BUREAU FOR ECONOMIC RESEARCH

The South African manufacturing Purchasing Managers' Index™

A monthly index of business conditions in the manufacturing sector

Introduction

The BER has proudly produced a monthly manufacturing Purchasing Managers' Index™ (PMI™)[1] since September 1999, with the first publication of the index in the public domain in September 2000. The PMI is currently sponsored by Absa Bank and is released as the Absa PMI. The entire PMI time series as well as the monthly reports are available on the **BER's website**.

The manufacturing PMI is a composite index based on the results of five weighted questions. The results are derived from monthly surveys conducted under a representative group of purchasing managers in the manufacturing sector. In line with the experience internationally, the BER's PMI is closely watched as its consistent release on the first working day of the month means that it is one of the first indicators of how not only the manufacturing sector, but also the wider economy (and business cycle) fared during the month. Research in the US and elsewhere has shown that the manufacturing sector has specific qualities that make it especially relevant as a leading or cyclical indicator for the broader economy. This often holds true even as the share of manufacturing to the total Gross Domestic Product (GDP) declines over time. This is because the manufacturing sector is a supplier of goods to the primary industry (agriculture and mining), while also exposed to the tertiary industry (such as retail and wholesale). Therefore, it is often said that the factory sector is where recessions tend to begin and end. The PMI is also a useful tool to compare the performance of the manufacturing sector across countries, as the calculation and the interpretation are broadly the same across the world.

This comment provides a background overview of the BER's manufacturing PMI. It also explains a change in the methodology, or more specifically the calculation, of the monthly PMI figure that came into effect from the October 2020 release. A textbox provides further information on how to interpret the PMI during South Africa's lockdown and subsequent recovery. Finally, the comment provides some insight on the relationship between the PMI and official manufacturing production.

[1] The PMI™ and PURCHASING MANAGERS' INDEX™ are trademarks of Stellenbosch University

November 2020

Please refer to the **glossary on the BER's website** for explanations of technical terms.

Details of the South African manufacturing PMI

Survey respondents

The monthly survey is completed by purchasing managers[2] of factories across South Africa. Purchasing managers are in an exalted position to provide an early warning signal on, for example, changes in demand and supply conditions. Most respondents reply electronically and the BER regularly updates the distribution list to take account of businesses entering or exiting the market. The sample is fairly stable from month to month and the respondents receive the survey report as a token of appreciation for replying.

Importantly, individual **responses are <u>not</u> weighted for firm or sector size**.

Survey questionnaire

The BER's manufacturing PMI survey questionnaire consists of ten questions on the **monthly** changes in business conditions. Respondents are asked to indicate **qualitative changes** only, i.e. whether a particular phenomenon (for example activity or sales orders – see the box below) has increased, decreased, or remained unchanged compared to the previous month.

The responses to the questions are converted to indices. **The indices are calculated by taking the percentage of respondents that reported an increase and adding it to one-half of the percentage that reported no change.** This results in an index for which a value of 50 indicates no change in the activity, a value above 50 indicates increased activity and a value below 50 indicates decreased activity in the month in question compared to the month before. In line with the international norm, some of these indices are adjusted for seasonal variation in the data[3]. For the sake of transparency, the BER does not smooth the data further.

---

[2] The respondents in the BER's quarterly manufacturing business tendency survey are the most senior decision makers at factories, such as the plant manager, chief executive or chief financial officer. In contrast, purchasing managers are surveyed in the case of the PMI. Purchasing managers know about changes in supply and demand before other senior executives given their position in the supply chain (monitoring stocks of final goods and raw materials).

[3] Due to changes in seasonal patterns over time, the seasonal factors are recalculated once a year (usually around September/October), which then also necessitates the historical revision of the seasonally adjusted series.

Definitions to use with the PMI survey questionnaire[4]

1) **Business Activity – level (units/volume) of overall general business output**

The level/volume of general business output may be measured by production volumes, units of work accomplished, person-hours working, sales volumes or similar non-monetary measures. The reason for non-monetary indicators for this and several other questions is to prevent inflation from affecting the data over a period of time.

2) **New Sales Orders – level (units/volume) of overall new sales orders received**

The level/volume of new sales orders or other forms of requests for products, service or business activity received during the month whether or not fulfilled during the month. Again, we use non-monetary measures. It may be convenient to use the same unit of measurement for this question and for question 1.

3) **Backlog of Sales Orders – level (units/volume) of overall unfilled sales orders**

The level/volume of sales orders or other forms of requests for goods that have been received but not yet fulfilled (regardless of when they were received). This also needs to be a non-monetary measure and should be the same unit of measurement used for question 2.

4) **Employment – level (units/number) of overall employment**

Level (units/number) of overall employment in your organisation including temporary and contract personnel.

5) **Purchasing Inventories – level (units/volume) of overall purchased stock**

The level/volume of overall purchased stock of materials and goods used in your normal business or activities. Indicate the direction of change, if any, in overall purchased inventory quantities (not finished goods unless purchased).

6) **Purchasing Commitments - outstanding purchasing liabilities against lead time**

A usually irrevocable undertaking or responsibility in the obtaining of materials, goods and services in return for a consideration. Purchasing orders placed against lead time.

7) **Purchasing Supplier Deliveries - overall delivery performance of suppliers**

Overall delivery performance versus that of the previous month of suppliers of materials, goods and services purchased for the running of a business. If items and services are more readily obtainable this month than last month, then delivery performance is faster than a month ago. This item is not intended to measure actual versus expected delivery performance.

8) **Purchasing Prices - rate of change in overall purchasing prices**

Rate of change refers to the percentage change in the approximate overall weighted average prices paid for materials, goods and services purchased for conducting a business.

9) **Expected Business Conditions – compared to current levels, the expected change in the company/organisation's general business conditions in six months' time**

The expected general business conditions in six months' time compared to current conditions.

10) **Export Sales* – export sales (units/volume), <u>only applicable if your company exports</u>**

The level/volume of new export orders or other forms of requests for products, services or business activity received during the month whether or not fulfilled during the month. Again, use non-monetary measures. It may be convenient to use the same unit of measure for this question and for question 1.

** This question is surveyed, but the results are not published in the public domain. The resulting index does aide with the interpretation of movements in the headline PMI and the overall new sales orders index.*

Interpretation of diffusion indices

The PMI indices are called diffusion indices and indicate the degree to which the measured change is dispersed or "diffused" throughout the sample population. When a diffusion index increases to a higher level within its increasing range (50 to 100 for the PMI indices), it suggests that a period of increased activity is becoming more dispersed through the factory sector. Furthermore, it implies that the activity is

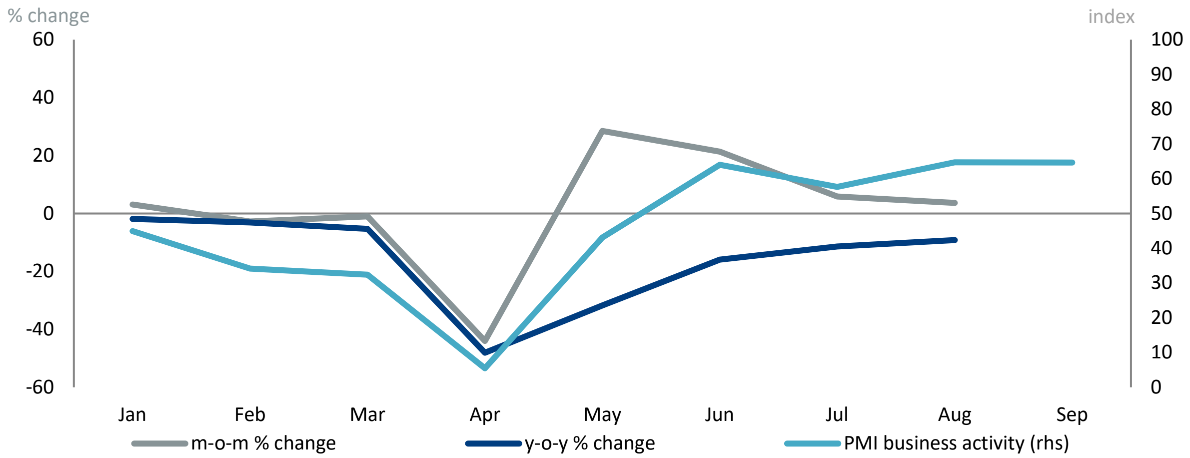
[4] The questions ask to compare the current month's level of purchasing activity to the previous month's in terms of the indicators listed in the textbox.

increasing at an accelerating rate. Diffusion indices tend to be **leading indicators** because typically the rate of change of an activity will change direction before the level of the activity changes direction.

Interpretation of the PMI during and after the South African COVID-19 lockdown

On 27 March 2020, South Africa entered what would be become a five-week strict lockdown (Level 5). While some essential manufacturing production was allowed, most subsectors had to shut down production completely or were faced with an unprecedented drop in demand for their products. The April PMI survey (released on 4 May) revealed that production came to a near standstill during Level 5. The PMI's business activity indicator fell to an all-time low as nearly all respondents reported a decline in production. The new sales orders index also plunged to a record low by some margin. However, the headline PMI (as printed in May) fell to only 46.1 index points. The main reason for this was because one of the headline PMI subcomponents – the inverse of supplier deliveries – surged higher. To a large extent, this countered the slump in the other four subcomponents. In the calculation of the PMI, the global convention is to use the inverse of the supplier deliveries index so that when more respondents report slower deliveries, this actually results in a higher index and thus contributes positively to the headline figure. This is because it is argued that during times of high demand, suppliers are so busy that deliveries of supplies may be slower, and this is thus seen as a positive development. However, in early 2020, due to local and global lockdowns and production stoppages resulting in significant supply-chain disruptions, the performance of supplier deliveries deteriorated even in the absence of the usual cause of an improvement in demand. This meant that the higher supplier deliveries index (due to slower delivery times) inadvertently lifted the headline PMI. Many manufacturing PMIs across the globe were impacted by this quirk (some were also affected by inventory distortions), but the impact was larger in South Africa because the supplier deliveries component had a larger weighting than the global norm. Amid the highly uncertain COVID-19 environment and the likelihood that the distortion of the supplier deliveries index may be temporary, the BER decided not to make a knee-jerk reaction change to the methodology or calculation of the headline PMI. However, as was done internationally, the issue was flagged in the PMI publications. In order to provide a better sense of what was happening with actual manufacturing output, the focus was shifted to the PMI activity index. The activity index on its own is normally too volatile to provide a reliable signal for output movements, but provided useful (and fairly accurate) insights on how production plummeted during Level 5 of the lockdown and subsequently recovered as lockdown restrictions were loosened – see Figure 1 below.

Figure 1: Business activity index and official manufacturing output growth



Source: BER, Stats SA

Another important feature to keep in mind when interpreting movements in the PMI and the subindices in the months after April is that the PMI questionnaire asks for a month-on-month comparison. As restrictions were eased, more production was allowed to take place and demand also slowly recovered compared to the previous month, although conditions remained worse than experienced before the lockdown. For example, one respondent noting higher production output and sales in the May PMI commented that "activity in April was zero, but May will be 50 to 60% of recent average sales turnover", while another explained that he had to tick higher "because there was zero production in April, but May output is about 70% of the normal output". This continued in subsequent months with a respondent noting in June that "sales in April were -90%, in May -50% and I expect to end June at -15%" and another also underscoring that activity remained far from normal by saying that in June the company had "about a quarter of normal sales, and nothing in the last two months with the lockdown".

The month-on-month improvements as South Africa's lockdown restrictions were eased meant that the headline PMI reached extremely high levels by September. However, as cautioned in the August and September release, the fact that the level of the PMI and business activity index rose above pre-pandemic levels does not directly translate to official manufacturing activity being back to pre-pandemic levels. Due to the month-on-month comparison asked for in the PMI questionnaire, the high level merely reflects that conditions continue to improve (with more respondents reporting an increase in output for example instead of no change or a decline compared to the previous month). This can still be entirely consistent with the level of output remaining well below that recorded prior to the lockdown because of the magnitude of the drop recorded in April. Indeed, some respondents noted that conditions remained far from normal in September, although improving. The month-on-month signalling corresponded well with the actual Stats SA production numbers since May 2020.

Calculation of the PMI

The norm internationally is to aggregate five of the PMI's subindices (business activity, new sales orders, supplier deliveries, inventories and employment) to form the headline index known as the PMI. The other indices provide additional information on, for example, price trends and expected conditions but do not form part of the headline manufacturing PMI.

From the October 2020 PMI release, the headline South African manufacturing PMI will assign equal weights to the five subindices and is thus calculated as follows:

PMI =
0.2 Business activity +
0.2 New sales orders +
0.2 Employment +
0.2 Supplier deliveries +
0.2 Inventories

The historic PMI was recalculated with the new weighting method and revised accordingly[5]. Importantly, the change in index weightings only impacted the historic data for the <u>headline</u> PMI. The historic time series of the (non-seasonally adjusted) subindices are therefore still the same.

[5] As before, the BER will continue to publish the full historic dataset for all the subindices, so should a user of the data prefer to calculate the PMI with the previous (or different) weighting method, this is possible.

Previous calculation methodologies for the South Africa manufacturing PMI

As is the case internationally, the South African manufacturing PMI has always consisted of the same five subindices.

From its inception in 1999 to October 2019, the weighting of these five subindices was based on the PMI produced by the Institute for Supply Management (ISM) in the US from 1982 to 2008. These weights, based on analytical work by the US Department of Commerce, were chosen to maximise the relationship between the PMI and GDP in the US in the early 1980s. The weights per subindex were 0.25 business activity, 0.30 new sales orders, 0.20 employment, 0.15 supplier deliveries and 0.10 inventories.

In October 2019, the BER decided to adjust the weighting assigned to the five included subindices. The main reason for the change in weightings of the PMI subindices was to address the deterioration in the correlation between the PMI and the reference series since the global financial crisis (GFC). After the GFC, the co-movement between the changes in the PMI and actual production became poorer relative to the pre-crisis period. While it is not possible to fully determine why this happened, the behaviour of both the PMI and manufacturing production data changed in the aftermath of the GFC. Official manufacturing data, as produced by Stats SA, became unusually stable (barring exceptions due to production stoppages triggered by labour strikes or electricity disruptions), while the PMI was more volatile than before the GFC. Furthermore, while both series trended sideways during the pre-crisis period and downwards during the post-crisis period, the PMI's downward trend was more pronounced than that of Stats SA's manufacturing series.

The estimation of unique subindex weightings for the South African PMI was possible because the series covered twenty years, including both up- and downswing phases of the business cycle. A regression analysis was used to determine the weighting of the subcomponents of the PMI which would fit the reference series best[6]. The resulting weights were as follows: 0.05 business activity, 0.20 new sales orders, 0.20 employment, 0.40 supplier deliveries, 0.15 inventories. While it is (still) uncommon to apply unique country-specific weights to the subindices (components) making up the manufacturing PMIs, it is standard practice to use different weightings and variables (and to periodically revise these) to construct composite (summary) indices in non-PMI business tendency surveys. For instance, see the German ifo Business Climate Indicator, the Swiss KOF Barometer and the European Commission's Confidence Indicator.

The new weighting method resulted in a more stable PMI. Lower volatility is important as it helps with the interpretation of the results and reduces false signals. However, as explained in the text box about the South African lockdown period, when the COVID-19 shock distorted the supplier deliveries index, the impact on the South African PMI was larger because this index had a relatively larger weighting than in the case of other PMIs. Furthermore, where we had hoped that the weights would not have to be adjusted

---

[6] The reference series is the year-on-year percentage change in the total manufacturing production index (seasonally adjusted) as published by Stats SA each month in the Manufacturing: production and sales (P3041.2) statistical release. The econometric estimation was based on data from September 1999 to July 2019. The weights were rounded slightly for ease of use, but this did not have a meaningful impact on the performance of the PMI compared to the exact, unrounded weights.

frequently, the COVID-19 shock also significantly distorted the reference series. An updated regression analysis, with the available data for 2020 also included, would result in very different weightings than suggested by a similar analysis in 2019. Notwithstanding the uniqueness of the COVID shock, after the 2020 experience with weightings based on a regression analysis, we decided against another weighting change solely based on a statistical evaluation.

However, with effect from the October 2020 PMI report, the BER decided to move away from the 2019 weightings. After further internal research and external consultation, it was decided to move to the equal weights method as used by the ISM since 2008. The shift to equal weights means that the headline PMI should be less vulnerable to a temporary shock disproportionally affecting one of the subindices (as happened during the COVID-19 lockdown with the supplier deliveries index) and simplifies interpretation. While frequently updated weights determined by regression analysis might result in the best track record with the reference series, this could result in frequent revisions to historic data and might unnecessarily complicate the interpretation of the index.

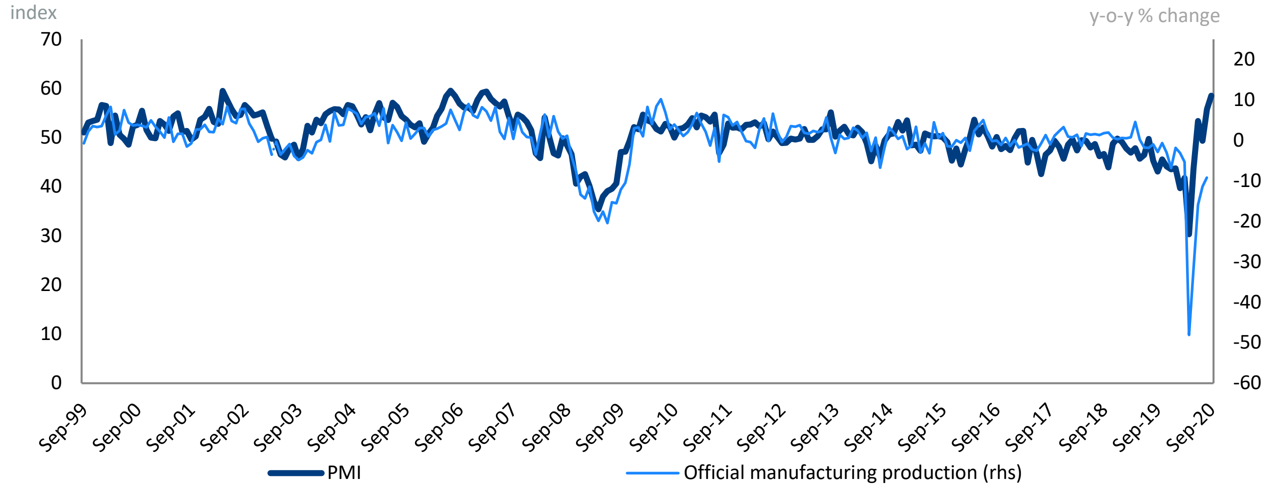
For the reasons flagged in the textbox about the South African lockdown period, the equally weighted (new) PMI still does not accurately reflect the lockdown-induced slump in official production (and should also not pick up on the strong rebound in annual growth expected in 2021 as month-on-month movements should have stabilised by then). Indeed, a correlation analysis shows a marked deterioration in the co-movement between the PMI and official indicators of manufacturing output when including the lockdown period. Any PMI including the supplier deliveries index as a subcomponent will show such a deterioration during the lockdown. However, due to the temporary and unusual nature of the shock, we decided not to exclude the sub index from the headline PMI calculation, but as before we will flag any anomalies (in any of the indices) in the monthly releases if necessary. This is in line with the approach taken by the ISM.

Figure 2: Correlation (co-movement) statistics of the PMI with equal-weighted subindices with various official production series

	Correlation (measure of co-movement)	
	Full period	**Period up to March 2020**
Manufacturing production (y-o-y % change, monthly data)	69%	73%
Manufacturing gross value added (y-o-y % change, quarterly data)	71%	76%
Gross domestic product (y-o-y % change, quarterly data)	69%	80%
Manufacturing survey production volumes (net balance, quarterly data)	79%	83%

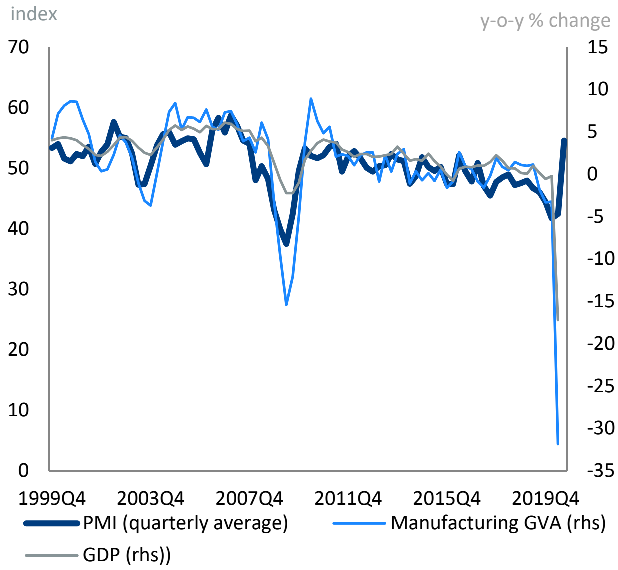
Source: BER

Figure 3: PMI and official manufacturing production



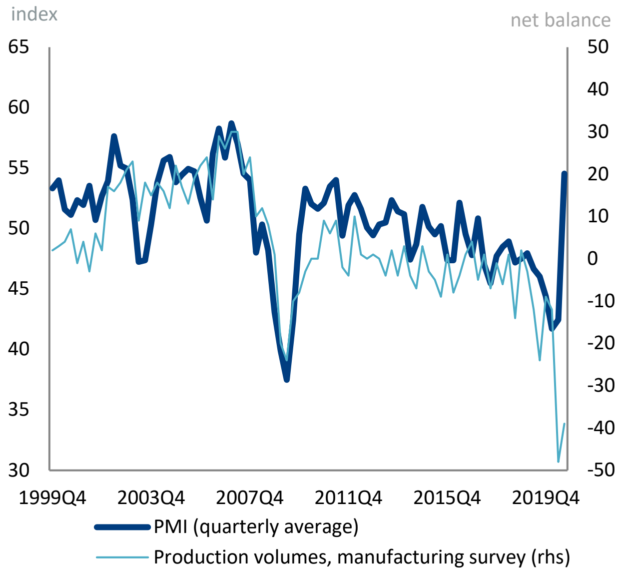
Source: BER, Stats SA

Figure 4: PMI and manufacturing GVA, GDP



Source: BER, Stats SA

Figure 5: PMI and quarterly survey production volumes



Source: BER, Stats SA

Reasons for a possible divergence between the PMI and official data

Over time, even outside of the lockdown period, the magnitude of the movement of the qualitative PMI and the corresponding quantitative reference series does not match every month. In our view, the PMI should rather be used as a directional guide for the reference series. This is opposed to using the PMI in order to gauge the likely magnitude of any directional change in the reference series. This was also the case with the previous PMI.

There are a few reasons that could explain month-on-month differences between the reference series and the PMI. For example, the PMI does not account for size differences across firms or sectors and each response is assigned the same weight in the calculation. The official Stats SA data employs firm and sectoral weightings. Furthermore, as a diffusion index, the PMI typically shows developments that are widely dispersed (or prevalent) across sectors and firm sizes. This means that it does not fully reflect developments that are limited to a few large firms and only shows trends when these developments also spread to smaller firms and firms in other sectors. This means that the PMI may deviate from the official statistics in a particular month when a development was limited to a few big firms, such as petroleum refineries. This may have a significant impact on the official data as refineries make a big contribution to total output, but not the PMI as there are only a handful of refineries (and thus possible respondents in this sector) in the country. In contrast, there could also be a deviation between the PMI and official data when many firms report a small change. The magnitude of the change would then be overstated in the PMI compared to the official data. In such instances, the PMI data also becomes more volatile even though the actual month-on-month changes in the official data are fairly small.

Another factor to keep in mind is that the post-GFC period, particularly since 2017, was characterised by significant **uncertainty**. International studies (and our experience) have shown that the relationship between survey data and actual data diminishes in times of increased uncertainty. The increase in external uncertainty may change respondents' behaviour. Relative to a more stable period in the past, in the current environment individual responses may reflect respondents' own uncertainty to a greater extent than actual changes in the variable in question.

Furthermore, while the headline PMI should in principle only capture actual changes in the activity component of the survey, we do suspect that the responses are at times affected by changes in **sentiment** rather than changes in actual activity. In a tough operating environment, it is to be expected that respondents are at times inclined to assume that their production or demand levels are down compared to the previous month (as the trading environment is tough), while actual levels (as captured by the official data) are more or less the same, if not slightly better.

Lastly, it should be noted that the BER can only study the PMI survey composition and results, the official data from Stats SA is taken as a given. It could thus be that (at least a part of) the divergence stems from a change in the official data and not the PMI, with the PMI correctly reflecting the actual higher volatility.

Conclusion

The intention of the change to the weighting made in 2019 was to help the PMI become a more reliable, stable indicator of changes in actual manufacturing business conditions amid increased volatility after the GFC. Unfortunately, the headline PMI was unable to provide for the unprecedented COVID-19 shock to global and local production and supply-chain dynamics. Taken separately, the PMI subindices provided invaluable information in a timeous manner and (as later confirmed by official data) fairly accurately captured the month-on-month changes. But, due to the inadvertent boost from the supplier deliveries index, the headline (composite) PMI did not. The new PMI with equal weightings still does not fully reflect the COVID-19 shock to production as it did not fall 'low enough' in April. However, we anticipate that the shift to equal weightings – to be in line with the ISM – makes the PMI an even more user-friendly and robust indicator, specifically one that is less prone to large swings in a single subcomponent.

Lisette IJssel de Schepper

Copyright & Disclaimer