UDK 336.71(497.4):338.23:336.74

How Circular is Slovenian Economy?

*Manca Jesenko, Klemen Košir, Damjan Kozamernik and Polona Lah**

In line with the EU long-term objectives Slovenia aims at reaching climate neutrality of its economy by 2050 at the latest, meaning net-zero greenhouse gas emissions. Transition to a more circular economy will be an indispensable instrument to achieve this ambitious goal. Scaling up circular transformation from current frontrunners to the largest part of the economy possible is therefore one of the main policy objectives, to which SID banka, as national development bank, endeavours to contribute by providing targeted financial support. This note provides early evidence on how circular Slovenian economy is by applying SID banka's circularity evaluation framework to a sample of firms from its credit portfolio. It finds that only around 40% of firms can currently be classified as applicants of circular business models, but, on the positive side, there seem to be concentration of circular business models in segments of the economy where it is most needed. In examining how circularity relates to business performance the evidence indicates little positive effect, if any, suggesting that up to now linear business models have not been subject to relevant environmental constrains.

JEL G14 G21 G28

Introduction

As a recent report by the World Bank states, the current use of nonrenewable natural resources is unsustainable and these resources could eventually be depleted (Lange, G.-M., Wodon, Q., Carey, K., 2018). This calls for a fundamental change in principles and concepts in organising economic activity to preserve the environment and implement a more sustainable system. One of the main principles aiming at reorganising the economy towards achieving sustainability is circularity. The Ellen Macarthur Fundation, a leading global foundation in this field, with Slovenia being its member, defines it as follows: "circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems". The main aspect of circular economy is decoupling of economic growth from use of natural resources and its negative environmental impact.

A transition to circular economy potentially requires a great deal of investing, change and effort. Nevertheless, Slovenia can also benefit significantly from transitioning to circular economy, not least because its main economic advantages are not reserves of rare natural resources and its economic wellbeing is not dependent on selling

* Manca Jesenko, Klemen Košir, Damjan Kozamernik and Polona Lah, all SID banka.

mineral resources. These benefits include the creation of new profit opportunities, reduced costs due to lower virgin-material requirements. Furthermore, by mitigating waste and pollution, keeping products and materials in use, the transit from linear to circular business models could contribute a decisive part in tackling the climate challenges. This note aims at providing some early evidence on how circular Slovenian firms actually currently are and whether this has mattered in their business performance. First, a sample of firms, applying for a loan at SID banka, was evaluated against the relevant sustainability elements, among which was circularity of their business model. Sample results were extrapolated to match the Slovenian economy by applying appropriate weighting. The second part of the note evaluates possible linkages between the firm's business model circularity and the firm's medium-term business indicators. Some implications of the results are summarised in the final section of the note.

Assessing business model sustainability and circularity

To encourage circular transformation of the Slovenian economy and to better understand this process, SID banka designed its own circularity assessment tool at a firm level (Giacomelli, Kozamernik and Lah, 2018). It involves a 5-scorecard evaluation tool based on a financial score which assesses a long-term business model resilience and competitiveness, further combined with four sustainability aspects of its business model: the raw materials scorecard, environmental scorecard, energy efficiency scorecard and innovation scorecard. The structure of the tool, using an appropriately selected subsample of 12 among all 53 questions in addition enables for an evaluation of the current degree of circularity and its capability for circular transition.

The analysis is based on a sample of 170 firms that applied for a loan from SID banka in the period from mid-2018 to February 2020 and were assessed using the 5-scorecard evaluation tool. The participants' scores by the 5-scorecard evaluation tool are ranged on the spectrum from -100 (negative value indicates negative sustainability business model) to +100 points. The mass of the distribution is concentrated around the interval from -10 to + 10 and its shape seems to resemble to a normal distribution with a slight skew; there are slightly more companies that perform worse than the distribution mode (Chart 1). Interestingly, dividing data relative to firm's size makes apparent a noticeable disparity, with medium and especially large firms being located on the far right of the distribution, thus performing far better in terms of sustainability scores. Looking at the five scorecards separately unveils quite irregular distribution patterns, as shown in Charts 2-6. While medium and especially large companies perform better on all 5-scorecards, vast majority of their advantage over smaller competitors actually comes from the financial and innovation scorecard. Nevertheless, the charts with distribution of firms by scores, especially energy scorecard, but also environmental and raw materials scorecards, show that most of the firms are in the negative territory in those sustainability aspects.

Chart 1: Distribution of firms by scores from 5-scorecard framework

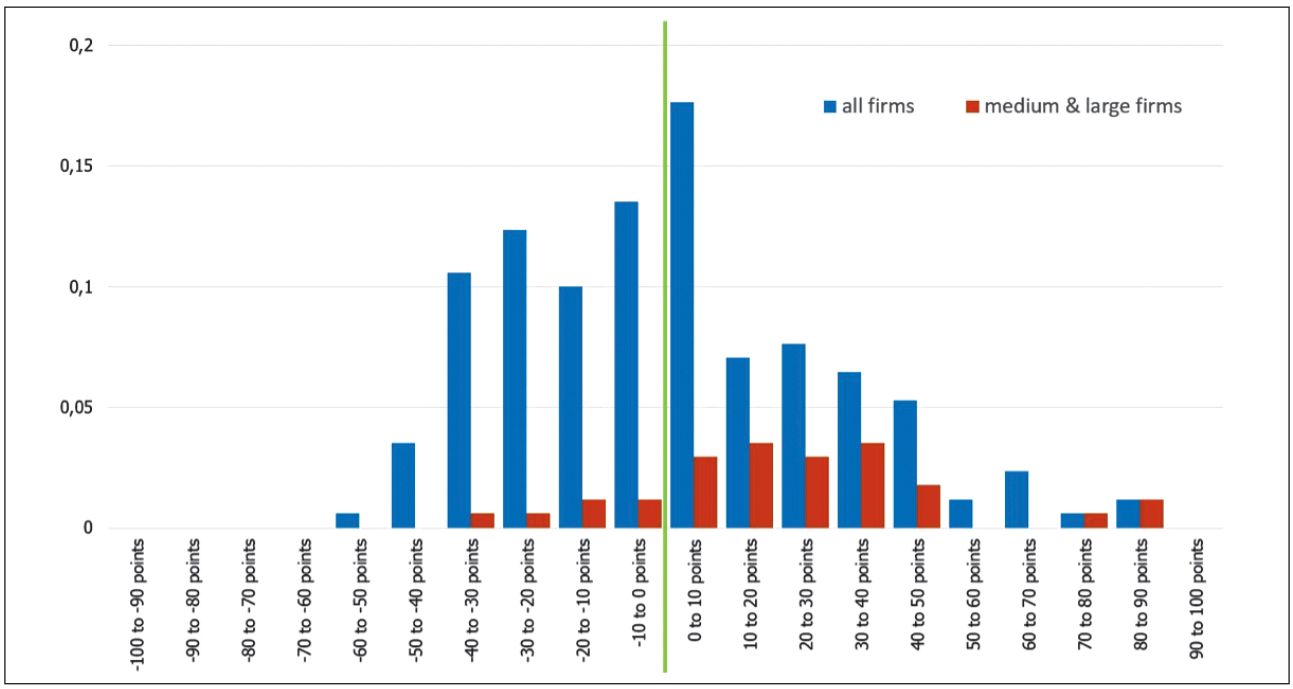


Chart 2: Financial balance scorecard distribution

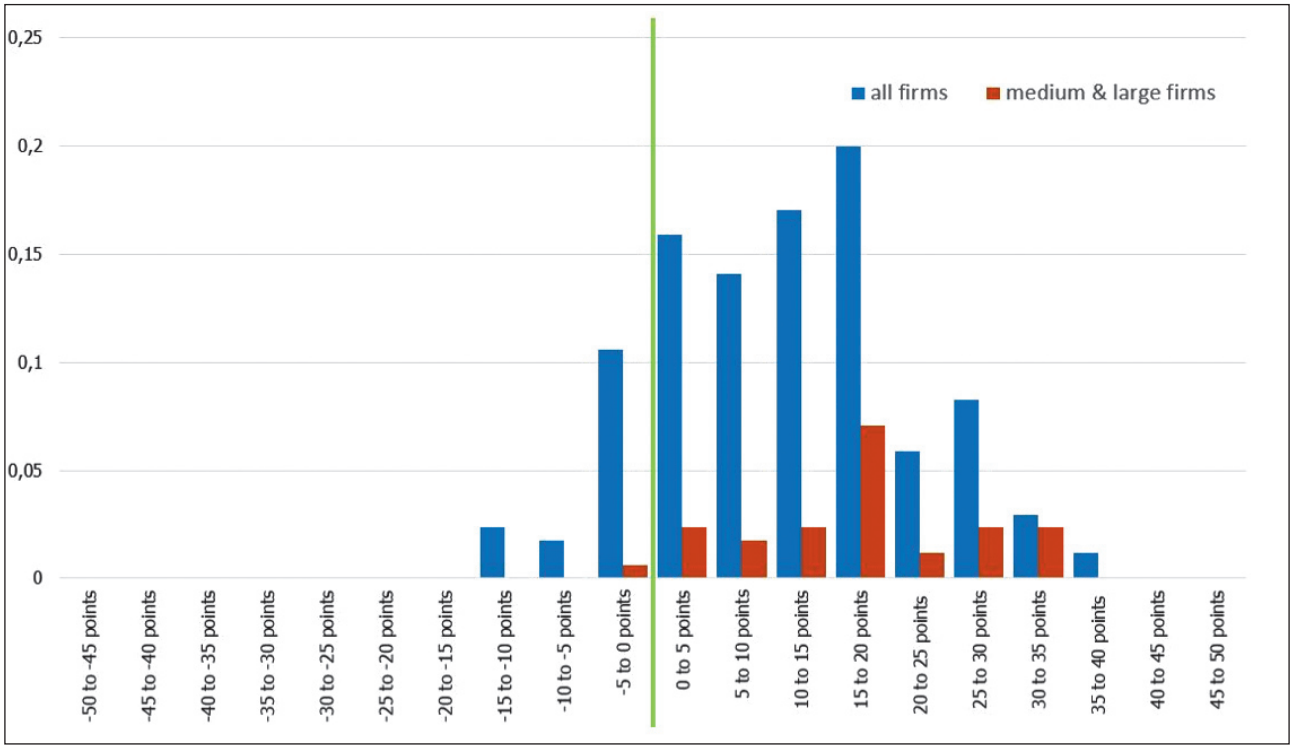
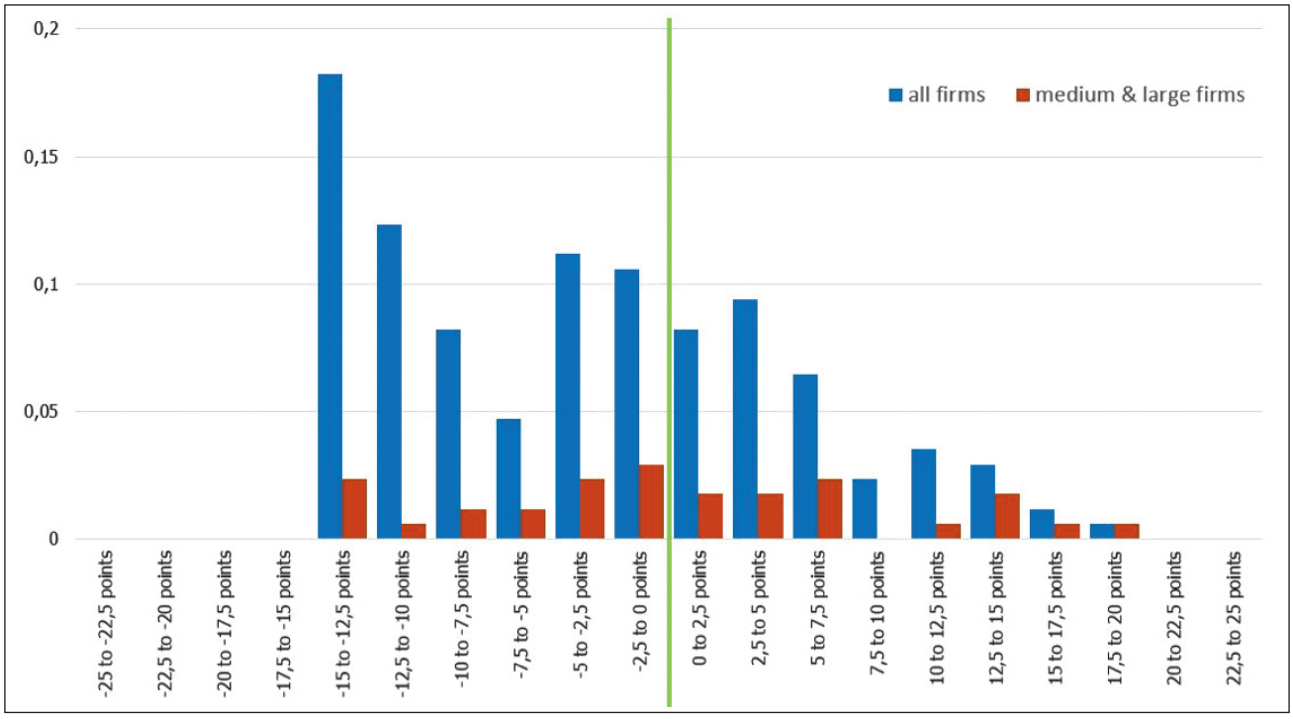


Chart 3: Raw materials scorecard distribution



The level of circular orientation and capability for circular transformation

The twelve circularity-assessing questions are divided in two dimensions, one related to the level of circular orientation of the firm and the second related to the firm's capability of the transition into a circular economy. A more detailed analysis (not integrated in this note) indicates that the two circular orientation aspects most commonly being integrated into the business model are the consideration of circular principles in the process of designing a product (esp. modularity, renewability, degradability, input reduction) and in the process of selecting suppliers along with setting terms and circular requirements. Most of the circular transformation capability emerges from the technology

Chart 4: Environmental scorecard distribution

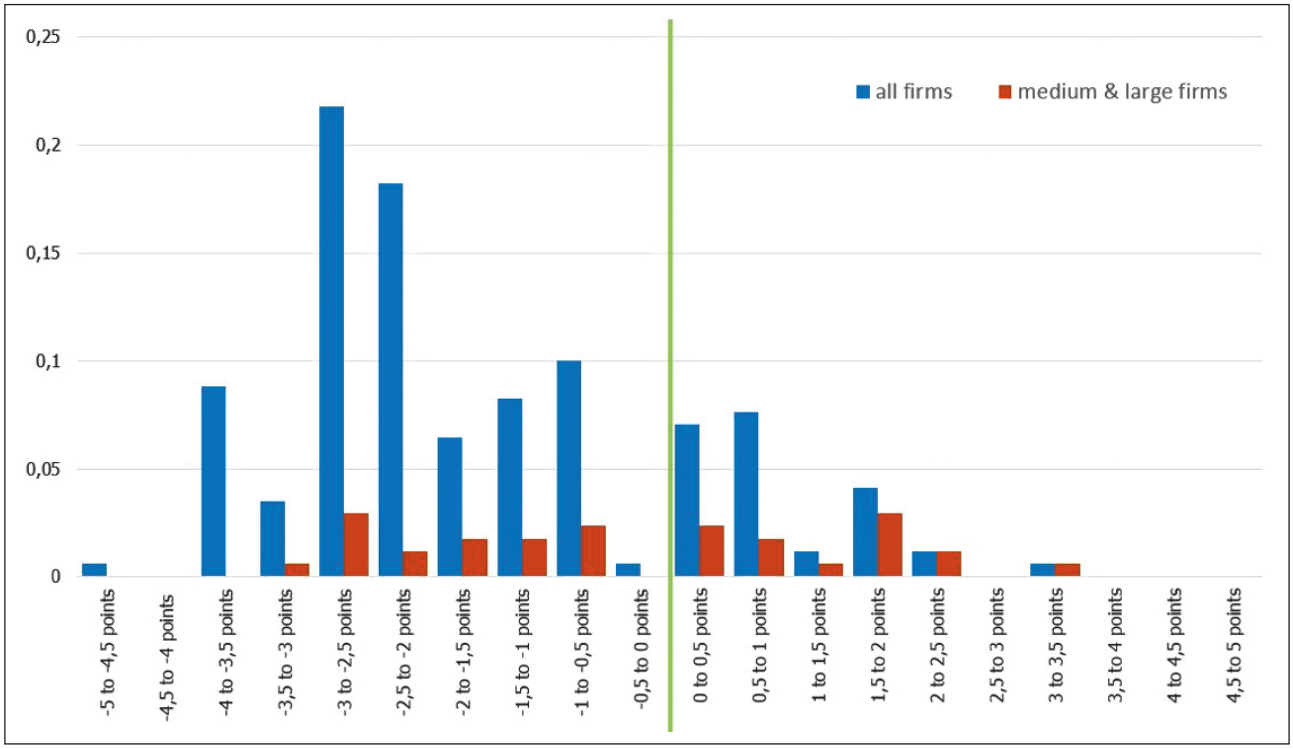
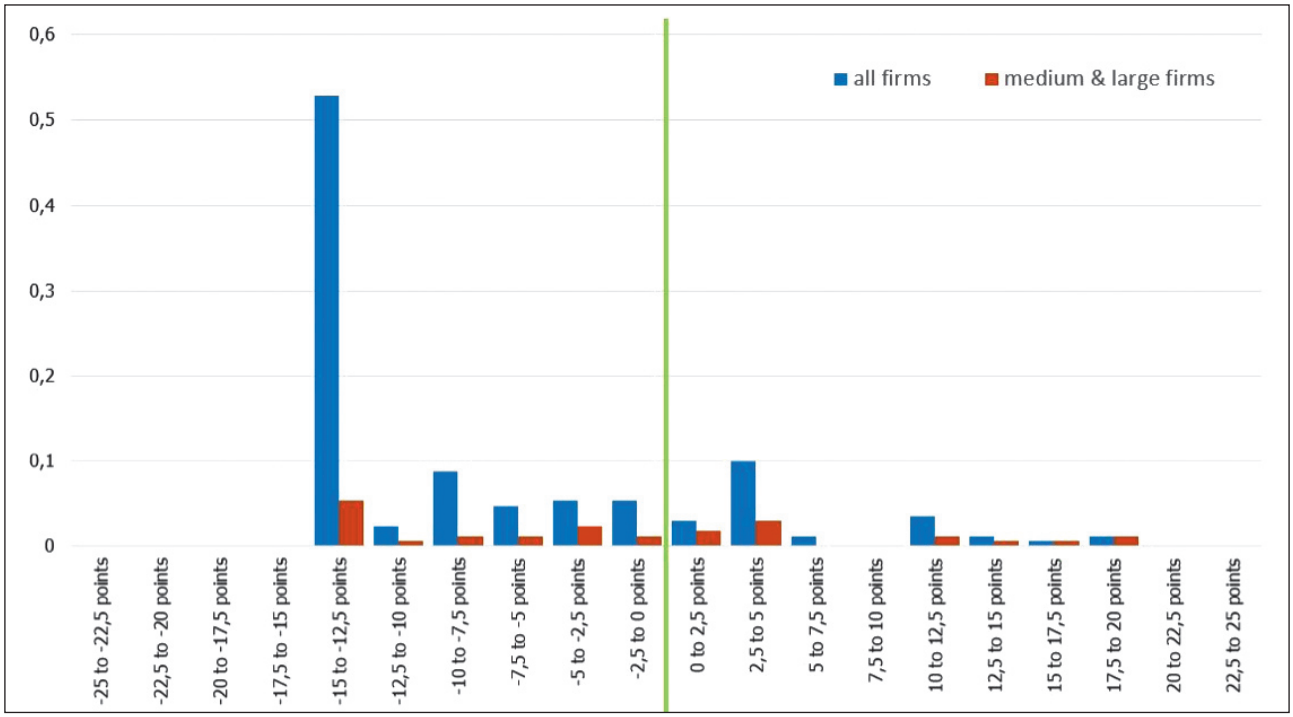


Chart 5: Energy scorecard distribution



capacity, some of the firms also elaborated a documented plan for integration of circular principles in their business processes.

Chart 7 shows the dispersion of the firms in the sample according to circular orientation and circular capability. It is immediately obvious that all the companies with the weakest capabilities for circular transition also do not have high levels of circular orientation. The Spearman's correlation coefficient[1] for all the units in the sample between the level of capabilities for circular transition and levels of circular orientation is 0,66, which indicates a relatively strong correlation between the two variables. Since the sample is

[1] Spearman's correlation coefficient shows the correlation even if the relation between two variables is not linear.

Chart 6: Innovation scorecard distribution

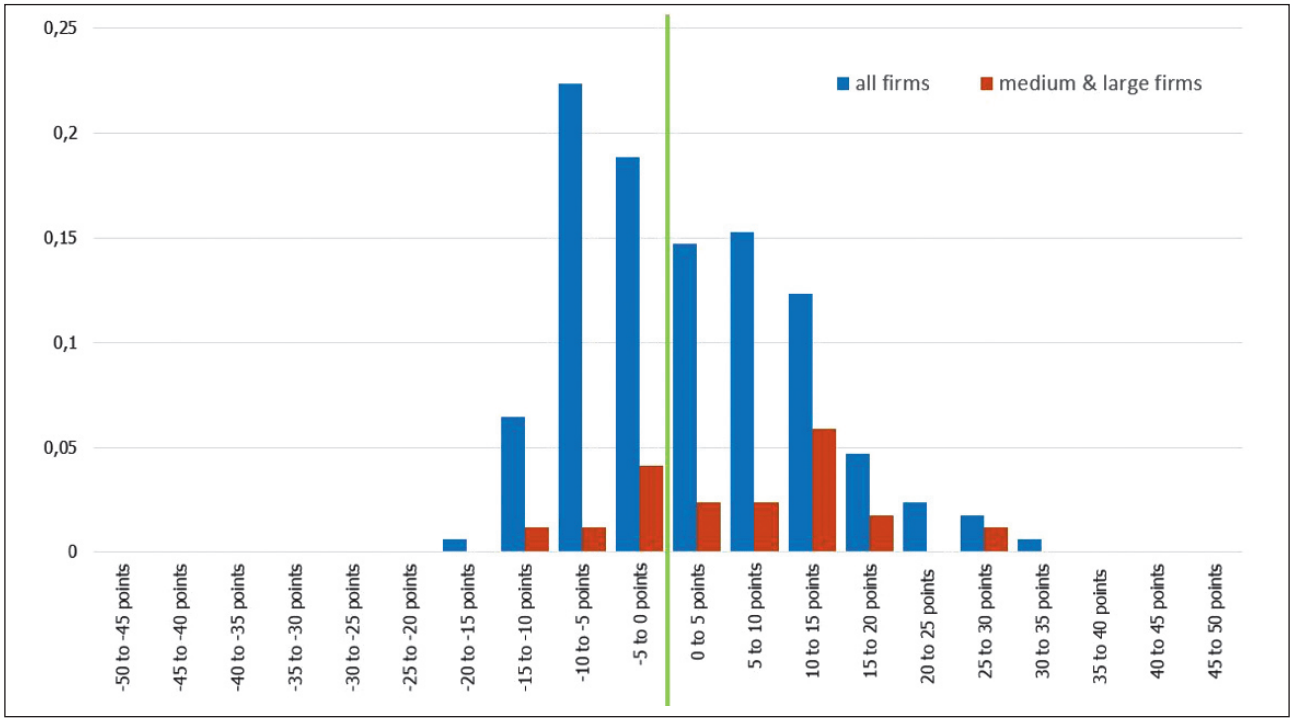
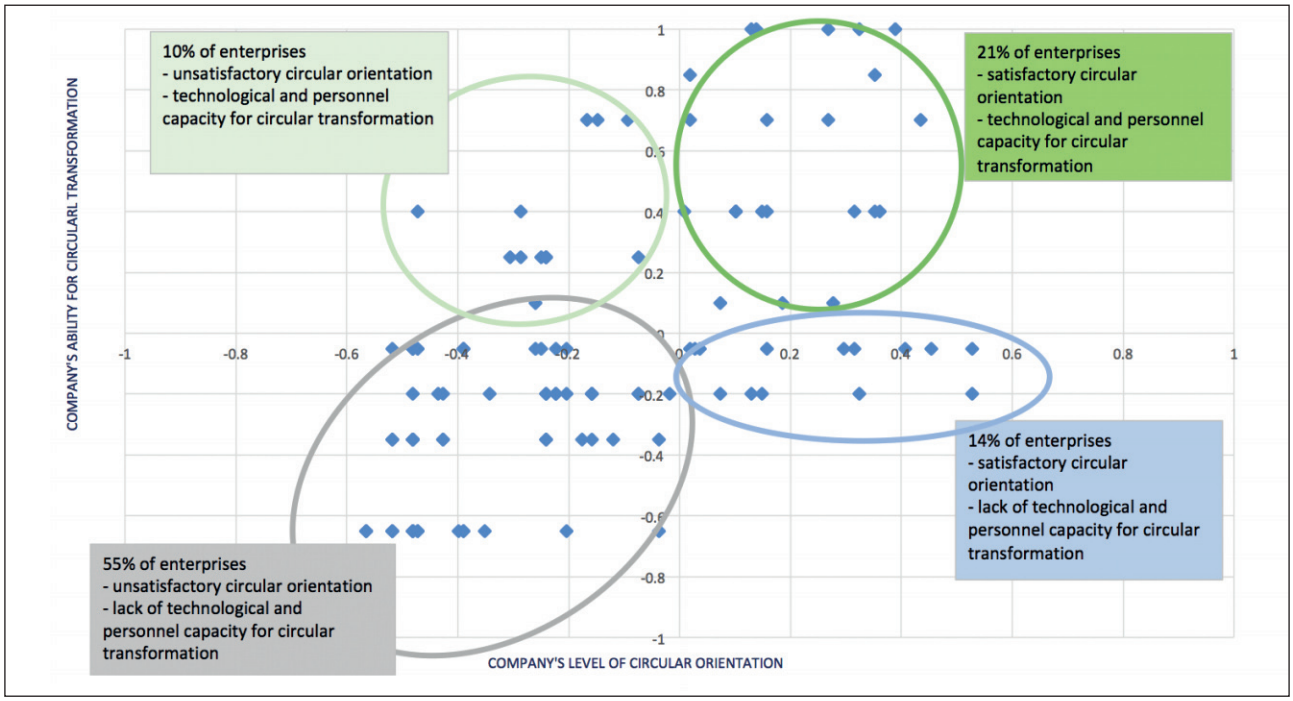


Chart 7: Circularity of a business model, identified groups.



Source: SID banka

divided into four distinct groups determined by these two dimensions, it is not surprising that the groups containing units with one of the variables considerably more prominent than the other only contained a small proportion of the sample. The group containing companies with both satisfactory level of circular orientation and technological and human capital resources for circular transformation – labelled as circular frontrunners, represents 21% of firms. Expectedly the largest group is on the other end of the spectrum – 55% of firms are attaining unsatisfactory level of circular orientation and at the same time lack capacity for circular transformation. The group containing firms with only satisfactory technological and human capital resources for circular transformation holds 10% and the

Table 1: Population-weighted structure by size and industry (weights determined by employment and production sector)

		circular frontrunners	in circular transition	circular latecomers	Linear business model	➔ of which: strictly linear business model
		11%	19%	15%	55%	30%
size	micro	10%	22%	16%	52%	31%
	small	13%	7%	8%	72%	31%
	medium	41%	8%	17%	34%	9%
	large	34%	0%	50%	15%	6%
sector	construction	1%	83%	3%	13%	5%
	industry	16%	14%	24%	46%	13%
	commerce	2%	1%	40%	57%	47%
	services	17%	15%	1%	67%	33%
	- transport & catering	4%	2%	0%	94%	10%
	- other services	20%	18%	1%	61%	39%

group with only satisfactory level of circular transformation holds 14% of firms. The group in the bottom right on the chart is missing a technological and/or human capital for completion of the transformation, is in transition. The group in the upper left quadrant of the chart has the capability but lack the circular orientation, is labelled as circular latecomers.

The extrapolation of the circularity characteristics from SID banka sample on the population of Slovenian firms gives an overview of the circularity in relation to some business characteristics. The portion of firms with linear business model is almost on the same level as the one from SID banka's sample (55%). However, the extrapolation significantly decreases the portion of circular frontrunners from 21% to 11% and puts more firms into the circular transition group, resulting in the increase from 10% to 19%. This is mainly because the share of large and medium-sized firms in the sample. Results indicate that two sectors with the most evident supply side potential for circular change – construction and industry – stand out in terms of circularity. It is estimated that transition of heavy industries, such ascement and construction, steel, aluminium and plastic production, to circular economy, can cut GHG emissions by 56% by 2050. The other two sectors, commerce and services, show a low level of the circularity.

The obtained results may corresponds to the international study of some circularity aspects (mainly exploitation of recycled materials and waste management) by Olga Giannakitsidoua, Ioannis Giannikosa and Anastasia Chondroub: *Ranking European countries on the basis of their environmental and circular economy performance: A data envelopment analysis application in Municipal Solid Waste*. Their findings suggest that Slovenia is at the top of newer EU members as regards a noticeable integration of circular principles. Interestingly, Slovenia also substantially outscores many old members such as France or Spain.

Is circularity of business models aligned with business performance?

Going forward from the circularity assessment, this section aims at providing some early evidence on whether circularity can be in some way related to business performance. To examine differences between circularity groups of firms in terms of business performance a set of indicators of business success are selected: value added per employee, labour cost per employee, profit margins, ratio between financial debt and EBITDA, EBITDA in operating revenue and level of equity in total assets of the company. Note that these are all indicators designed for measuring success in a traditional linear business economy. To avoid focusing on firms' performance in a potentially to narrow point of time, a range of medium-term growth indicators were added to complete the above list of indicators, i.e. five-year average growth rates in value added, employment, value added per employee, operating revenues, investments and five-years change in equity share.[2]

As the group of companies with mostly linear business models encompasses the majority of the sample, we narrowed it down to those with strictly linear business to make the potential differences more evident. A special "extreme linear" group has been created. It includes companies that not even partially meet the listed circular

[2] In case the enterprise has not existed for that long or the data were not available, the reference period was adjusted – shortened.

Table 2: Frontrunners vs. linear model companies.

Frontrunners vs. linear model companies	circular frontrunners	strictly linear model companies	p-value	the rest of the linear business model companies	p-value
value added/employee	45,717	33,799	0.005	43,688	0.741
equity/assets	38%	34%	0.198	36%	0.391
labour costs/employee	24,614	20,63	0.005	21,76	0.042
profit margin	6%	3%	0.042	4%	0.123
financial debt/EBITDA	2.5%	3.30%	0.047	3,6	0.020
EBIDTA/operating revenue	13%	7%	0.000	10%	0.064
Employment	25	11	0.004	11	0.003

Source: SID banka

principles. By concentrating these limiting cases 37 companies with strictly linear business model are obtained, 22 percent of the whole sample. The groups of circular frontrunners and those with strictly linear business model are therefore of the same size.

The results of the between-groups comparison are presented in Table 2, showing t-tests[3] for the two groups examined. The main conclusions of the test for the static indicators are statistically quite conclusive; circular frontrunners in the sample are on average larger and more developed firms, with lower indebtedness and (therefore) affording to pay better wages. Not only are differences between groups substantial (e.g. 33,799 EUR of value added per employee in the group of strictly linear model firms being less than three quarters of that in the group of circular frontrunners, 45,717 EUR, and profit margin being twice as much for circular frontrunners as attained by strictly linear model firms) but also the level of statistical significance shown by the p-values assure that this differences are significant and not random for all the categories except for the ratio between equity and assets, where though circular frontrunners perform better, the difference is statistically not significant.

Similarly favourable values for circular frontrunners arise from the comparison of credit ratings of firms with respect to their circular orientation. Table 3 shows the cumulative distribution of credit rankings among the selected groups of firms. Circular frontrunners display more than ten percentage points higher cumulative density up to the investment grade rating (BBB) and BB rating. More than a fifth of circular frontrunners have at least single A rating, while this ratio is less than one tenth in other groups.

Moving from static indicators to those measuring trends, the evidence of positive correlation between circular orientation on positive business performance largely fades

Table 3: Cumulative distribution of ratings in different groups

	circular frontrunners	strictly linear business model	the rest of the linear business model companies
AAA	4%	0%	0%
AA	13%	0%	2%
A	21%	9%	6%
BBB	42%	27%	30%
BB	75%	61%	70%
B	96%	94%	94%
C	100%	100%	100%

away, as shown in Table 4. Circular frontrunners lag behind other groups in most of the compared indicators, albeit nowhere is the difference in values statistically significant.

This evidence of no effects of circularity of business models on firms' business performance should not surprise nor disappoint. In our interpretation circularity is statistically positively corelated to business performance for some non-causal reasons. The lack of positive relationship in trend indicators is clearly suggesting that other structural forces prevail over circularity in explaining the business performance of firms (such as a simple reversion to the mean, a standard maturation of firms as they grow larger, comparative advantages – interestingly, as shown in Table 5 circularity strongly correlates with the innovation score (and, obviously, the financial balance score) at the firm level. One could also interpret the statistical relationships identified as resulting from reverse causality – mature and better performing firms may have on average lesser further potential to improve their business performance and at the same time higher incentive or willingness to enhance circular aspects of their business model. Or, eventually, in a

[3] Inferential statistic used to determine if there is a significant difference between the means of two groups.

Table 4: Frontrunners vs. linear model companies, trends.

Frontrunners vs. linear model companies	circular frontrunners	strictly linear model companies	p-value	the rest of the linear business model companies	p-value
Growth of value added	0.31	0.36	0.620	0.32	0.928
Growth of employment	0.25	0.28	0.663	0.25	0.968
Growth of value added/employee	0.05	0.08	0.643	0.07	0.731
Growth of operating revenue	0.28	0.37	0.342	0.48	0.534
Growth of investment	0.48	0.71	0.173	0.23	0.517
Growth of equity	0.40	0.57	0.193	0.63	0.336

Source: SID banka

more pessimistic view, better performing firms that invest in circularity have been (temporarily) impaired by doing so. The identification of circular effects on business performance and risk therefore requires controlling for other relevant factors determining firms' business performance. The data at our disposal is not (yet) sufficient for a more complete econometric analysis along these lines, but a step forward can be done by controlling for levels of business indicators in trend regressions, i.e. controlling for convergence (regression to the mean – low value indicators tend to increase faster and high value indicators tend to slow down) a one of the relevant idiosyncratic explanatory factors of a growth in particular business indicator. Regressions shown in Table 6 apparently strongly confirm this hypothesis, as shown by highly significant negative signs of the coefficients related to the level of the indicators. Still, the effect of circularity remains modest – while regressions now consistently indicate a positive impact across all selected performance indicators, this impact is in no case statistically significant.

Looking ahead

The early evidence in this note, based on a sample of 170 firms that applied for financing in SID banka, indicates that around 40 % of Slovenian firms run business models mainly consistent with the principles of circular economy. Linear business models may account for roughly 30 % of firms. According to scarce available international evidence this is comparable to other advanced economies.

There is a fair amount of diversity in circularity of business models related to firms' characteristics, such as their size or sector in which they operate. Circular business models are

Table 6: regression of the growth in selected performance indexes on its level and firm's circularity

growth	const.	level	circularity
DV_zap: koef	**2.503**	**-0.227**	**0.002**
DV_zap: p-val	0	0	0.11
DV: koef	**1.215**	**-0.067**	**0.003**
DV: p-val	0	0	0.212
zap: koef	**0.325**	**-0.034**	**0**
zap: p-val	0	0.04	0.947
place_zap: koef	**3.041**	**-0.293**	**0.002**
place_zap: p-val	0	0	0.225
prih: koef	**0.675**	**-0.028**	**0**
prih: p-val	0.015	0.132	0.843
inv: koef	**2.115**	**-0.12**	**0.003**
inv: p-val	0	0	0.289
kapital: koef	**1.628**	**-0.091**	**0.001**
kapital: p-val	0	0	0.558

[4] Raw materials scorecard is omitted as 5 out of 7 questions in forming groups are from this category, therefore calculating the differences would be pointless as they are selfimposed.

Table 5: Average scores for different groups in different in each of the scorecard

	averages				
	circular frontrunners	strictly linear model companies	p-value	the rest of the linear business model company	p-value
Financial balance scorecard	17.9	4.7	0.000	7.5	0.000
Innovation scorecard	6.2	-7.4	0.000	1.3	0.027
Environmental scorecard	-2.0	-4.7	0.007	-4.2	0.036
Energy scorecard	-5.4	-12.7	0.000	-8.6	0.058

concentrated among larger firms and more industrial sectors, and less so in services sectors. It is important that circular business models are implemented where most needed, i.e. where negative environmental impacts are the most worrying. Early evidence provides some comfort in this respect since circular orientation is found to correlate with circular capacity. Further work shall examine in more detail which aspects of circularity at the firm level are relevant or lacking in this respect.

The evidence also seems to indicate that circularity is not yet impacting firms' business performance in a relevant way. Put differently, linear business models were up to now not constrained by environmental sustainability in any way that could have significantly affected their business performance. Therefore, there may be (to) little business incentives to internalize societal benefits in firms' transition to circularity. Nevertheless, this may (and should) drastically change in a not so distant future – with likely unfavourable effects on circular laggards, constrained by shortages of raw materials, regulations or targeted taxation measures. More of proactive and progressive local and global policies should therefore foster transition to circularity, also by penalizing linearity, by directly or indirectly the impacting firms' business performance.

References:

Giacomelli, J., Kozamernik, D., Lah, P. (2018). Evaluating and monitoring circularity. In Bančni vestnik, vol. 67, No. 11. Ljubljana: ZBS

Giannakitsidou, O., Giannikos, I., Chondrou, A. (2020). Ranking European countries on the basis of their environmental and circular economy performance: A DEA application in MSW. In Waste Management, Vol. 109. Elsevier: Amsterdam

Lange, G.-M., Wodon, Q., Carey, K. (2018). The Changing Wealth of Nations 2018 : Building a Sustainable Future. Washington, DC: World Bank