of actual hours

5.1 Counterfactual analysis

Table 1 shows actual hours significantly decrease in 2020, contrary to desired hours which do not significantly change. Actual hours are therefore a first plausible explanation for the change the AHG experiences in 2020. To see to which extent the variation in actual hours contributes to the AHG increase, I conduct a counterfactual exercise for the AHG of the employed only, since actual hours do not affect the AHG of the other labor force states. The purpose of such exercise is to have a precise idea of what the level of labor market under-utilization would have been during the COVID-19 crisis in the absence of changes in actual hours. If the counterfactual level stands higher than the baseline, I conclude actual hours contributed to decreasing under-utilization, and vice versa. Since actual hours decreased, they must have increased under-utilization. I therefore expect the counterfactual AHG to stand below the baseline.

To perform this exercise, I attribute to each employed individual in 2020 the average 2017-2019 value of actual hours of the cell they belong to, then recalculate their AHG using these counterfactual actual hours. Formally, employed's AHG is defined as

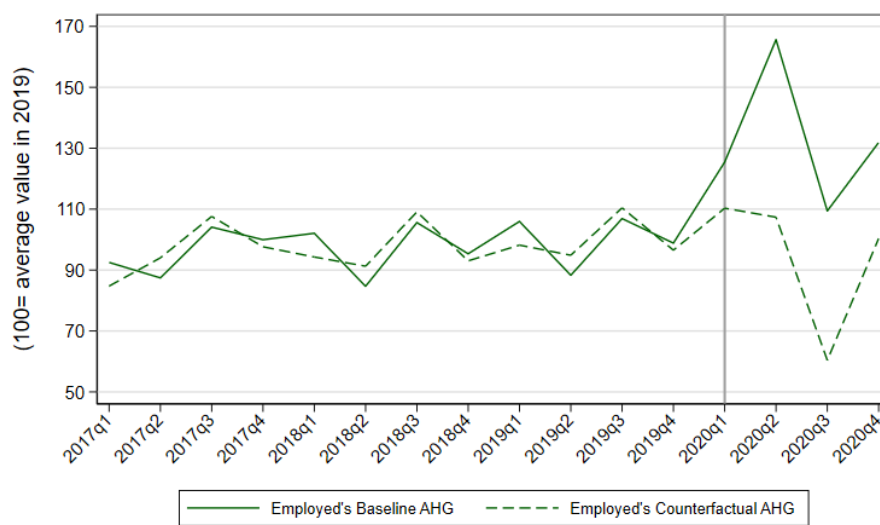
$$\frac{\omega_{et}DHG_{et}}{\sum_j \omega_{jt}PH_{jt}} \quad (4)$$

where ω_{et} is the share of employed in the population in quarter t and DHG_{et} the desired hours gap of employed as in equation 2. The denominator is exactly the denominator of the overall AHG. Under this approach, the counterfactual AHG gives a sense of what the level of under-utilization would have

been in 2020, had there been no changes to actual hours compared to pre-Covid times.

Figure 6 shows the results of the counterfactual exercise. It plots the baseline and counterfactual AHG for employed and highlights that ignoring the fall in actual hours in 2020 implies a lower AHG estimate and thus, a lower degree of labor market under-utilization. That is, if actual hours had stayed constant at their 2017-2019 average, the labor market would have been less slack. Indeed, while the baseline exceeds 160 in the second quarter of 2020, the counterfactual stands 50 percentage points under. This is evidence that the decline in actual hours in 2020 drove the increase of the hours gap for the employed and thus, their AHG.

Figure 6: Baseline and Counterfactual Movements in the Employed's AHG.



Notes: Estimates come from the author's calculations using Statbel LFS for individuals aged 15 to 64. The baseline AHG exactly corresponds to employed's AHG presented in Figure 5 but normalized to make its average 2019 value equal to 100. The counterfactual estimate recalculates the series holding actual hours in 2020 constant at their 2017-2019 average within each cell. The measures are de-seasonalized. The counterfactual's slight deviations from the baseline before 2020 are due to the de-seasonalization process. Seasonalized, they track each other perfectly (see Figure 22 in the Appendix).

As far as the overall AHG is concerned, its change is also mainly driven by the drop in 2020 of employed's actual hours. Indeed, the contribution of the employed to the overall AHG is substantial. Looking at Figure 5, it is clear the employed's AHG is the largest. Since the overall AHG is the sum of each of the three graphs of Figure 5 and unemployed and inactives' AHG's are of a much smaller size, it is the employed's contribution that primarily drives AHG changes¹¹. Over the course of the period studied, the contribution of the employed is systematically the most important of all labor force states. This is, for the most part, due to the way the AHG by labor force state is computed: the share of employed, at the numerator of employed's AHG, being higher than the other labor force state shares, it mechanically makes employed's contribution larger. This also explains why the shape of

¹¹Quantitatively, in the second quarter of 2020, the overall AHG stood at 0.295. The employed contributed to 0.266, the unemployed to 0.0144 and the inactive to 0.0147.

the overall AHG resembles that of employed's. This finding means the intensive margin contributed to the AHG increase in 2020, through the drop of actual hours of the employed.

In this respect, resort to short-time work schemes are not to be overlooked. In the second quarter of 2020, 35% of employed individuals had their working time reduced, 37% of which, due to "economic or technical" reasons. In 2020, almost three quarters of those whose working time is reduced due to "economic or technical" reasons desired to work their contractual hours, that is, the number of hours stated in their employment contract. This suggests the majority of these employed individuals wanted to work according to their contractual hours but were forced to work substantially less due to government restrictions. This increased their hours gap. In the absence of such government-enhanced support measures, the AHG would have in all likelihood behaved differently.

The rise of the AHG at the onset of the pandemic may also be due to the extensive margin. Even if the inactive's contribution is of a smaller magnitude, an increase in their AHG can be distinctly noticed. Combined with the results of Figure 4 showing a decline in the labor force participation rate, this indicates the growing share of inactive in the population contributed to a certain extent to the AHG increase. Indeed, if the share of individuals whose AHG is by definition 1 rises, so does the overall AHG.

Hence, the evidence surrounding the analysis of the AHG in Belgium during the COVID-19 crisis enables to capture various underlying mechanisms of labor market under-utilization. I find that the rise in the AHG is mainly due to the intensive margin of labor demand, through lower actual hours and, to a lesser but non-negligible extent, due to the extensive margin of labor supply, through a lower participation rate.

5.2 Comparison with the US case

In their paper, Faberman et al. (2022) use the AHG to examine the effect the COVID-19 crisis had on the willingness to work. Overall, their findings for period 2017-2020 differ considerably from the Belgian case in many aspects. Contrary to evidence for Belgium, all individuals wished to work on average one hour less during the Covid-period compared to pre-Covid period¹². This decline of desired hours holds for all labor force states and all demographics.

They also find the AHG rose in 2020 but, unlike Belgium, at the same time as the unemployment rate. One reason for this may be the fact the US resorted to a lesser extent to short-time work schemes than European countries (Eyméoud et al., 2021): the crisis then made itself apparent through the unemployment rate sooner. Unlike in Figure 4, the US saw their potential hours and labor force participation rate move in the same direction at the onset of the COVID-19 crisis¹³. They both dropped, although not to the same extent. Potential hours fell about twice as much as the participation rate (Faberman et al., 2022).

¹²Note Faberman et al. (2022) compare periods 2018-2019 with 2020-2021 in Table 1 of their paper. I instead compare periods 2017-2019 with 2020 due to reasons detailed above.

¹³Figure 2 of their paper.

To understand the process underlying this drop, they conduct a counterfactual exercise in which they compute the AHG from 2020 on holding desired hours constant at their pre-Covid level. In their case, the use of such exercise for desired hours makes sense, as this component of the AHG experienced a change as of 2020. An analogous exercise for Belgium would result in very little difference between baseline and counterfactual since desired hours in Belgian barely moved. Faberman et al. (2022)'s resulting counterfactual AHG estimates over this period show what the degree of labor market under-utilization would be if desired hours had not changed. This counterfactual, plotted alongside the baseline AHG, provides a better understanding of the extent to which desired hours contributed to the AHG increase. Accordingly, the authors show that all of the discrepancy between potential hours and the participation rate reflects a reduction in desired hours. That is, half of the decline in aggregate labor supply can be attributed to a decline in desired hours, the other half to a drop in labor force participation.

Again, these findings differ from the Belgian case in which it is the impact of actual hours that is found to matter the most in the AHG increase.

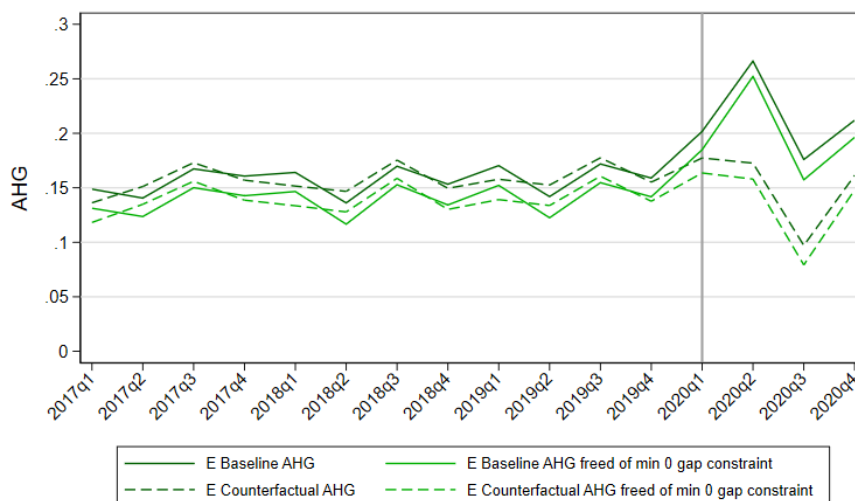
5.3 Sensitivity analysis: relaxing the minimum gap constraint

For all the findings presented above, a constraint of minimum zero hours gap is imposed: individuals with desired hours lower than actual hours were assigned a zero hours gap rather than a negative one. I do this following Faberman et al. (2020)'s reasoning. Namely, an individual with a negative gap is someone wishing to work less than they actually are. If the gap was left unchanged, they would contribute to a reduction of the AHG, reflecting a lower level of under-utilization. Yet, the authors show these individuals' search effort intensity is significant. Therefore, notwithstanding the fact these individuals want to work less, their gap is set to zero, thereby making them contribute to the AHG the same way as an employed person fully satisfied with their working hours (desired hours equal to actual hours). This reduces the otherwise potential inaccuracy that would result from them contributing in a way that would decrease labor market slack when they, in fact, exert significant search effort. This nevertheless leads to an omission of an "overemployment" phenomenon during the pandemic which should not be ruled out. In the baseline calculations of the AHG, 12.3% of employed individuals reported a negative gap, in the counterfactual, with actual hours fixed to their pre-Covid average, it concerned 13.4% of them. This difference is not surprising, as the counterfactual actual hours -which ignore the drop of actual hours during the pandemic- were significantly higher than in the baseline. This results in a smaller gap and for some, even a negative gap.

To assess the extent to which this non-negative gap constraint impacts the findings and conclusions, I conduct a sensitivity analysis whereby this constraint is relaxed. I compute the AHG and counterfactual AHG allowing for negative hours gaps.

Figure 7 presents employed's baseline and counterfactual AHG's under constraint (hereafter "original AHG") and freed from the constraint. It shows the employed AHG with no minimum zero gap is slightly lower than the original one, both in the baseline and counterfactual. This is not unfore-

Figure 7: AHG with and without a minimum zero hours gap constraint (Baseline and Counterfactual).



Notes: Estimates come from the author's calculations using Statbel LFS for individuals aged 15 to 64. The original AHG, both baseline and counterfactual, exactly correspond to Figure 6 but not normalized. The AHG's freed from the constraint are computed the same way except they allow for negative hours gaps. All measures are de-seasonalized.

seen, since allowing for negative gaps yields a lower level of under-utilization and thus a lower AHG. Overall, the results of this sensitivity analysis underline a change in terms of scale but not as far as the general pattern is concerned. Without the constraint, the conclusions remain the same. Namely, the counterfactual AHG, in which actual hours stay constant, stands lower than the baseline, implying a tighter labor market than what is in fact observed. The general AHG (Figure 23 in the Appendix) highlights a very similar picture. The original AHG stands above the one freed from the constraint. This is a direct consequence of employed's original AHG being also above the one freed from the constraint, and the fact the employed's contribution to the overall AHG is substantial.

6 Conclusion

In this master's thesis, I analyze how labor market tightness evolved during the COVID-19 crisis in Belgium and the factors that led to such movements. The study of the descriptive evidence before and during the pandemic shows decreasing tightness levels during 2020, which are due to a shift to the right of the Beveridge curve: the unemployment rate increased while the vacancy rate stayed somewhat constant. To capture the determinants of labor market slack during 2020, I use an aggregate measure that encapsulates all possible margins of labor market under-utilization: the Aggregate Hours Gap. It differentiates individuals based on their labor force state and uses data on their desired hours as a measure of their potential labor supply to produce an aggregate measure of labor market under-utilization. This comprehensive hours-based measure of slackness underlines that any gap between desired and actual work hours must reflect some degree of labor market slack. Using the AHG, my

analysis of the Belgian labor market reveals an overall increase of under-utilization during 2020, in accordance with the decrease of tightness observed on the Beveridge curve. It also provides two main reasons for such a change.

First, there is evidence of a significant decline in actual work hours of employed in 2020 compared to pre-pandemic times. I therefore conduct a counterfactual exercise holding these actual hours constant at their 2017-2019 average in 2020 to understand how actual hours exactly affected the rise in the AHG. I find that, in the absence of variations along actual hours, the AHG would have stood below its actual level, thereby confirming that the drop of actual hours contributed to the increase of labor market under-utilization. The phenomenon of actual hours drop was made possible thanks to the feasibility, for employed individuals, to decrease working time or stop working altogether, while still staying employed. This resort to short-time work schemes therefore notably influenced the overall AHG through an increase of employed's desired hours gap. Second, the AHG increased due to a lower participation rate at the onset of the COVID-19 crisis. As such, these explanations highlight that both the intensive and extensive margin contributed to reducing the level of labor market tightness in Belgium in 2020.

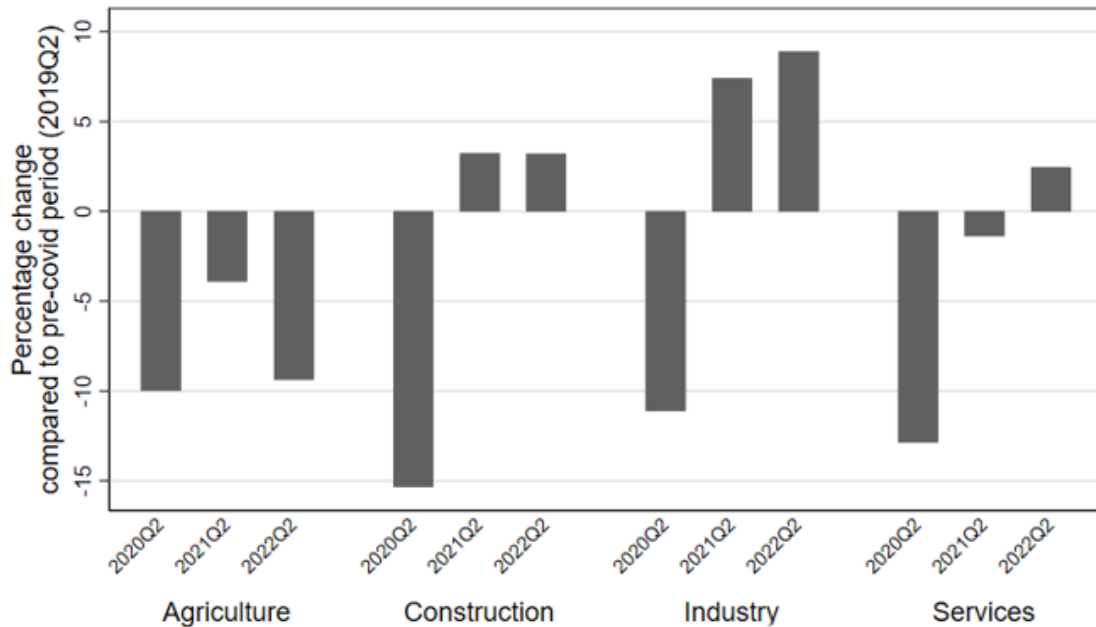
References

- Bell, D. N., & Blanchflower, D. G. (2018, August). *Underemployment in the us and europe* (Working Paper No. 24927). National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w24927> doi: 10.3386/w24927
- Bodart, V., & Van der Linden, B. (2022). Crise du covid-19, rebond économique et difficultés de recrutement en belgique. *Regards économiques*(4).
- Brunello, G., & Wruuck, P. (2021, September). Skill shortages and skill mismatch: A review of the literature. *Journal of Economic Surveys*, 35(4), 1145-1167. Retrieved from <https://ideas.repec.org/a/bla/jecsur/v35y2021i4p1145-1167.html> doi: 10.1111/joes.12424
- Bulligan, G., Guglielminetti, E., & Viviano, E. (2019). Adjustments along the intensive margin and wages: Evidence from the euro area and the us..
- Carcillo, S., Cahuc, P., & Zylberberg, A. (2014). *Labor economics*.
- Cockx, B., Declercq, K., Dejemeppe, M., Inga, L., & Van der Linden, B. (2020). *Switching from an inclining to a zero-level unemployment benefit profile: Good for work incentives?* (Tech. Rep. No. 2020004). Université catholique de Louvain, Institut de Recherches Economiques et Sociales (IRES). Retrieved from <https://EconPapers.repec.org/RePEc:ctl:louvir:2020004>
- Coppens, B., Minne, G., Piton, C., & Warisse, C. (2021, september). The Belgian economy in the wake of the COVID-19 shock. *NBB Economic Review*(ii), 131-157. Retrieved from <https://ideas.repec.org/a/nbb/ecrart/y2021mseptemberiip131-157.html>
- CSE. (2021). *Etat des lieux et prespectives du marché du travail en belgique et dans les régions, juillet*.
- Duval, R., Ji, Y., Li, L., Oikonomou, M., Pizzinelli, C., Shibata, I., ... Tavares, M. (2022, March). *Labor Market Tightness in Advanced Economies* (IMF Staff Discussion Notes No. 2022/001). International Monetary Fund. Retrieved from <https://ideas.repec.org/p/imf/imfstdn/2022-001.html>
- Eyméoud, J.-B., Petrosky-Nadeau, N., Santaaulàlia-Llopis, R., & Wasmer, E. (2021, February). Contrasting U.S. and European Job Markets during COVID-19. *FRBSF Economic Letter*, 2021(05), 01-05. Retrieved from <https://ideas.repec.org/a/fip/fedfel/89961.html>
- Faberman, R. J., Mueller, A. I., & Şahin, A. (2022, February). *Has the willingness to work fallen during the covid pandemic?* (Tech. Rep. No. 29784). National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w29784> doi: 10.3386/w29784
- Faberman, R. J., Mueller, A. I., Şahin, A., & Topa, G. (2020, March). *The shadow margins of labor market slack* (Working Paper No. 26852). National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w26852> doi: 10.3386/w26852

- Gee Hee Hong, W. L., Zsoka Koczan, & Nabar, M. S. (2023, May). *More slack than meets the eye? recent wage dynamics in advanced economies* (IMF Working Paper Nos. 2018/050, A001). International Monetary Fund. Retrieved from <https://www.elibrary.imf.org/view/journals/001/2018/050/article-A001-en.xml>
- Hijzen, A., & Venn, D. (2011). *The role of short-time work schemes during the 2008-09 recession* (OECD Social, Employment and Migration Working Papers No. 115). OECD Publishing. Retrieved from <https://EconPapers.repec.org/RePEc:oec:elsaab:115-en>
- Jessen, R., Rostam-Afschar, D., & Schmitz, S. (2018). How important is precautionary labour supply? *Oxford Economic Papers*, 70(3), 868-891. Retrieved from <https://EconPapers.repec.org/RePEc:oup:oxecpp:v:70:y:2018:i:3:p:868-891>.
- Michaillat, P., & Saez, E. (2022). $u^* = \sqrt{uv}$ (Working Paper). National Bureau of Economic Research.
- Statbel. (2022). *Modifications apportées à l'enquête sur les forces de travail (eft) en 2021*. Retrieved from <https://statbel.fgov.be/fr/modifications-apportees-lenquete-sur-les-forces-de-travail-eft-en-2021>
- Termote, A., & Depickere, A. (2018). *Réforme de l'enquête sur les forces de travail en 2017* (Tech. Rep. No. 4). Statbel.
- Tuda, D. (2020, May). *Desired hours worked over the business cycle: stylised facts for European countries* (Trinity Economics Papers No. tep1320). Trinity College Dublin, Department of Economics. Retrieved from <https://ideas.repec.org/p/tcd/tcduee/tep1320.html>
- Van der Linden, B., Bodart, V., & Dejemppe, M. (2018). The labor market in belgium, 2000–2016. *IZA World of Labor*, 428. Retrieved from <https://EconPapers.repec.org/RePEc:iza:izawol:journl:y:2018:n:428>

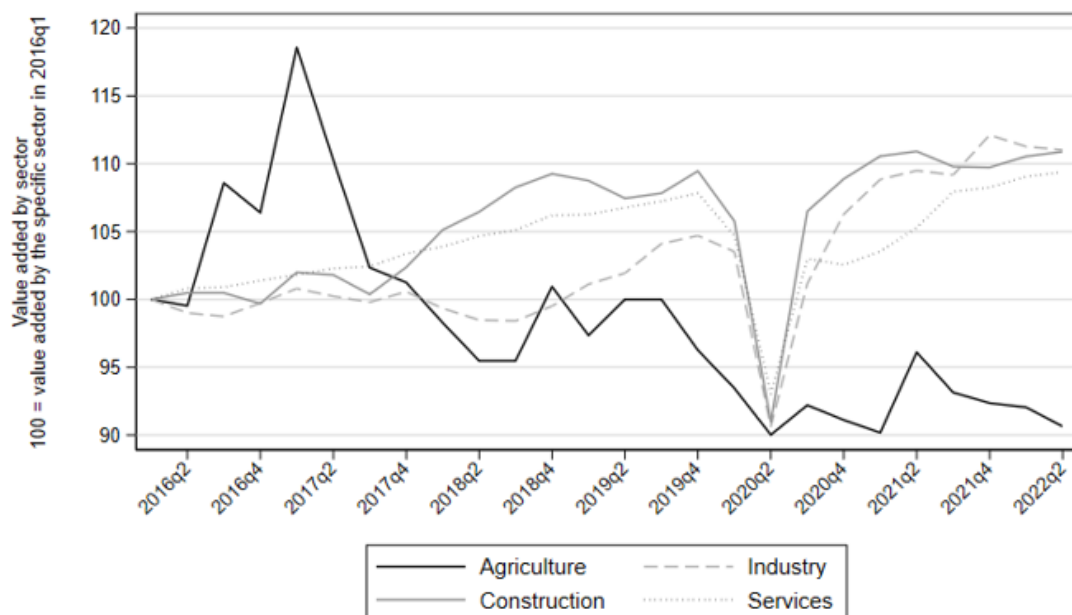
Appendix: Additional figures and tables

Figure 8: Variation (%) of GDP in 2020, 2021 and 2022



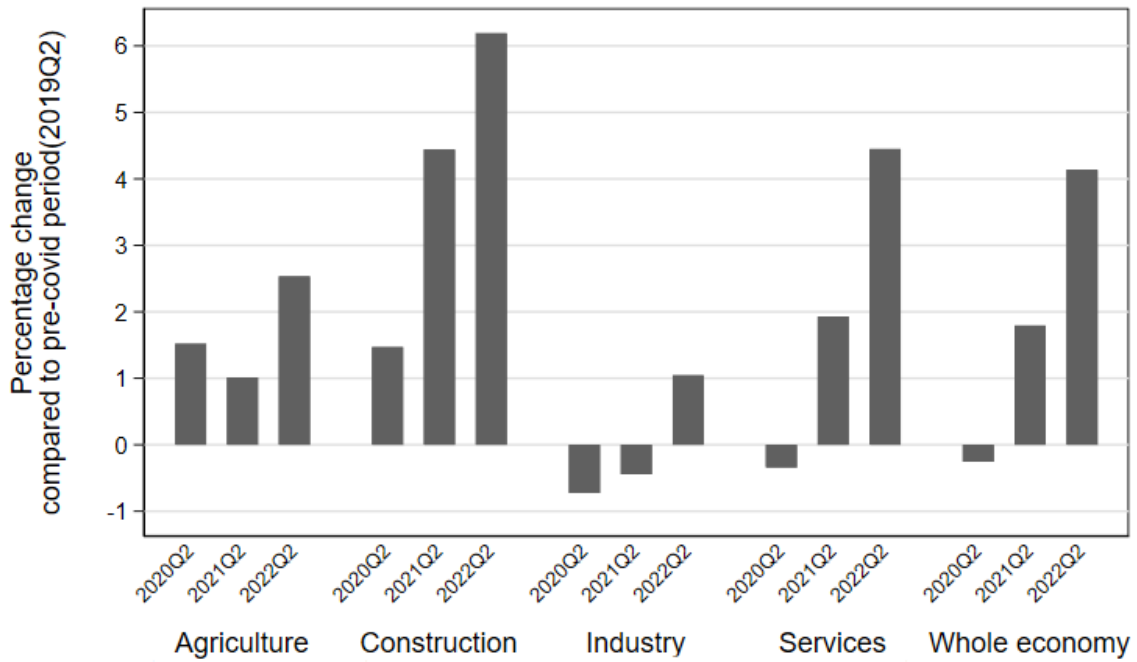
Notes: The industry breakdown comes from NBB statistics using seasonally adjusted data. Online at <https://stat.nbb.be/#>. Calculations done by the author.

Figure 9: Value added by sector



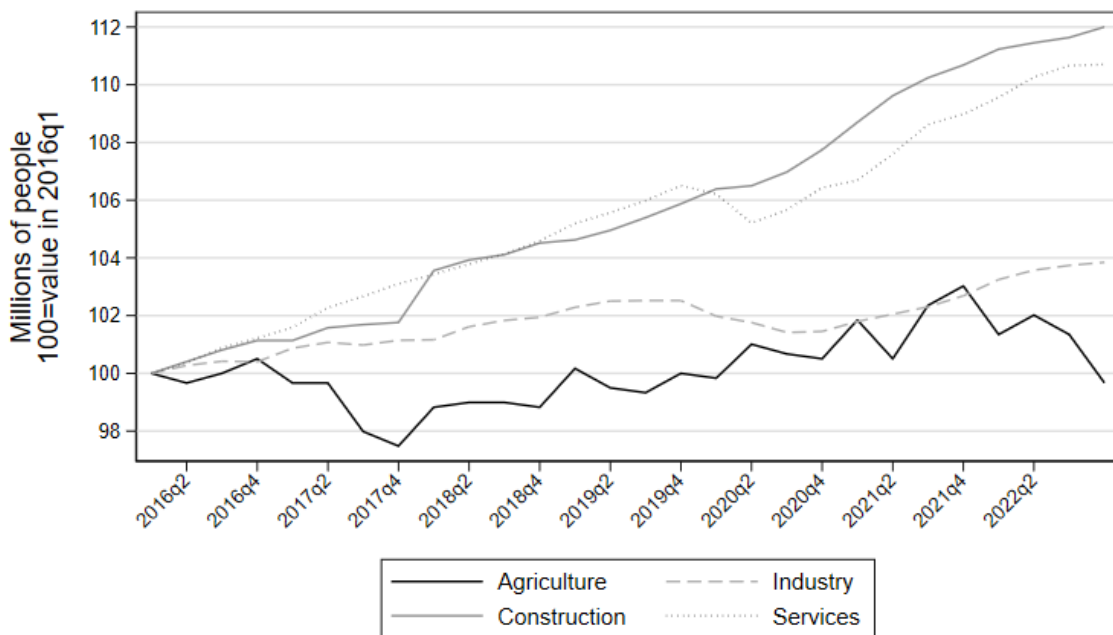
Notes: The industry breakdown comes from NBB statistics using seasonally adjusted data. Online at <https://stat.nbb.be/#>. Calculations done by the author.

Figure 10: Variation (%) of employment in 2020, 2021 and 2022



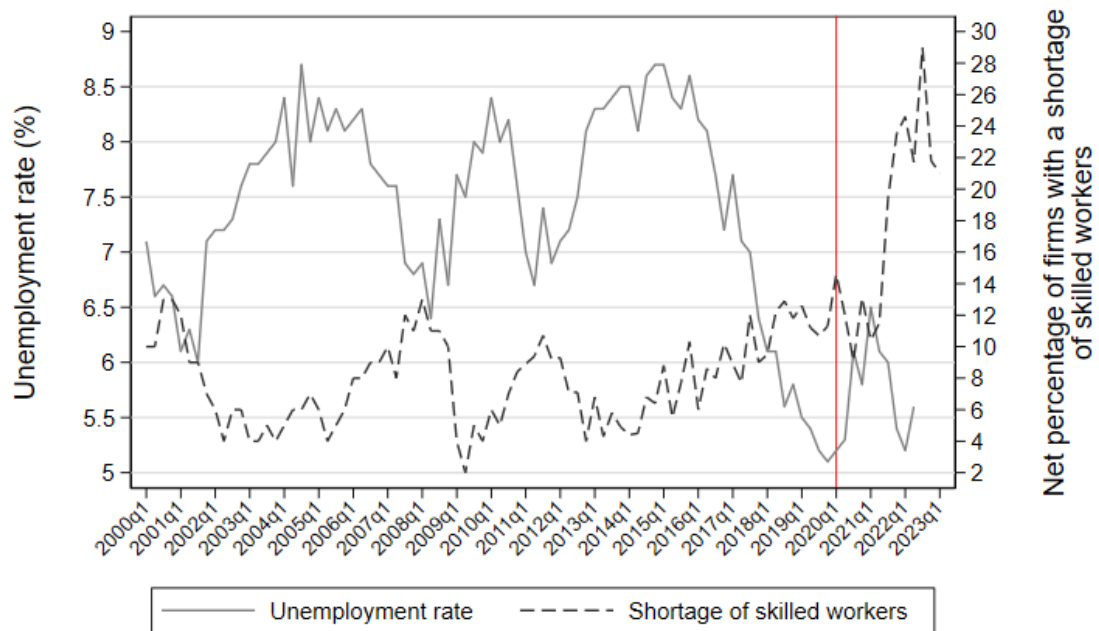
Notes: The industry breakdown comes from NBB statistics using seasonally adjusted data. Online at <https://stat.nbb.be/#>. Calculations done by the author.

Figure 11: Employment by sector



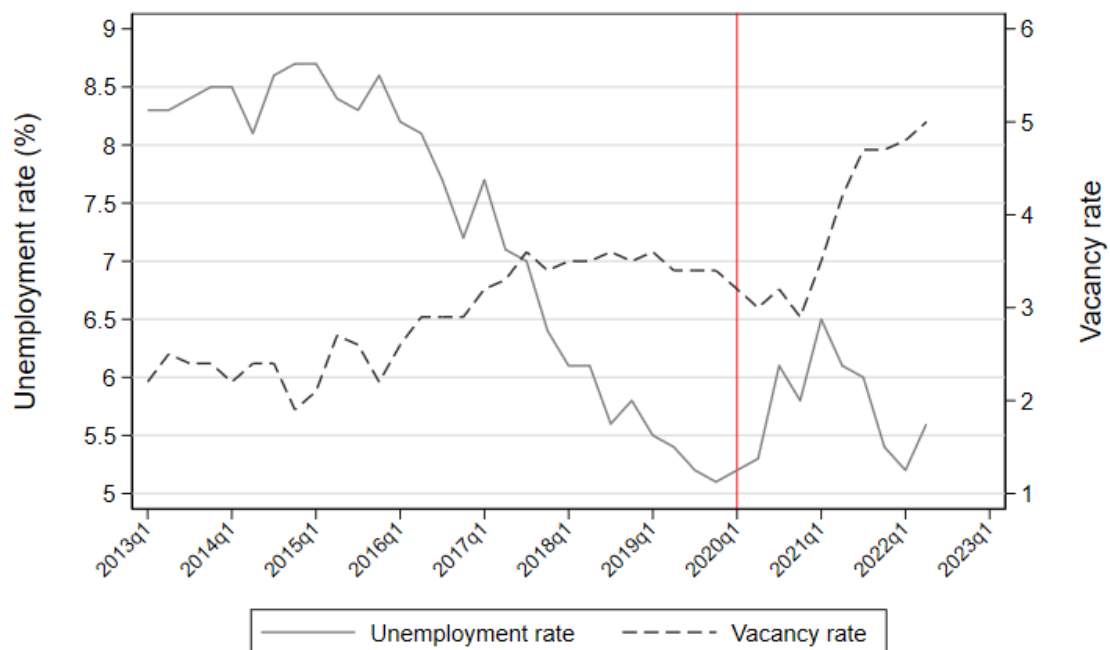
Notes: The industry breakdown comes from NBB statistics using seasonally adjusted data. Online at <https://stat.nbb.be/#>. Calculations done by the author.

Figure 12: Unemployment and labor shortage



Notes: The unemployment rate comes from Eurostat statistics using seasonally adjusted data. Online at <https://ec.europa.eu/eurostat/en/>. Shortage of skilled workers come from NBB statistics. Online at <https://stat.nbb.be/#>.

Figure 13: Unemployment and vacancy rate



Notes: The unemployment rate and vacancy rate comes from Eurostat statistics using seasonally adjusted data. Online at <https://ec.europa.eu/eurostat/en/>.

Table 2: Share of each demographic group among the missing values for the unemployed and among the unemployed as a whole.

Category	Share of the category:	
	Within missing values of desired hours	Within the unemployed population
Women	46%	46%
Men	54%	54%
15-24	18%	18%
25-49	58%	58%
50-64	24%	23%
No degree in higher education	72%	73%
Degree in higher education	28%	27%

Notes: This table reports, in the middle column, the share of each demographic group among the inactive individuals whose desired hours variable is missing, and in the last column, the share of each demographic group within all inactive individuals. It shows little disparity between both columns.

Table 3: Share of each demographic group among the missing values for the inactive and among the inactive as a whole.

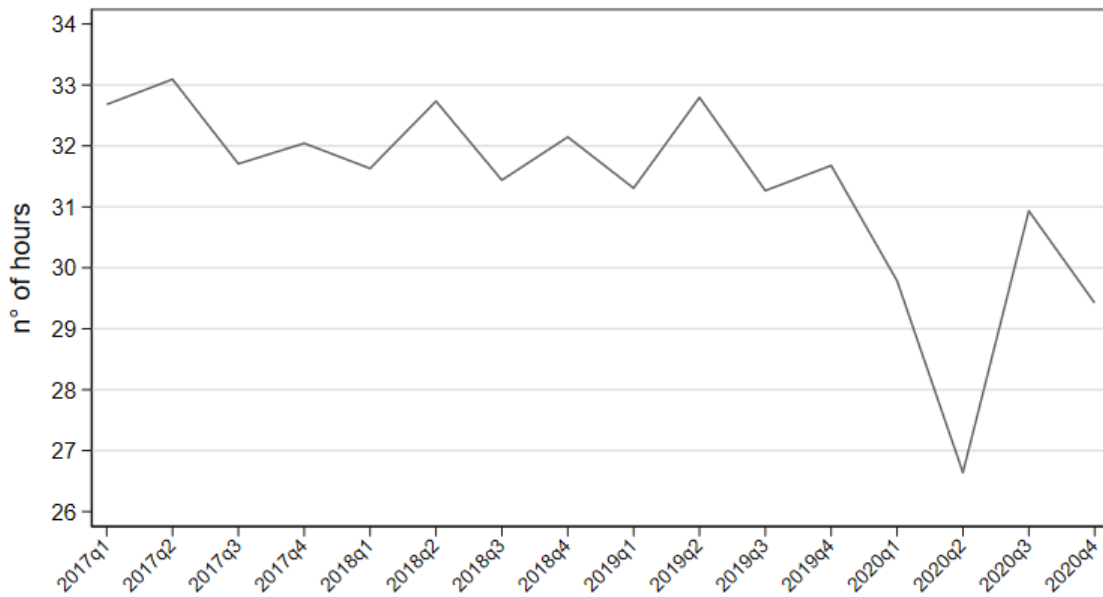
Category	Share of the category:	
	Within missing values of desired hours	Within the inactive population
Women	42%	42%
Men	58%	58%
15-24	37%	37%
25-49	20%	21%
50-64	42%	42%
No degree in higher education	85%	84%
Degree in higher education	15%	16%

Notes: This table reports, in the middle column, the share of each demographic group among the inactive individuals whose desired hours variable is missing, and in the last column, the share of each demographic group within all inactive individuals. It shows little disparity between both columns.

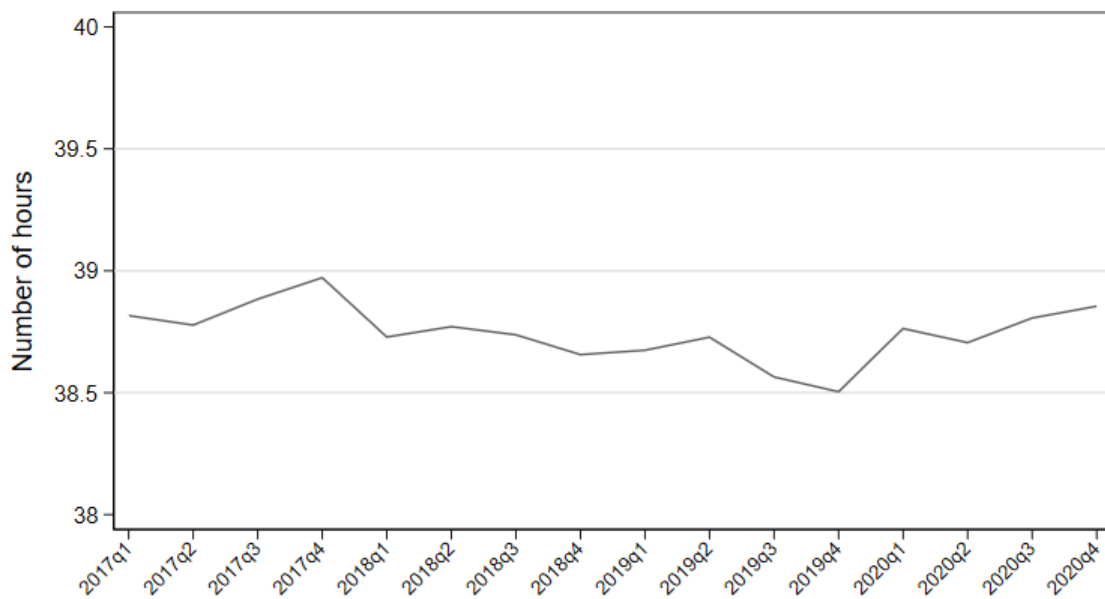
Table 4: Desired work hours by labor force status and demographics.

Last quarter of...	2017-2019	2020	Difference '20 - '17-19
A. All			
All individuals	38.54 (0.05)	38.71 (0.09)	0.18 (0.10)
B. By labor force status			
Employed	38.72 (0.05)	38.87 (0.09)	0.15 (0.11)
Full-time	42.26 (0.05)	42.22 (0.09)	-0.04 (0.01)
Part-time	28.03 (0.09)	28.86 (0.17)	0.83 (0.19)
Unemployed	35.59 (0.23)	35.94 (0.38)	0.35 (0.45)
Out of the labor force	31.80 (0.41)	31.83 (0.68)	0.03 (0.79)
C. By gender, sex and education			
Women	35.00 (0.07)	35.42 (0.13)	0.42 (0.15)
Men	41.79 (0.07)	41.79 (0.12)	-0.01 (0.13)
Prime age (25-54)	39.25 (0.06)	39.46 (0.10)	0.21 (0.11)
Older (55-64)	37.15 (0.14)	37.51 (0.23)	0.36 (0.27)
No degree in higher education	37.57 (0.07)	37.65 (0.13)	0.08 (0.14)
Highest degree in higher education	39.72 (0.07)	39.86 (0.13)	0.15 (0.15)

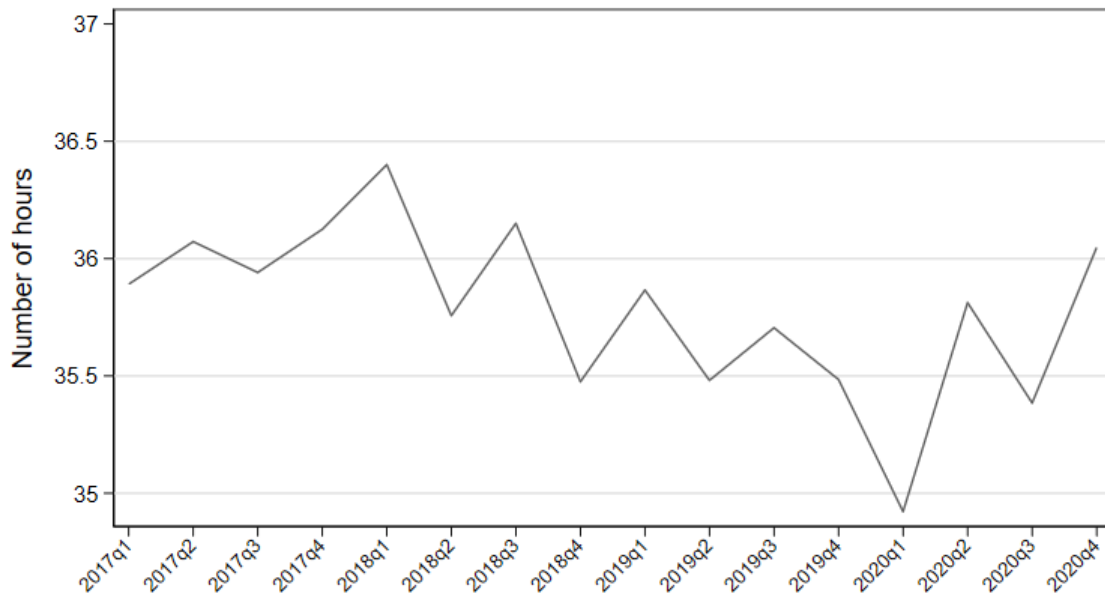
Notes: This table reports mean seasonalized desired work hours for each labor force state and demographic group. Desired hours are adjusted to impose a non-negative hours gap and to account for missing values for the employed. The last column presents the difference between the mean of the last quarters for 2017-2019 and the last quarter of 2020 for each category. Standard errors are in parentheses.

Figure 14: Actual hours of the employed

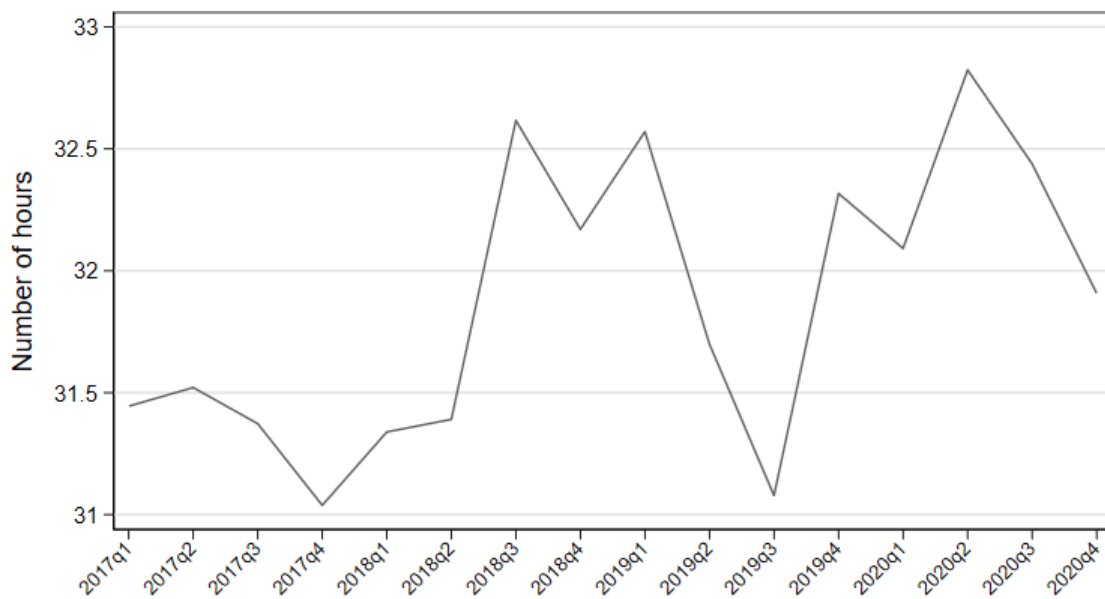
Notes: The graph reports the evolution of de-seasonalized actual hours worked per week for the employed using Statbel LFS for individuals aged 15-64.

Figure 15: Desired hours of the employed

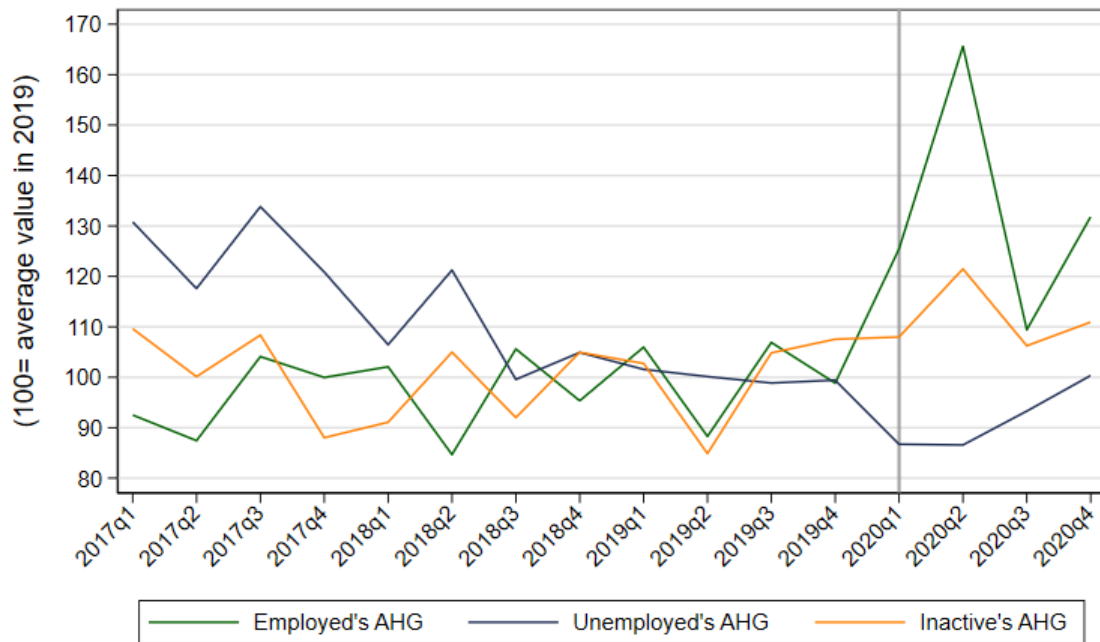
Notes: The graph reports the evolution of de-seasonalized desired hours worked per week for the employed using Statbel LFS for individuals aged 15-64.

Figure 16: Desired hours of the unemployed

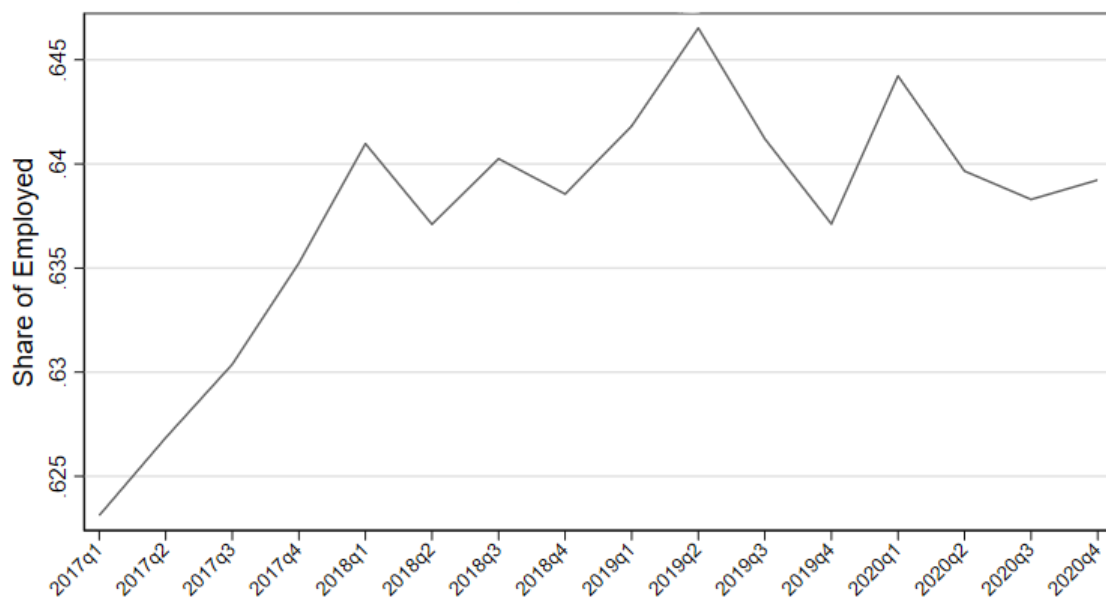
Notes: The graph reports the evolution of de-seasonalized desired hours worked per week for the unemployed using Statbel LFS for individuals aged 15-64.

Figure 17: Desired hours of the inactive

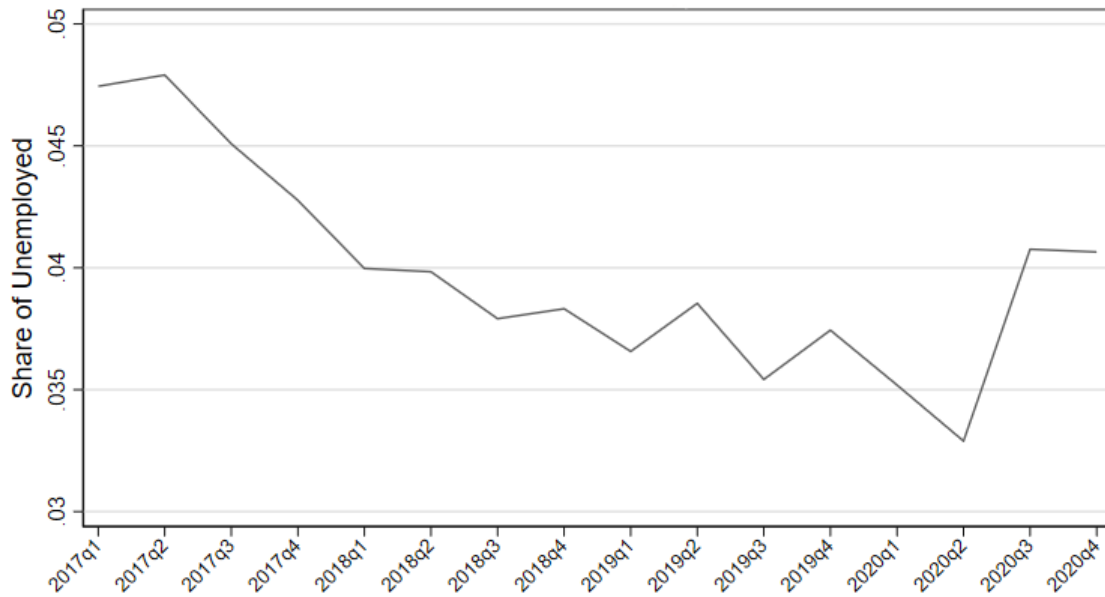
Notes: The graph reports the evolution of de-seasonalized desired hours worked per week for the inactive using Statbel LFS for individuals aged 15-64.

Figure 18: Desired hours of the employed

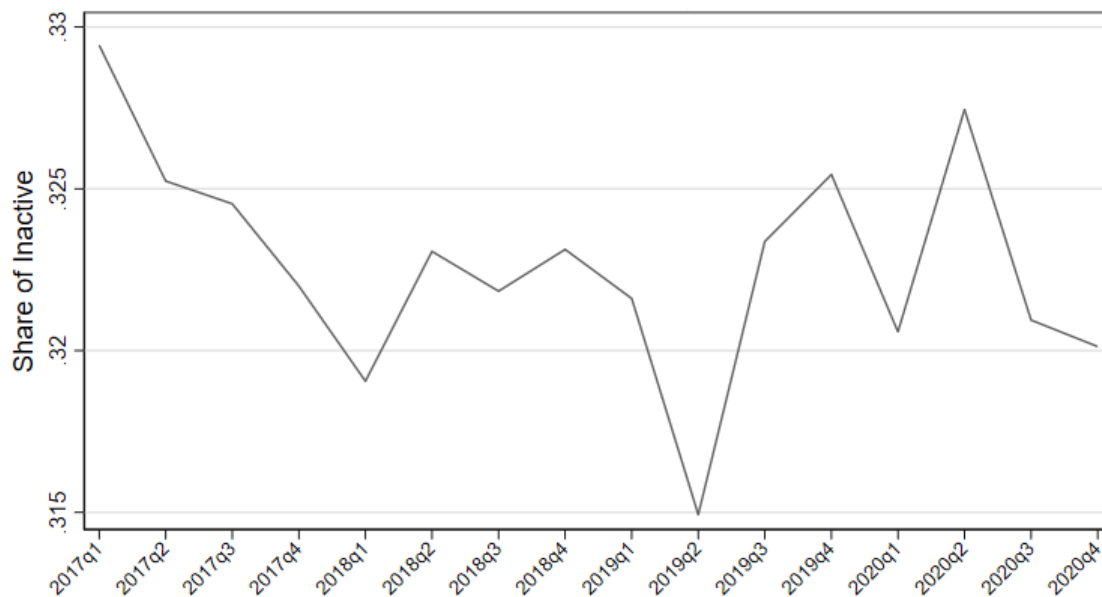
Notes: Estimates come from the author's calculations using Statbel LFS for individuals aged 15 to 64. The graph reports the evolution of each labor force state component of the AHG normalizing them so that their average 2019 value = 100. All measures are de-seasonalized.

Figure 19: Shares of employed in the population

Notes: The graph reports the evolution of the ratio of the number of 15-64-year-old employed individuals over the number of individuals aged 15 to 64. This share is de-seasonalized.

Figure 20: Shares of unemployed in the population

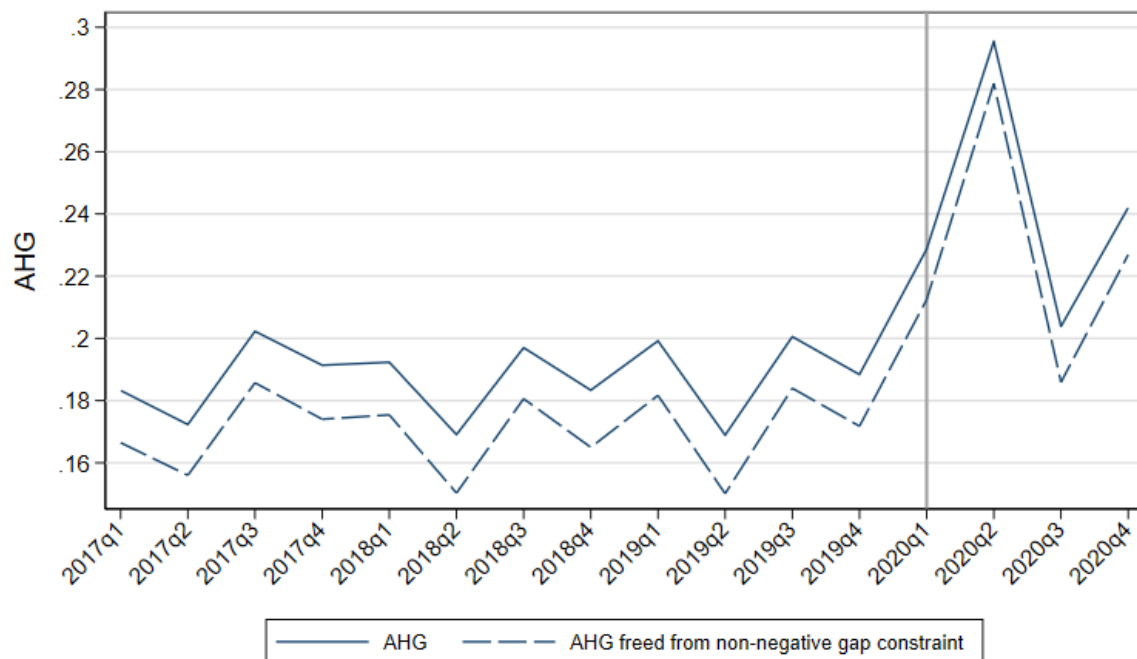
Notes: The graph reports the evolution of the ratio of the number of 15-64-year-old unemployed individuals over the number of individuals aged 15 to 64. This share is de-seasonalized.

Figure 21: Shares of inactive in the population

Notes: The graph reports the evolution of the ratio of the number of 15-64-year-old inactive individuals over the number of individuals aged 15 to 64. This share is de-seasonalized.

Figure 22: Baseline and counterfactual AHG for employed (seasonalized)

Notes: The graph reports the evolution of baseline and counterfactual AHG using Statbel LFS for individuals aged 15 to 64. The baseline AHG is employed's AHG as in figure 5 but not de-seasonalized. The counterfactual estimate recalculates the series holding actual hours in 2020 constant at their 2017-2019 average within each cell. The measures are seasonalized and track each other perfectly before 2020.

Figure 23: AHG with and without a minimum zero hours gap constraint.

Notes: Estimates come from the author's calculation using Statbel LFS for individuals aged 15 to 64. The original AHG estimate is the same as in figure 3 but not normalized. The AHG freed from the constraint is computed the same way except it allows for negative hours gap. Both measures are de-seasonalized.