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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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Abstract

This paper documents a durable increase in the cross-sectoral dispersion of earnings expectations during the COVID-19 crisis. An empirical analysis shows that the rise in dispersion of earnings forecasts can be explained by the introduction of lockdown measures, which had a particularly adverse impact on the travel sector. Accordingly, in terms of earnings expectations, countries that are relatively independent from the travel sector were least affected by a tightening of lockdowns. At the same time, the start of vaccination campaigns has been a game changer: more stringent lockdown measures added far less to the cross-sectoral dispersion in earnings expectations once vaccines started to be rolled out in late 2020. Going forward, the dispersion in earnings expectations remains elevated, implying that analysts may expect the effects of the crisis to be of a rather structural nature.

JEL codes: E44; G10; G12

Key words: COVID-19; Financial markets; Earnings expectations; Cross-sectoral dispersion; Lockdown measures; Vaccinations

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Non-technical summary

One year after the onset of the COVID-19 crisis, euro area stock markets have recovered and stand at all-time highs, mainly driven by a recovery in earnings expectations. However, COVID-19 has left a larger and longer-lasting mark on some companies than on others. This study proposes a metric that shows that earnings expectations have become more dispersed across sectors, in line with expectations of a structural and heterogenous impact of the crisis. The rise in dispersion stands in sharp contrast with developments during the Global Financial Crisis, potentially related to the specific nature of the measures taken to avert a public health disaster.

Indeed, empirical findings suggest that cross-sectoral dispersion in 12-month earnings forecasts for euro area corporates persistently increased with a tightening of lockdown measures. The travel sector has by far underperformed other sectors' earnings expectations during lockdowns. In consequence, the cross-sectoral dispersion is also found to have led to a more heterogenous recovery across countries. In terms of earnings expectations, the results show that corporates listed in countries that are relatively independent from the travel sector are hurt the least by lockdown measures.

At the same time, the start of vaccination campaigns has been a game changer: more stringent lockdown measures added far less to the dispersion in earnings expectations since the start of vaccinations in late 2020. For example, earnings expectations for the travel sector no longer declined upon tightening lockdown measures following the start of vaccinations, with also cross-country effects waning. Nonetheless, tighter mobility restrictions in the post-vaccine period continued to have some negative impact on corporate earnings expectations in countries with relatively low vaccination rates.

Looking ahead, the forward-looking metric of dispersion remains at historically elevated levels. This implies that analysts may expect the societal and economic consequences for some companies to be of lasting nature, in line with expectations of a K-shaped economic recovery.

1. Introduction

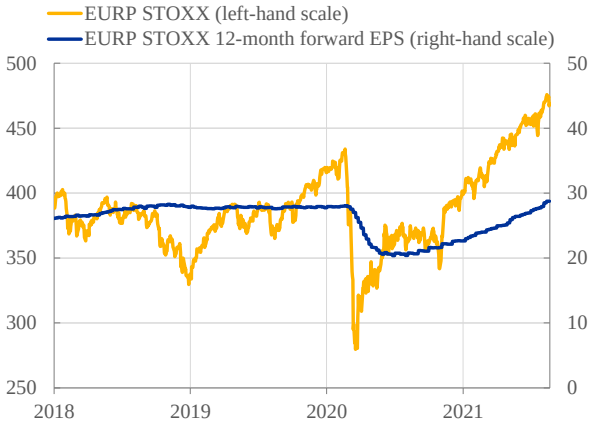
The COVID-19 crisis has had an unprecedented impact on euro area business activity. Its footprint differed from past crises, since the tight lockdown measures implemented to avert a public health disaster have created heterogenous effects across sectors and firms (e.g. Fairlie, 2020, Fernandes, 2020, Kaplan et al., 2020, Akcigit et al., 2021, Bloom et al., 2021). One of the reasons for the heterogenous impact lies in the business models of sectors that are relatively dependent on free mobility, both for the "production" and demand side, such as travel. By contrast, other sectors may have benefitted from restricted mobility, such as technology, in part because the related social distancing and mobility restrictions sped up social developments that otherwise would likely have taken place only gradually. From an economic perspective, the heterogenous implications of behavioural restrictions matter because it has led to the possibility of an uneven recovery. While some firms may lose out more permanently, others may profit from the recent changes and exit the crisis relatively unharmed.

Most of the papers that analyse cross-sectoral heterogeneity use backward-looking data on sales, profitability, or labour activity. This paper complements this dimension by investigating forward-looking data on equity analysts' earnings per share (EPS) forecasts. These data reflect how financial analysts expect firms' earnings to develop over time and thus provide a forward-looking indicator of the dispersion across sectors. The analysis stipulates empirically whether changes in this indicator can be explained by the lockdown and social distancing measures.

The proposed forward-looking metric of dispersion relates to studies analyzing the stock market reaction to the COVID-19 pandemic. These studies find that the COVID-19 crisis had caused an unprecedentedly sharp drop in equity prices (e.g. Alfaro et al., 2020, Baek et al., 2020, Baker et al., 2020, He et al., 2020, Ramelli and Wagner, 2020, Ding et al., 2021, Mazur et al. 2021), mainly driven by downward revisions in earnings expectations and a spike in

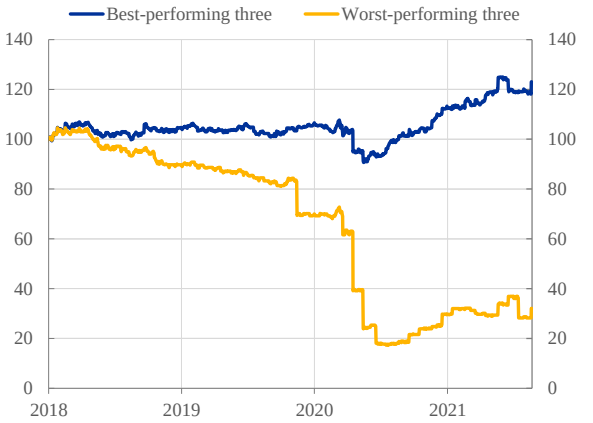
equity risk premia (e.g. Bretscher et al., 2020 and Landier and Thesmar, 2020).[5] In line with these findings, Chart 1 shows that the subsequent equity price recovery since March 2020 was largely underpinned by improvements in aggregate short-term earnings expectations.[6] However, developments in the latter varied greatly across sectors (Chart 2). Compared with the situation before the pandemic, expected short-term earnings remain permanently subdued for sectors such as travel and tourism, while they have recovered rapidly for the technology, utilities and financial services (excl. banks) sectors. As a result, current earnings expectations are in line with what is called a cross-sectoral K-shaped recovery (the decoupling of the recovery paths of the best and worst performing sectors visualize the two arms of the letter "K").

Chart 1: Broad stock market performance and EPS expectations *(index, EUR)*



Sources: Refinitiv.
Latest observation: 13 August 2021.

Chart 2: Earnings expectations for the best and worst performing sectors *(percent)*



Sources: Refinitiv, IBES.
Notes: Figures are normalized to 100 at 1 Jan 2018. The top 3 represents the technology, utilities and financial services (excl. banks) sectors. The bottom 3 includes the travel, banks, and drugs and groceries stores sectors. Latest observation: 13 August 2021.

There are a few recent papers that, in addition to Bretscher et al. (2020) and Landier and Thesmar (2020), also dissect the effects of the COVID-19 crisis on the earnings expectations

[5] Landier and Thesmar (2020) also show that while short-term earnings forecasts for the US decreased substantially since the start of the pandemic, longer-term earnings forecasts remained relatively stable.

[6] Earnings expectations are an important driver of stock prices. See for example Kapp and Kristiansen (2021) for more information on the drivers of stock prices and equity risk premia.

for firms.[7] Papanikolaou and Schmidt (2020) focus on the United States and show that the downward revisions in revenue forecasts are heterogenous across sectors. More specifically, the authors find that sectors in which a larger share of the workforce is unable to work remotely experience the largest reductions in expected revenue growth. Gao et al. (2021) focus on China and show that for individual firms, earnings forecasts have become more scattered across analysts as mobility restrictions tightened during the pandemic. Hong et al. (2020) look at the United States and show that the downward revisions in forecasted earnings lasted until the expected start of vaccinations.

The contribution of this paper to the above studies is fourfold. First, this paper focuses on the euro area. Second, this study uses the Gini coefficient as an indicator of cross-sectoral dispersion in earnings expectations. The key advantage of the Gini coefficient is that it demonstrates the degree of cross-sectoral dispersion at any given time while being relatively easy to interpret. Third, using state-dependent models, the impact of vaccinations policies is accounted for by investigating the effects of COVID-19 lockdown measures on cross-sectoral dispersion in earnings expectations in the periods before and after the start of vaccinations. Fourth, in terms of earnings expectations, this paper studies whether cross-sectoral dispersion and vaccination progress have contributed to an uneven recovery in earnings expectations across euro area countries.

The results lead to four key conclusions. First, the tightening in lockdown measures have persistently increased the cross-sectoral dispersion in 12-month ahead earnings expectations. Before the start of vaccinations, the travel sector performed by far the worst relative to other sectors' earnings expectations. Second, the dispersion has contributed to a heterogenous recovery across countries, because the impact of tightening lockdown measures on earnings expectations was less severe for countries that are relatively independent from the travel sector than for other countries. Third, the start of vaccination rollouts has been a game changer. After the start of vaccinations, the impact of lockdown measures on the cross-

[7] In addition to earnings forecasts, Gormsen and Koijen (2020) analyze the reaction of dividend futures to the COVID-19 crisis. They find that the drop in annual dividend growth is almost twice as large in the European Union compared to Japan and the United States.

sectoral dispersion in earnings expectations decreased by 75%, with also cross-country differences disappearing. Nonetheless, tighter mobility restrictions in the post-vaccine period continued to have some negative bearing on earnings expectations in countries with relatively low vaccination rates. Fourth, despite progress in vaccinations, cross-sectoral dispersion in earnings expectations remains elevated, indicating persistent expectations of an uneven economic recovery.

The rest of this paper is organized as follows. Section 2 describes the data. Section 3 discusses the empirical methodology. Section 4 presents the results, and section 5 concludes.

2. Data

The analysis uses data on 12-month ahead EPS forecasts for listed euro area firms.[8,9] The data are available at a daily frequency across a maximum number of 20 different sectors for the euro area as a whole, and across the following individual countries: Austria, Belgium, Finland, France, Germany, Greece, Italy, Netherlands, Portugal and Spain.[10] The data are aggregated at the sector- and country-level by calculating the weighted average, using a firm's total number of shares outstanding.[11] The EPS forecast data stem from the Refinitiv Institutional Brokers' Estimate System (I/B/E/S). In order to gauge a sector's relative performance, data on 12-month ahead EPS forecasts aggregated for the total euro area stock market are also included. For the total market aggregation of EPS forecasts, this paper uses the Thomson Reuters euro area Total Market Index from Refinitiv I/B/E/S. In addition, the

[8] The data time series reflect a historically consistent set of firms (e.g. firms that are delisted at any given time are dropped from the data sample).

[9] This paper does not analyse longer-term earnings expectations, as there are no daily data at the sectoral level. Moreover, this paper investigates the most immediate effects of the COVID-19 crisis on firms' expected performance, which are generally clearly reflected in revisions to shorter-term earnings expectations.

[10] Together, the sectors fully add up to the Refinitiv total euro area market index, which can be considered a representative sample of the population. The sectors included are: Autoparts, Banks, Basic Resources, Chemicals, Construction Materials, Consumer Products and Services, Drugs and Groceries Stores, Energy, Financial Services (excl. banks), Food and Beverages and Tobacco, Healthcare, Industrial Goods and Services, Insurance, Media, Real Estate, Retailers, Technology, Telecom, Travel and Leisure, and Utilities.

[11] $\text{EPS 12M}_{aggregate} = \frac{\sum_{c=1}^{T}(\text{EPS 12M}_i * Shares\ Outstanding_c)}{\sum_{c=1}^{T}(Shares\ Outstanding_c)}$, where the subscript *c* denotes the individual corporation and *T* the total number of corporations included in the sector or country.

analysis accounts for the volatility of the broader stock market by looking at the 30-day implied volatility, i.e. the VStoxx index. These data also stem from Refinitiv I/B/E/S. The empirical analysis covers the full-time span of the COVID-19 crisis: from January 2020 to August 2021.[12]

As a measure of cross-sectoral dispersion in earnings expectations, the Gini coefficient is used. For a variable of interest (here: earnings expectations), sampled across individuals (here: sectors), the Gini coefficient can be interpreted as a scaled average of the absolute differences in the variable's outcome between all pairs of individuals.[13] In this way, the Gini coefficient has been used in various fields of science, including finance.[14] Appendix A provides further details.

For measuring cross-sectoral dispersion in earnings expectations, the Gini coefficient has several advantages over simpler measures of dispersion such as the standard deviation. First, it demonstrates the degree of inequality in any statistical distribution of earnings expectations.[15] Second, as a ranking measure, it is not very sensitive to outliers.[16] As such, the Gini coefficient provides information on how the ranking of sectors changes over time. Third, the Gini coefficient provides a relatively easy to interpret summary metric: it reaches its maximum value of 1 when earnings expectations are positive for one sector and zero for all others, and 0 when all sectors contribute equally to the sum of expected earnings. On top of these advantages, this paper calculates the Gini coefficient using data on earnings expectations in levels instead of growth rates to assess whether changes in cross-sectoral dispersion are structural. Basing the Gini coefficient on levels also has the advantage of

[12] The data are accessed at August 20.

[13] This is mathematically equivalent to the Gini coefficient's standard formulation based on the Lorenz curve. See Appendix A for further details.

[14] For example, Bongaerts et al. (2012) use the Gini coefficient to gauge the dispersion in the accuracy of default predictions by credit rating agencies; Jaremski (2018) measures the distribution of banks' assets via the Gini coefficient; Hautsch and Horvath (2019) use the Gini coefficient as a measure of individual stocks concentration.

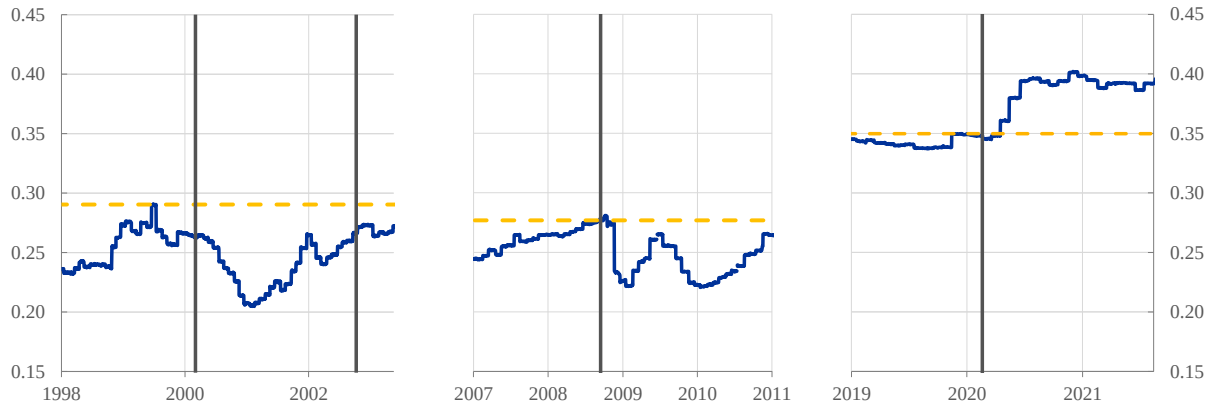
[15] By means of alternative, this can also be demonstrated by the interquartile range.

[16] The Gini coefficient does not apply quadratic values, in contrast to for example standard deviation. See Appendix A for further details.

excluding base effects, which occur when using growth rates because the time reference matters for the size of the change in earnings expectations across sectors.

The data show that the Gini coefficient of cross-sectoral earnings expectations has persistently risen since the onset of the COVID-19 crisis, in contrast to past crises such as the Dot-com bubble and Global Financial Crisis (GFC), where the impact was more homogeneous (Chart 3). While the Gini coefficient dropped after the collapse of Lehman Brothers during the Global Financial Crisis – reflecting a broad-based downward revision of the earnings outlook for especially the overperforming sectors – it trended upwards since the start of the COVID-19 crisis. Together, these observations signal a structural shift in expectations during the current pandemic: the market expects some sectors to persistently underperform others over the coming year. Chart B1 in Appendix B shows the daily developments in the Gini coefficient of cross-sectoral dispersion in earnings expectations since 1998 without breaks in the data.

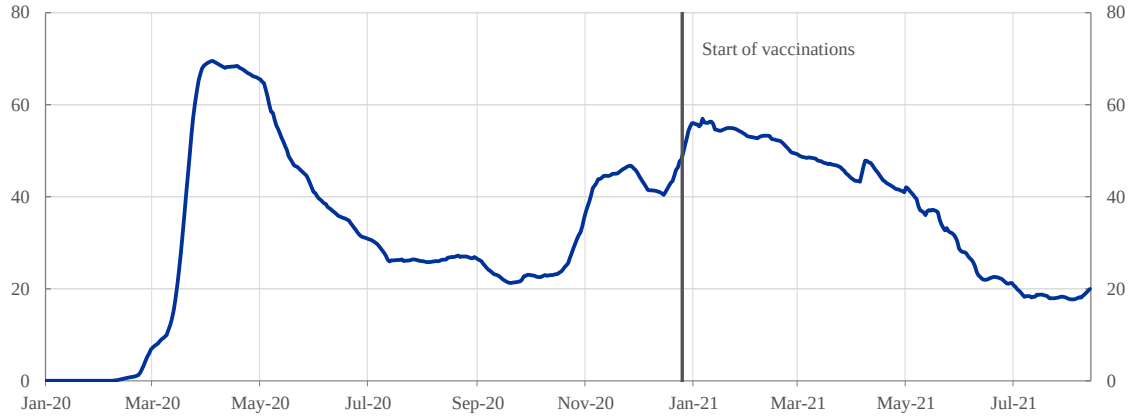
Chart 3: Gini coefficient of corporate earnings expectations during the (i) Dot-Com Crisis, (ii) Global Financial Crisis and (iii) COVID-19 Crisis



Sources: Refinitiv, IBES and author calculations.
Notes: The blue line shows the Gini coefficient based on earnings expectations 12-months ahead across 20 sectors. The yellow dashed line indicates the pre-crisis high for the relevant period. The vertical lines mark the date of the peak of the NASDAQ before the Dot-Com crisis outburst (lhs), the NASDAQ market bottom during the Dot-Com crisis outburst (lhs), Lehman bankruptcy (middle), and the outbreak of the COVID-19 crisis (rhs). Latest observation: 13 August 2021.

The decline in mobility due to lockdown measures help to explain why the dispersion in earnings expectations increased during the COVID-19 crisis – with distancing measures generally being the biggest difference to past crises. The reason is that mobility restrictions affect economic activity differently across sectors. To investigate the impact of a tightening in lockdowns, the Goldman Sachs ELI for Western Europe is used as an indicator of lockdown stringency.[17] The ELI accounts for a combination of official government restrictions and actual mobility data (using Google). Chart 4 plots the ELI over time. The indicator shows that behavioural restrictions due to lockdowns were largest in April and May 2020, but remained elevated after the start of vaccinations in 2021. The ELI is effectively 0 in the sample period from January to February 2020, because lockdown policies were not yet being implemented during that time.

Chart 4: Effective lockdown index developments



Source: Goldman Sachs
Notes: This figure shows developments in the Goldman Sachs Effective Lockdown Index (ELI) for Western Europe. The ELI accounts for a combination of official government restrictions and actual mobility data (using Google). The data show that behavioural restrictions due to lockdowns were largest in April and May 2020, but remained persistently elevated after the start of vaccinations in 2021. Latest observation: 13 August 2021.

Table 1 shows the descriptive statistics of the data. The descriptive statistics are provided for the periods prior and post the start of vaccinations in December 2020. Several observations

[17] In a separate robustness check, the ELI for Western Europe is substituted with the country-specific ELI, weighted by the capital key. The conclusions remain unchanged.

stand out. First, the Gini coefficient shows more variation in the period prior to the start of vaccinations than thereafter. This reflects the developments in the right-hand-side of Chart 3, which shows that the Gini coefficient rises in 2020, and remains persistently elevated in 2021. Second, sectoral EPS forecasts have been changing by more than 100%. This is because prior vaccinations, analysts temporarily expected the travel sector's earnings for the following year to be negative. Third, lockdown measures remained relatively tight in the period after the start of vaccinations, as also described in Chart 4. Fourth, stock market volatility has been higher in the pre-vaccine period than in the post-vaccine period. There are no missing values in the data.[18]

Table 1: Descriptive statistics

Variables	Obs		Mean		Std Dev		Min		Max	
	Prior vaccine	Post vaccine	Prior vaccine	Post vaccine	Prior vaccine	Post vaccine	Prior vaccine	Post vaccine	Prior vaccine	Post vaccine
Cross-sectoral dispersion										
Gini coefficient	258	165	37.71	39.21	2.15	0.33	34.49	38.62	40.22	40.00
EPS forecasts developments										
Sector EPS forecasts (Δ%)	5140	3300	-0.05	0.08	3.71	2.47	-168.18	-66.67	137.50	41.18
Country EPS forecasts (Δ%)	2570	1650	-0.09	0.06	1.43	1.39	-21.77	-34.17	13.01	20.36
Lockdown stringency										
Effective lockdown index	258	165	31.37	38.44	19.92	13.81	0.00	17.69	69.46	56.96
Control variables										
Stock market volatility	258	165	29.04	19.78	12.83	2.71	10.69	15.15	85.62	29.01
Total market EPS forecasts (Δ%)	257	165	-0.05	0.05	1.40	1.01	-15.70	-7.75	3.67	5.65

Notes: This table presents the descriptive statistics of all variables from the 1st of January 2020 to the 13th of August 2021. The first variable represents the Gini coefficient of cross-sectoral dispersion. The second and third variables are the developments (percentage changes) in the 12-month ahead EPS forecasts at the sectoral- and country-level, respectively. The fourth variable is the Goldman Sachs' effective lockdown index (ELI) for Western Europe. The last two variables represent the 30-day implied volatility of STOXX50E and developments (percentage changes) in the 12-month ahead EPS forecasts for the total EA market, respectively.

Further to this, country-level data on the GDP contributions of the different sectors in 2018 are used to determine a country's relative dependence on a given sector. These data are from Eurostat and World Bank (World Travel & Tourism Council). Data on the countries' debt-

[18] In Table 1, note that the developments in the EPS forecasts at the sectoral-, country- and total market level exclude the first observation at the beginning of the daily sample due to the calculation of percentage changes.

to-GDP ratios are included to cluster countries into relatively high- versus low-debt jurisdictions. These data are from the ECB Statistical Data Warehouse and cover the period until March 2021. Data on the share of the countries' population vaccination rates are also used. These data are provided by Our World in Data (see also Ritchie et al., 2020) and cover the full sample period with daily frequency.

3. Empirical methodology

To understand the relationship between lockdown measures and the dispersion in earnings expectations for firms, empirical estimations are employed using four separate models. The first model estimates the effect of tightening lockdown measures on the Gini coefficient of cross-sectoral dispersion in firms' earnings expectations. The second model compares the relative performance of individual sectors by regressing sectoral earnings expectations on the stringency of lockdowns using sectoral-panel regressions. The third model performs country-panel estimations, estimating the impacts of lockdown measures on the earnings expectations for countries that are relatively independent from the underperforming sector versus the other countries. The fourth model employs country-panel estimations, determining the impact of lockdown measures on the earnings expectations for countries with relatively high versus low vaccination rates. All four models are estimated through local projections to check the persistence of the effects.

3.1. Effects on the Gini coefficient of cross-sectoral dispersion

To analyse the impact of lockdown stringency on cross-sectoral dispersion in firms' earnings expectations, local projections are estimated on the following model:

$$Gini_{t+h}^{EPS} - Gini_{t-1}^{EPS} = \beta_{1,h}\left(Lockdown_t^{index} * Pre_t^{vaccine}\right) + \beta_{2,h}\left(Lockdown_t^{index} * Post_t^{vaccine}\right) + \beta_{3,h} VSTOXX_t + \beta_{4,h}\left(Market_{t+h}^{EPS} - Market_{t-1}^{EPS}\right) + \epsilon_{t+h} \quad (1)$$

which runs 21 separate regressions for h = 0, 1, …, 20 working days, and where $Gini_{t+h}^{EPS} - Gini_{t-1}^{EPS}$ represents changes in the log of the Gini coefficient of cross-sectoral dispersion in 12-month ahead earnings expectations, $Lockdown_t^{index}$ is the ELI, $Pre_t^{vaccine}$ and $Post_t^{vaccine}$ indicate dummies that respectively indicate the period before and after the vaccine rollout in late December 2020, $VSTOXX_t$ is the implied volatility of the euro area broad stock market, $Market_{t+h}^{EPS} - Market_{t-1}^{EPS}$ is a benchmark variable that indicates changes in the log of 12-month ahead earnings expectations for the total euro area stock market, ϵ_{t+h} is the error term, and the subscript *t* denotes the day.

The local projections are based on Jordà (2005). The model is state-dependent, meaning that $\beta_{1,h}$ and $\beta_{2,h}$ represent the estimated impact (respectively pre- and post-vaccine introduction) of a change in the lockdown index on the Gini coefficient *h* working days ahead. Generalized impulse responses are plotted as the sequence of the estimated betas, multiplied by 50 to reflect an increase in lockdown stringency by 50 index points. At each forecast horizon, changes in earnings' expectations for the total euro area stock market are accounted for.

3.2. Effects on individual sector performance

To identify which sectors are underperforming relative to the total market during lockdowns, an individual sector's relative performance is gauged using a different model that estimates cross-sectoral panel local projections:

$$EPS_{s,t+h}^{forecast} - EPS_{s,t-1}^{forecast} = \beta_{1,s,h}\left(Lockdown_{s,t}^{index} * Pre_t^{vaccine}\right) + \beta_{2,s,h}\left(Lockdown_{s,t}^{index} * Post_t^{vaccine}\right) + \beta_{3,h}VSTOXX_t + \beta_{4,h}\left(Market_{t+h}^{EPS} - Market_{t-1}^{EPS}\right) + \epsilon_{s,t+h} \quad (2)$$

for h = 0, 1, …, 20 working days, and where $EPS_{s,t+h}^{forecasts} - EPS_{s,t-1}^{forecast}$ indicates the change in the log of 12-month ahead earnings expectations for euro area stock markets, and the subscript *s* denotes 1 of the 20 sectors, such that $\beta_{1,s,h}$ and $\beta_{2,s,h}$ estimate the pre- and post-

vaccine effects of lockdown measures at the sectoral level, respectively. In model (2), the coefficient $\beta_{4,h}$ represents the estimated beta of cross-sectoral earnings expectations, i.e. the response of sectoral earnings expectations to the earnings expectations for the total euro area stock market. Controlling for broad stock market developments allows for a quantification of the relative performance of sectoral earnings expectations.

3.3. Effects on individual country performance

Differences between sectors' relative performance during lockdowns may have implications for the developments in earnings expectations at the country-level. The total earnings expectations for countries that are relatively independent from the most underperforming sector are likely to be less adversely affected by a tightening in lockdowns than the total earnings expectations for the other countries. In addition, within countries that are relatively independent from the underperforming sector, better-performing sectors may be less negatively impacted by the relatively poor performance of the underperforming sector. Therefore, in an additional exercise, the relative performance of the total earnings expectations for individual countries is compared by estimating the following model:

$$EPS_{c,t+h}^{forecast} - EPS_{c,t-1}^{forecast} = \beta_{1,h}\left(Lockdown_{c,t}^{index} * Pre_t^{vaccine} * Independent_c^{sector}\right) + \beta_{2,h}\left(Lockdown_{c,t}^{index} * Post_t^{vaccine} * Independent_c^{sector}\right) + \beta_{3,h}\left(Lockdown_{c,t}^{index} * Pre_t^{vaccine} * Others_c\right) + \beta_{4,h}\left(Lockdown_{c,t}^{index} * Post_t^{vaccine} * Others_c\right) + \beta_{5,h} VSTOXX_t + \beta_{6,h}\left(Market_{t+h}^{EPS} - Market_{t-1}^{EPS}\right) + \beta_{7,h} High_c^{debt} + \epsilon_{c,t+h} \quad (3)$$

for h = 0, 1, …, 20 working days, and where $Independent_c^{sector}$ and $Others_c$ represent dummies that respectively indicate whether the underperforming sector's GDP contribution to a country is below or above the 25th percentile of the sector's GDP contribution in the entire sample, $High_c^{debt}$ denotes a dummy that indicates whether the mean of a country's debt to GDP ratio is above or below the sample median, and the subscript *c* denotes 1 of the

10 countries. The debt-to-GDP ratio is controlled for because it may impact analysts' earnings expectations and correlates with a country's relative dependence on certain sectors (e.g. indebted countries such as Greece, Italy and Portugal are captured by the dummy $Others_c$ since they are relatively dependent on the travel sector).

In the period after the start of vaccinations, the impact of lockdowns on earnings expectations may also vary across countries depending on how successful their vaccination campaigns were. To compare the relative performance of earnings expectations for countries that have relatively high versus low vaccinations rates as a separate exercise, the following model is estimated for the period after the start of vaccinations:

$$EPS_{c,t+h}^{forecast} - EPS_{c,t-1}^{forecast} = \beta_{1,h}\left(Lockdown_{c,t}^{index} * High_c^{vaccine}\right) + \beta_{2,h}\left(Lockdown_{c,t}^{index} * Low_c^{vaccine}\right) + \beta_{3,h}VSTOXX_t + \beta_{4,h}\left(Market_{t+h}^{EPS} - Market_{t-1}^{EPS}\right) + \beta_{5,h}High_c^{debt} + \epsilon_{c,t+h} \quad (4)$$

for h = 0, 1, …, 20 working days, and where $High_c^{vaccine}$ and $Low_c^{vaccine}$ represent dummies that respectively indicate whether, by the end of April 2021 (four months after the start of vaccinations, and in the middle of the sample period after the start of vaccinations), the total share of a country's vaccinated population is below or above the sample median.

4. Results

This section presents the main results.

4.1. Effects on the Gini coefficient of cross-sectoral dispersion

Chart 5 presents the Gini coefficient of cross-sectoral dispersion in EPS forecasts on the left-hand side, and the estimates for model (1) on the right-hand side. The shaded area represents

the 90% confidence interval. Newey-West standard errors robust to heteroscedasticity and autocorrelation up to the fifth lag are used.[19]

The results indicate that, before the start of vaccinations, the Gini coefficient of cross-sectoral dispersion in 12-month EPS forecasts persistently increased with a tightening in lockdown measures. Up until December 2020, imposing a lockdown such that the ELI rises by 50 points (which is half of its maximum range from 0 to 100, and corresponds to the change observed during March 2020) significantly increased the Gini coefficient by 2.5 percentage points after 20 working days. This change is sizable: it resembles approximately 2.5 times the standard deviation of monthly percentage changes in the Gini coefficient of cross-sectoral dispersion since early 2018, corresponding to the time period of the left-hand-side of Chart 5.[20] At the same time, the start of vaccination campaigns has been a game changer. Stringent lockdowns added far less to the dispersion metric after vaccinations started in the euro area in late 2020. Since mid-December 2020, the effects of restrictive lockdown measures on cross-sectoral dispersion decreased by more than 75 percent.[21] The Gini coefficient of cross-sectoral dispersion also no longer reacted significantly to a tightening of lockdowns over most of the forecasted horizon. By implication, while remaining elevated, cross-sectoral dispersion in earnings forecasts did not rise further during 2021.

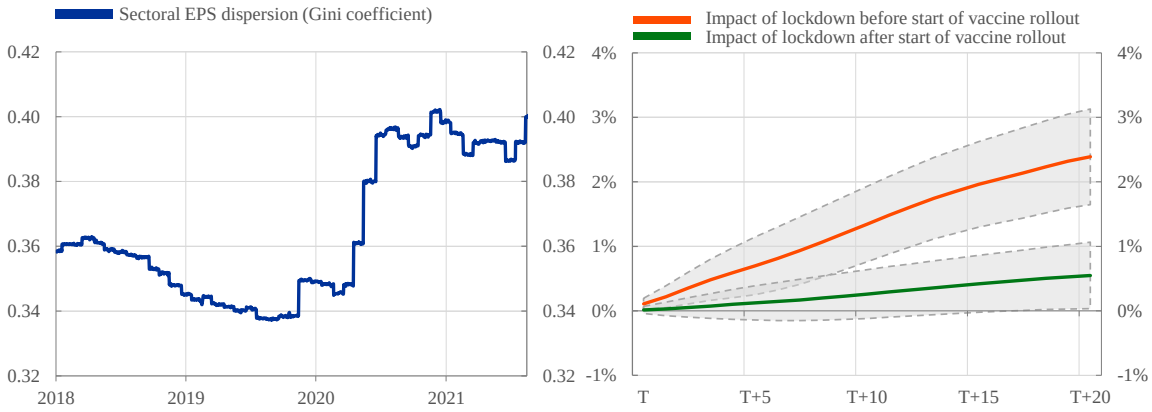
In a separate specification, the date of announcement of the vaccine rollout in early November 2020 is used as an alternative proxy for the impact of the vaccination policies. The results show that the impact of stringent lockdowns on cross-sectoral dispersion in earnings expectations is broadly similar when looking at the period as of early November 2020 rather than mid-December 2020 (available upon request).

[19] The number of lags is based on the number of observations and data frequency.

[20] It corresponds to close to 2 times the standard deviation of the Gini coefficient of cross-sectoral dispersion when the periods of the GFC and sovereign debt crisis are included.

[21] The ELI is a continuous stringency index with respectively 258 and 165 observations during the pre- and post-vaccinations periods (since the first lockdown, the mean value of the ELI is approximately 50 and 40 out of 100 during the periods prior and post vaccinations, respectively). Econometrically, the estimated impact of imposing a lockdown is thus derived from the continuous data series.

Chart 5: Sectoral dispersion in EPS forecasts and estimated impact of lockdowns before and after vaccinations *(index, percentage points)*



Sources: Refinitiv, Goldman Sachs, and author calculations.

Notes: This chart shows the impact of lockdowns (i.e. lockdown stringency index increase by 50 points) on the Gini coefficient of sectoral 12-month EPS forecasts. The estimated impacts are state-dependent on the start of vaccinations by the end of December 2020. The effects are estimated using local projections. The shaded areas represent 90% confidence intervals using Newey-West standard errors robust to heteroscedasticity and autocorrelation. Latest observation: 13 August 2021.

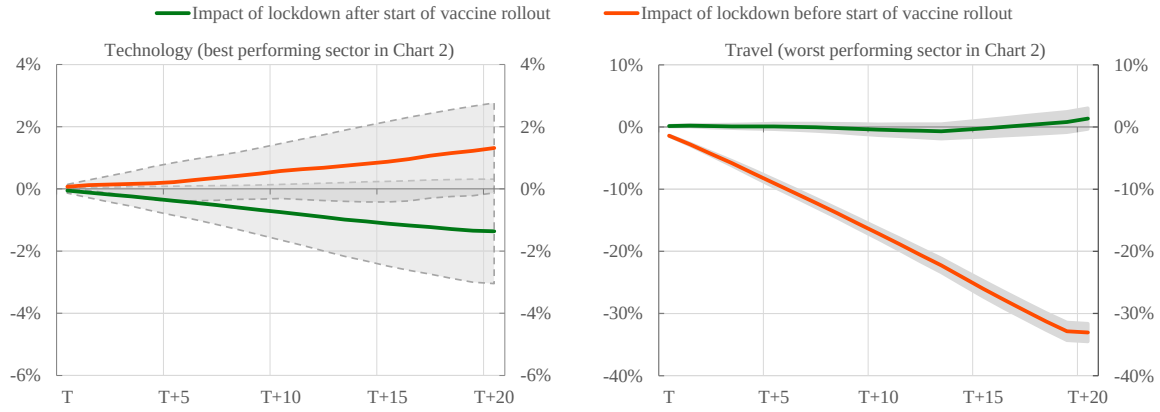
4.2. Effects on individual sector performance

Digging deeper into the sectoral dimension, Chart 6 presents the panel estimations for model (2), specifically focussing on technology and travel, which have so far been the best- and worst-performing sectors in Chart 2, respectively. The results for the other sectors are also described in the text below. Compared to the estimated impacts of lockdowns on the EPS forecasts for the other sectors, the travel sector has by far been the largest underperformer in the period prior vaccinations. Robust standard errors clustered at the sectoral level are used.

The results show that, during a tightening of lockdowns prior vaccinations, the travel sector has by far underperformed relative to the earnings expectations for the total market. A 50-points increase in the lockdown index decreased the travel sector's earnings expectations by more than 30 percentage points relative to the broader stock market after 20 working days. The narrow confidence band indicates how statistically significant this effect is. By contrast, the EPS forecasts for the technology sector increased during more stringent lockdowns. The earnings expectations for the technology sector increased by approximately 1.5% during a 50-points increase in the lockdown index. However, this effect is not statistically significant at the 10% level.

After the start of vaccinations, renewed tightens in lockdowns no longer significantly impacted the earnings expectations for the travel sector, both statistically and economically. This result may reflect the conviction that the latest lockdowns were anticipated to be the last, making a reopening of the economy more likely. Compared to before the vaccine rollout, lockdowns no longer had a statistically significant effect on the EPS forecasts for the technology sector. Overall, these effects did not suffice to lead to a reversal in the overall measure of dispersion, which continues to signal 1-year ahead expectations for an uneven recovery (Chart 5; left-hand side).

Chart 6: Impact of lockdowns before and after vaccinations on earnings expectations across sectors



Sources: Goldman Sachs, Refinitiv, and author calculations.
Notes: This chart shows the impacts of a tightening in lockdowns on sectoral 12-month EPS forecasts for the technology and travel sectors, relative to the market average by also controlling for the 12-month EPS forecast for the total EA market. See also the notes to Chart 5. Latest observation: 13 August 2021.

The estimations for model (2) also suggest that, at the 10% significance level, several other sectors have been affected by tightening lockdown measures (not shown). Relative to the earnings expectations for the total market, a tightening of lockdowns prior vaccinations had impacted the banking, basic resources, energy and industrial goods and services sectors negatively, and the healthcare and drugs and groceries stores positively. After the start of vaccinations, more stringent lockdowns had a negative impact on the construction materials, consumer production and services, drugs and groceries stores, food and beverages and

tobacco, healthcare, insurance, real estate, retailers, telecom and utilities sectors, and a positive impact on the basic resources and energy sectors, relative to the total market.

4.3. Effects on individual country performance

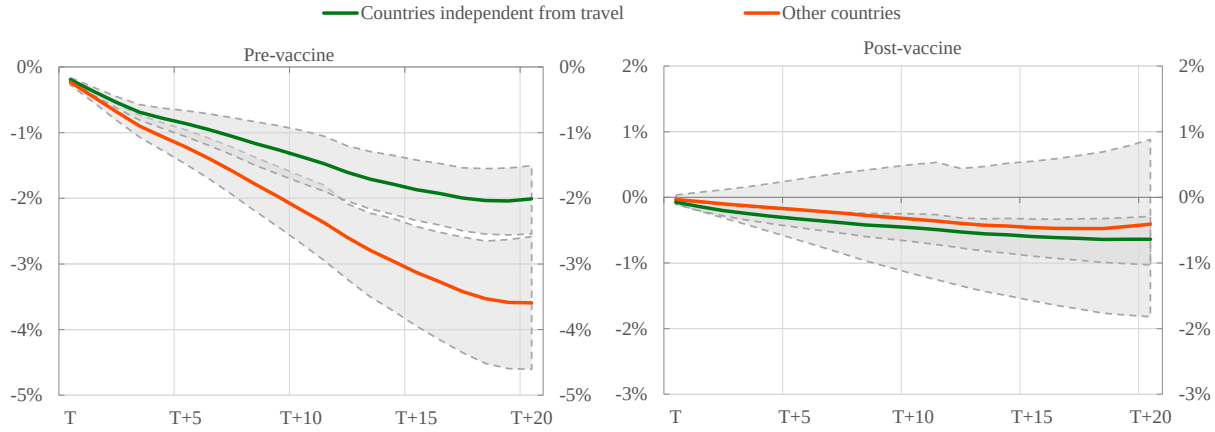
In terms of earnings expectations, countries that are relatively independent from travel may have been less adversely affected by the travel sector's poor performance during tight lockdowns. To analyse differences between the effects of lockdowns on earnings expectations for countries that are relatively independent from the travel sector versus other countries, Chart 7 presents country-panel estimations for model (3). Gauged from country-level data on the GDP contributions of the travel sector, Belgium, Finland and the Netherlands are considered independent from travel as the travel sector's GDP contributions to these countries are below the 25^{th} percentile of the sample. The data show that, compared to the other countries in the sample, Belgium, Finland and the Netherlands form a cluster with particularly low GDP contributions of the travel sector. As for the other countries, this paper includes a dummy variable that equals 1 when a country has a relatively high debt-to-GDP ratio. Public debt is controlled for because it correlates with a country's relative dependence on travel, which may impact analysts' earnings expectations (e.g. indebted countries such as Greece, Italy and Portugal are relatively dependent on travel). Robust standard errors clustered at the country level are used.

The results suggest that before the start of vaccinations, the negative impact of lockdowns on earnings expectations is smaller for countries that are relatively independent from the travel sector. Prior vaccinations, a 50-points increase in the lockdown index decreased the earnings expectations for travel-dependent countries by 3.5 percentage points relative to the total market after 20 working days. Following a similar increase in lockdown stringency in the same period, the earnings expectations for the other countries only drop by 2 percentage points relative to the total market. For the longer forecast horizons, the results of a Z-test show that the difference between the estimated effects for countries that are relatively

independent from the travel sector and the other countries is statistically significant at the 5% level (not shown in Chart 7).[22]

In a separate robustness check, a country's relative independence from the travel sector is measured by creating dummies that respectively indicate whether the travel sector's GDP contribution to a country is below or above the sample median. By implication, in addition to Belgium, Finland and the Netherlands, this exercise also considers France and Germany relatively independent from the travel sector. The results continue to show that, prior vaccinations, lockdowns have had a more adverse impact on the earnings expectations for countries that are relatively independent from the travel sector than for the other countries. However, the difference between the effects for the two groups of countries is not statistically significant.

Chart 7: Impact of lockdowns before and after vaccinations on earnings expectations across countries



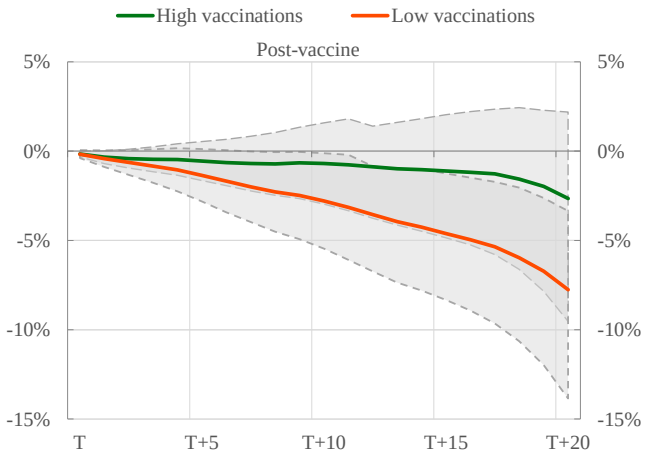
Sources: Goldman Sachs, Refinitiv, World Bank and author calculations.
Notes: This chart shows the impacts of lockdowns on sectoral 12-month EPS forecasts for countries that are relatively independent from the travel sector (i.e. Belgium, Finland and the Netherlands) and the other countries, relative to the market average by also controlling for the 12-month EPS forecast for the total market. The difference between the estimated effects for countries that are relatively independent from the travel sector and the other countries is statistically significant at the 5% level. See also the notes to Chart 5. Latest observation: 13 August 2021.

[22] Where, for model (3), the tested hypothesis is $H_0: \beta_{1,c,h} = \beta_{2,c,h}$ for $h = 0,1,\dots,20$.

In addition, Chart 7 shows that the country-level earnings expectations are no longer significantly impacted by the implementation of lockdowns in the period after the start of vaccinations. Moreover, during that period, a tightening in lockdowns is not found to have a different impact on countries that are relatively independent from the travel sector versus the other countries, both statistically and economically.

However, the post-vaccine impact of lockdowns on earnings expectations may have still varied across countries depending on their progress in vaccination rates. To compare the relative performance of earnings expectations for countries that have relatively high versus low vaccinations rates (based on the sample median by the end of April 2021), Chart 8 presents country-panel estimations for model (4) using robust standard errors clustered at the country level.

Chart 8: Impact of lockdowns after vaccinations on earnings expectations across countries



Sources: Goldman Sachs, Refinitiv, Our World in Data and author calculations.
Notes: This chart shows the impacts of lockdowns on sectoral 12-month EPS forecasts for countries with relatively high and low vaccination rates, relative to the market average by also controlling for the 12-month EPS forecast for the total market. See also the notes to Chart 5. Latest observation: 13 August 2021.

The results show that a tightening of lockdowns only reduced the earnings expectations for countries with relatively low vaccination rates in the period after the start of vaccinations. A 50-points increase in the stringency of lockdowns decreased the earnings expectations for relatively low-vaccinated countries by more than 7 percentage points. This effect is significant at the 10% level. The earnings expectations for countries with relatively high vaccination rates did not significantly drop during lockdowns in the period post-vaccinations. A separate robustness check shows the results are not driven by whether a country is relatively independent from travel, because the results are similar when the dummy indicator of travel independence is included as a control variable (available upon request).

5. Conclusion

Cross-sectoral dispersion in earnings expectations surged in response to the stringent lockdowns during the COVID-19 pandemic. Since then, heterogeneity in the earnings expectations for firms has remained high. This stands in contrast with developments during the GFC, when most companies were affected alike, such that the dispersion in euro area earnings expectations dropped at first and then normalized.

A closer look at sectoral-level data indicates that, prior to vaccinations, deteriorating earnings forecasts for the travel sector were the main driver of cross-sectoral dispersion during lockdowns. In line with the notion that some countries are economically more dependent on some sectors than others, the poor performance of the travel sector is also found to have led to a more heterogenous recovery across countries prior vaccinations. Countries that are relatively independent from the travel sector are found to have been affected least by lockdowns in terms of forecasted earnings.

However, stringent lockdowns added far less to the cross-sectoral dispersion in earnings forecasts after the start of vaccinations. This mostly followed from the fact that lockdown regimes had no further impact on the earnings expectations for the travel sector after the start of vaccinations. As a result, during the lockdowns after the start of vaccinations, countries that are relatively independent from travel no longer performed better than the other countries,

although the earnings expectations for countries with relatively low vaccination rates continued to drop. Together, the findings signal that the success of vaccination campaigns is important to break ground for a more even recovery across sectors and countries than is currently expected.

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Appendix A. The Gini coefficient as a cross-sectoral dispersion metric of EPS forecasts

The Gini coefficient can be interpreted as the sum of the scaled absolute differences in the EPS forecasts between all pairs of sectors:

$$Gini = \frac{\sum_{i=1}^{N}\sum_{j=1}^{N} w_i w_j |EPS_i - EPS_j|}{2\mu_{eps}} = \frac{\sum_{j=2}^{N}\sum_{i=1}^{j-1} w_i w_j (EPS_j - EPS_i)}{\mu_{eps}} = \frac{\frac{1}{N^2}\sum_{j=2}^{N}\sum_{i=1}^{j-1}(EPS_j - EPS_i)}{\mu_{eps}} \quad \text{(A.1)}$$

with $EPS_1 \leq EPS_i \leq EPS_N$ in ascending order and where EPS_i and EPS_j represent 12-month ahead EPS forecasts (in euros) for sectors i and j, respectively; N equals 20, the total number of sectors; w_i and w_j are set to $\frac{1}{N}$, reflecting equal weights for sectors i and j, such that $\sum_{i=1}^{N} w_i = 1$; and μ_{eps} represents the cross-sectoral mean of EPS forecasts: $\sum_{i=1}^{N} w_i EPS_i$. Equation (A.1) shows the Gini coefficient is scaled between 0 and 1, and independent of unit changes in the underlying data.

In the case of maximum inequality, equation (A.1) can be rewritten as:

$$Gini\ max = \frac{\frac{1}{N^2}\sum_{i=1}^{N-1} EPS_N}{EPS_N/N} = \frac{N-1}{N} \quad \text{(A.2)}$$

where $|EPS_j| = 0$ for $j = 1, 2, \ldots, N-1$ and $|EPS_N| > 0$, such that only one sector has EPS forecasts larger than 0 (in absolute terms). Equation (A.2) shows that the range and granularity of the Gini coefficient increases with N. Hence, including only a small set of sectors may provide a less informative indicator of cross-sectoral dispersion. In this study, N is equal to 20 such that the Gini coefficient can take on a maximum value of 0.95 (19/20), which is considered sufficiently large for an accurate estimation of the Gini coefficient (see also Gastwirth, 1972).

Equation (A.1) is numerically equal to the Gini coefficient's standard formulation based on the Lorenz curve:

$$Gini = 1 - \sum_{k=1}^{N} (p_{k+1} - p_k)[L(p_{k+1}) + L(p_k)]$$
$$= 1 - \frac{1}{20}\sum_{k=1}^{N=20}[L(p_{k+1}) + L(p_k)] \quad \text{(A.3)}$$

Where p_k is the cumulative share of sectors ordered by earnings expectations; $L(p_k)$ is the Lorenz curve as a function of the cumulative contribution of a sector's EPS forecasts to the sum of the EPS forecasts for all sectors; and the subscript *k* represents the sectors ordered by EPS forecasts. Graphically, the Gini coefficient represents the area below the Lorenz curve relative to the area under the equality line.

To obtain a daily time series of the Gini coefficient, this study calculates equation (A.3) for each time observation in the data. Further, this study assigns equal weights across sectors so as to make the sector weights constant over time. As such, developments in the Gini coefficient solely reflect changes in the cross-sectoral distribution of EPS forecasts. If the weights were instead based on the sizes of the individual sectors – gauged for example from market capitalization or reported revenue – then changes in the Gini coefficient would also reflect changes in a sector's size, which makes the metric more difficult to interpret (the distribution of EPS forecasts may for example have remained constant). Related to this, the number of sectors used is also constant over time.

Appendix B. Additional output

Chart B1: Gini coefficient since 1998 (index)

Sources: Refinitiv, IBES and author calculations.
Notes: This chart shows the daily Gini coefficient of sectoral 12-month EPS forecasts since 1 January 1998. Latest observation: 13 August 2021.

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