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Beyond a-growth

Sustainable zero growth

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The debate on the relationship between economic growth and the environment has a long and controversial history (see also Higgs this volume). Three positions can be identified: (1) the view that (the right kind of) economic growth is beneficial for sustainability (green growth) (Ekins, 2000; Fay, 2012; Jacobs, 2016; OECD, n.d.); (2) it should be focused on reducing environmental throughput and whether this goes along with positive, zero, or negative growth is to be seen (a-growth) (Petschow et al., 2018; van den Bergh, 2011; van den Bergh & Kallis, 2012); (3) that the necessary reduction of environmental throughput has to go along with zero growth or a reduction in production and consumption (degrowth) (Alexander, 2012; D'Alisa, Demaria, & Kallis, 2014; Demaria, Schneider, Sekulova, & Martinez-Alier, 2013; Kallis, 2011, 2015;van den Bergh & Kallis, 2012). This chapter relates to the latter two positions and goes beyond the question "can economic growth and sustainability be reconciled?" The chapter instead investigates the question, "how would sustainable economies without growth look like at the macroeconomic level?" It starts by laying out why going beyond the position of a-growth helps to understand how sustainable economies of the future could be constituted (section "From a-growth to sustainable zero growth"). In the following, neoclassical, Keynesian and Marxian theories are used to investigate conditions for sustainable zero growth economies. These three have been chosen due to their prominence in the history of economic thought. However, the analysis could certainly be extended by additional schools of thought. Neoclassical theories focus on aggregate supply and in particular the role of technological change (section "Redirected technical change – based on neoclassical growth theories"). Marxian theories highlight the role of capital accumulation, firm expansion, and incentives connected to ownership (section "Diseconomies of scale and types of firms – based on Marxian economics"). Keynesian approaches connect supply with demand-side aspects of the economy (section "Constant consumption and zero net investments – based on Keynesian approaches"). The insights from these three schools of thought are used to describe central elements of sustainable economies without growth (section "Sustainable zero growth economies").

From a-growth to sustainable zero growth

Posing this question seems implausible at first sight. Why should we presuppose that sustainable economies cannot grow? Why not rather ask, along the lines of an a-growth position, how the environmental throughput can be reduced to a sustainable level – without assuming that such economies do not grow? However, if it is true that reducing the environmental throughput to a sustainable level goes along with zero or negative economic growth, this has consequences for several economic and societal systems. Therefore, solutions need to be found for how such systems can function without growth (Petschow et al., 2018; Seidl & Zahrnt, 2010a, 2010b, 2012; Strunz & Schindler, 2018).

The discussion between a-growth and degrowth positions typically goes something like this (cf. Petschow et al., 2018; van den Bergh & Kallis, 2012): sustainable economies by definition imply lower environmental throughput. The essential tool to reduce environmental throughput within a market economy is to internalise environmental costs – mostly operationalised by introducing taxes or caps (so far, most agree). However, if such measures were to be implemented to the degree necessary to achieve sustainability (for example, to keep global warming below 1.5 degrees), this would have massive impacts on economic activities (most still agree). The economic effects would be three-fold. First, more clean[1] products would be produced and consumed that have a lower environmental throughput, because they become relatively cheaper compared to dirty[2] products. At the same time, less dirty products are consumed (Brock & Taylor, 2005). Second, clean technologies (which typically have a higher labour intensity[3]) would be used for production across the diversity of products (Lange, 2018). Third – and this is the crucial point here – production would be lower than today (this is where disagreement takes place). The reason is that the increases in labour productivity the world has experienced since the industrial revolution have been based on massive increases in environmental throughput. If less resources would be available and less emissions possible (due to caps), it would in all likelihood not be possible to produce as much as today, let alone to further increase labour productivity (Ayres, 2003; Ayres & Warr, 2010; Common & Stagl, 2005; Kümmel, 2011; Kümmel & Lindenberger, 2014).

Hence, strict environmental regulation implies an end to economic growth. But – and this is crucial – economic growth is said to be necessary for the functioning of important aspects of the economy (Seidl & Zahrnt, 2010a). Economic growth is supposedly indispensable to keep unemployment low (Antal & van den Bergh, 2013), to facilitate profits (Foster, 2011), and even for the stability of the economy as a whole (Binswanger, 2013). Below, it is argued that some of these fears are justified only under certain circumstances. However, the fears themselves already prevent policy-makers and decision-makers at large to implement strict environmental regulation. Some of the fears are very likely to come true. Therefore, even if strict environmental regulation would be implemented, it seems likely that policy-makers reverse course when experiencing economic instabilities.

This is why we need to understand how economies could be stable without growth. If an economy can be stable and generate high social welfare without growth, strict environmental regulation is more likely to be implemented. Therefore, in the following it is summarised how "sustainable economies without growth" could be constituted. Referring to the argument so far, "sustainable" does not only mean environmental sustainability but also economic stability and high social welfare.

Redirected technical change – based on neoclassical growth theories

One manner to describe an economy on a macroeconomic scale is by looking at the supply side. In fact, the majority of theories on economic growth and environmental throughput take a supply-side perspective. In such theories, economic growth is determined by the development of the supply of production factors and of their productivities. As the latter depend on the speed and direction of technological change, technology plays a crucial part regarding economic growth. Technology is also decisive for environmental throughput, as it determines the emission and resource intensity of production (see, however, Alexander and Rutherford, this volume, for a critical perspective on placing too much hope in technology).

Determinants of economic growth

By far the most important determinant of economic growth is technological change. It increases labour productivity and therefore allows not only an increase in GDP but also GDP per person. It is to a major degree responsible for increasing environmental productivity, and thereby facilitates an improving (i.e. decreasing) relation between emissions and economic output. Many models of economic growth do not take into account environmental factors but rather focus on capital and labour. Early models, such as the famous Solow-model (Solow, 1956), include technological change as an exogenous factor (a factor that is not explained by the model but taken as a given). In such theories, technological change is the only determinant of labour productivity and – combined with population growth – of economic growth. However, these theories were incapable of explaining what factors are responsible for the speed of economic growth. Also, they could not explain different types of technological change (Barro & Sala-i-Martin, 2004). The first of such shortcomings was addressed by so-called endogenous growth theories. Such theories argue that knowledge and ideas are the drivers behind technological change and ask what determines the growth of such knowledge. The central answer is that firms need the right incentives to invest into developing new techniques (e.g. Aghion, Howitt, & Peñalosa, 1998). The second issue has been the topic of various theories from environmental economics. The question usually asked is how environmental productivity can be increased. In many approaches, this environmental productivity is independent from the question of labour productivity (Brock & Taylor, 2010). Others argue that by increasing the price for resources and emissions, firms get incentives to switch to technologies using more labour and less resources and also invest in the development of such technologies (Acemoglu, 2001; Acemoglu, Aghion, Bursztyn, & Hemous, 2012). Hence, the type of technological change depends on the accessibility and prices of production factors. The abundant access to natural resources and in particular fossil fuels since the industrial revolution has led to a focus on labour-saving technological change. The relation between the costs of using natural resources and labour is decisive. If the usage of natural resources was, relative to labour, more expensive than it is today, technological change would shift towards increasing environmental productivity instead of labour productivity.

Sustainable economies without growth

There are in principle two ways an economy can be organised without growth from such supply-side perspectives. If technological change continues to increase labour productivity, a reduction in labour supply (at the same rate as the increase in labour productivity) would lead to zero growth. Alternatively, technological change ceases to increase labour productivity. In this case, no change in labour supply is needed for a zero growth scenario (Lange, 2018).

It is insightful to connect this result to the starting point of the discussion. As outlined earlier, the a-growth position argues that strict environmental regulation should be implemented and whether economic growth still takes place is to be seen (van den Bergh, 2011). This point of view makes sense within the neoclassical framework. Strict environmental regulation here leads to the implementation of a different set of technologies and to a redirection of innovations, so that future technologies alter the relations between capital, labour, and natural resources differently than past innovations. Such changes would certainly lead to cleaner production. Whether such developments would still go along with increases in labour productivity is difficult to predict. The a-growth position makes sense within the neoclassical framework because independent of whether the economy grows, stagnates, or shrinks under strict environmental regulation, there are no economic instabilities (this is due to common neoclassical assumptions such as perfect substitutability and market clearing).

Depending on whether economic growth still takes place within such strict environmental regulation, one of two manners to organise economies with zero growth applies. If the environmental regulation leads to technological change that does not increase labour productivity (contrary to technological change in the past that has increased labour productivity), no further changes are needed. If labour productivity still increases, a reduction in labour supply would be necessary for zero growth to take place. (It should be noted, however, that the reduction in labour supply would not be necessary to achieve environmental sustainability in the neoclassical framework.)

Neither of the two manners to organise zero growth leads to economic instabilities, nor do they go along with unemployment or (at least in prominent models) with increasing poverty. Economic instabilities, in the sense of economic crises, do not take place because they cannot occur in neoclassical theories of economic growth or environmental economics, due to the design of the underlying models. Unemployment cannot be a problem because substitutability between production factors is assumed, so that the amount of labour supplied is always employed (Irmen, 2011). Issues of poverty or income inequality do not occur because the models assume a representative household – implying equal distribution of income (Lange, 2018).

In sum, within neoclassical supply-side theories, the key element is to implement strict environmental regulations, in order to alter technological change. This does not lead to economic or social problems. If such regulations still go along with increases in labour productivity, a reduction in labour supply would be needed to achieve zero growth. However, the environmental regulation is sufficient to achieve environmental sustainability – the reduction in labour supply is not needed for that goal. This also explains why many theorists using neoclassical frameworks support an a-growth position.

Diseconomies of scale and types of firms – based on Marxian economics

Another very different perspective from the supply side is to analyse the dynamics within and between firms and how they are related to economic growth and the environment. Such analyses are usually conducted by authors who refer to Marxian economics.

Determinants of economic growth

The analysis starts from the question of how firms act and how financial capital is used: why do firms try to maximise profits and why is capital continuously invested into expanding production? There are two major reasons why profits are reinvested and not consumed by its

owners – in Marxian terminology, the capitalists. First, capitalists are interested in reinvestment in order to accumulate wealth. Harvey (2010) argues that "[c]apitalists […] are necessarily interested in and therefore motivated by the accumulation of social power in money-form" (p. 257). Or as Marx (1990) puts it: The capitalists' "motivating force is not the acquisition and enjoyment of use-values, but the acquisition and augmentation of exchange-values" (p. 739). It is important to note though that this is not due to the attitude of capitalists, but the function the capitalists take within the capitalist system. And even if capitalists wanted to use their income differently, they are coerced to reinvest due to the following reason.

Second, capitalists are coerced to reinvest due to price competition. They stand in competition with each other and can only sell products when they are able to offer them at the market price. This is done by introducing new, cost-saving technologies. If they do not follow this logic, their firms go bankrupt and other firms take over their market share. Capitalists have both an incentive and an imperative to apply newly available technologies that allow production at lower costs per unit of production. The incentive is that those capitalists who introduce the cost-reducing technologies can earn extra profits, that is, profits above the normal profit rate: "The innovative capitalist gains an extra profit, extra surplus-value, by selling at or close to the social average while producing at a rate of productivity far higher than the social average" (Harvey, 2010, p. 167). These capitalists can sell the products at the prior price, while having lower costs until the other capitalists also introduce the new technologies and the average price falls. The imperative to apply new technologies rests upon the fact that when an increasing share of capitalists introduces the new technologies, the market price falls. The capitalists who do not introduce cost-reducing technologies are not able to offer products at the reduced price and are therefore pushed out of the market (Harvey, 2010).

When many or all capitalists reinvest profits, overall investments are high. In addition, new, more cost-efficient technologies are invented and implemented. These are – from a supply-side perspective – the crucial reasons for economic growth. Investments plus increases in labour productivity lead to economic growth.

The described analysis of the dynamics between private ownership, competition, and capital accumulation also explains the increasing environmental degradation of the capitalist system within Marxian theories. Two mechanisms are central. First, the described dynamics lead to continuous expansion – economic growth – on a macroeconomic level. Increasing levels of output go – ceteris paribus – along with more environmental throughput (Schnaiberg, 1980). Second, the dynamics lead to an incentive for firms to externalise costs to the environment. As firms have to compete, they have to reduce costs. This can be achieved by introducing more efficient technologies; however, it can also be obtained by exploiting the environment where possible (Foster, Clark, & York, 2010).

Sustainable economies without growth

Various Marxian authors have argued that zero growth is incompatible with capitalism (Blauwhof, 2012; Magdoff & Foster, 2010; Smith, 2010). According to Magdoff and Foster (2010) "No-growth capitalism is an oxymoron […]. Capitalism's basic driving force and its whole reason for existence is the amassing of profits and wealth through the accumulation (savings and investment) process" (p. 8). As I have argued elsewhere (Lange, 2018), this conclusion depends on how capitalism is defined and whether one looks only at economic aspects in a narrow sense or also at the political economy of capitalism.

Regarding economic aspects, two conditions are necessary for a zero growth economy within a Marxian framework: (1) the coercion to invest in order to stay competitive and

(2) the profit-motive of capitalists need to be addressed. Concerning the first issue, an additional analytical point needs to be made: the Marxian argument rests upon the assumption of economies of scale. Only when large-scale production is more efficient (in the sense that it allows firms to supply products at a lower price) than production at smaller scales, firms have to reinvest in order to stay competitive. Therefore, if diseconomies of scale would prevail over economies of scale, the need to expand (on the firm level) would not exist. Such diseconomies can, in particular, be introduced by introducing environmental regulation that would increase the price of trading products and intermediate products globally – which is closely related to the emergence of global companies. In addition, resource-intensive production tends to go along with large-scale production, while production methods with lower resource-intensity are often conducted on smaller scales. Therefore, an increase in the price of environmental throughput would be an essential step towards implementing diseconomies of scale. However, diseconomies of scale can also be introduced beyond the price of environmental throughput – for example by focusing state expenditure on regional production, changing the relative tax-burdens on small and large companies or governmental investments in local rather than global transport systems (cf. Gebauer, Lange, & Posse, 2017). Such changes of the economic framework would dampen or even reverse the coercion to expand on a firm level.

However, capital is not tied to one firm but can be invested anywhere. Even if owners of specific firms do not have the incentive to expand production of such firms, they have an incentive to use profits to invest elsewhere – for the "amassing of profits and wealth" (Magdoff & Foster, 2010, p. 8). The interest to reinvest goes along with the profit-motive as explained earlier. Within high-income countries, such investments beyond the coercion of price competition often go along with the so-called sales effort – firms try to sell products despite satisfied markets by using advertising, inventing new products, or planned obsolescence (Baran & Sweezy, 1966). In order to prevent such motives and strategies to expand consumption and (thereby) also production, firm ownership would need to be collectivised. Firms that are owned by stakeholder-groups, for example employees, follow different logics and in particular follow different goals. Rather than focusing on the interests of individual owners such as firm growth and profit maximisation, they can concentrate on the interests of the stakeholders, for example good working conditions, democratic participation and high wages (cf. Blauwhof, 2012; Gebauer et al., 2017; Lange, 2018).

In sum, the analysis of Marxian theories shows that diseconomies of scale and collective firm ownership would be crucial aspects of non-growing market economies. In addition, Marxian theories also take into account aspects of political economy – including the power-relations within a society. It is argued that political decisions are influenced by powerful societal actors, in particular the representatives of the interest of capital (Sweezy, 1942). This implies that introducing changes such as diseconomies of scale or collective firm ownership are unlikely to be implemented without significant political struggle, as they contradict such interests.

Constant consumption and zero net investments – based on Keynesian approaches

The supply is only one side of the economic story. Demand is the other. That is why other theories – in particular Keynesian types - emphasise the role of demand. While focusing on it, macroeconomic dynamics are always understood as an interplay between aggregate demand and aggregate supply in those theories.

Determinants of economic growth and environmental throughput

Keynesian analyses often refer to the equation of aggregate demand (Y_d), which is determined by the sum of private consumption (C), government spending (G), and investments (I): $Y_d = C + G + I$. This is an identity and always holds for closed economies. However, it helps to illustrate the interconnections between the components of aggregate demand and how such dynamics lead to economic growth. Keynesian authors also see technological change and capital accumulation as central pieces in explaining economic growth (Kalecki, 1971). The key driver behind firms' investments is the demand for final goods by households and public bodies (Keynes, 2006). When firms experience high demand for their goods, they expand production, i.e. have high investments. Technological change is typically regarded as going along with investments (Hein & Tarassow, 2009). The faster production expands, the more technologies are implemented and therefore new technologies disseminate more rapidly. The demand for final goods depends on two major aspects. First, income inequality influences the amount of private consumption. As people with low income consume a larger share of income than richer households, low-income inequality goes along with a higher consumption share (of income). Second, the government can influence demand by the level of spending it undertakes – financed either by taxation (of richer households) or by borrowing (Hein, 2014).

The combination of consumption spending, investments, and technological change leads to a circular view on macroeconomic dynamics between aggregate demand and aggregate supply (Keynes, 2006). The level of private and government consumption influences the capacity utilisation of firms and is therefore the primary reason for the level of investments. Investments lead to an expansion of production, while at the same time introducing new technologies into the production process. This has opposing effects on the level of employment. More production implies larger employment, while new technologies typically go along with increasing labour productivity and hence less employment per unit of output. Which factor prevails is of major importance for the development of (un)employment. This is the primary determinant of the total wage level. And the total wage level, in turn, is the primary determinant of private consumption demand – as people with low or middle income primarily depend on wage income, rather than capital income.

There are two major arguments regarding the relation between economic growth and environmental throughput. The first is similar as in the supply-side theories. Robinson (1956) covers different choices of technique. Techniques with different sets of production factor proportions are chosen based on the price of capital and labour. Therefore, Robinson allows for different directions of technological change, based on different production factor prices. When, for example, the price of physical capital increases relative to the price of labour, firms are likely to switch to a different type of technique that uses less capital and more labour. As argued in Lange (2018), this approach can be extended to natural resources. The more expensive they relatively are, the more incentives exist for firms to use techniques saving on them. The second argument is a rather new one. Harris (2010, 2013) argues that economic activities can be divided into two categories: (1) those with high negative environmental effects and (2) those with minor negative, or even positive effects on the environment. While the former need to be limited, the latter can grow. The development of the two types of economic activities depends on the demand for them – by the government and by households.

Sustainable economies without growth

The description of a sustainable economy without growth from such a Keynesian – demand side – point of view is similar to the one from supply-side perspectives (as is argued below in particular regarding working hours and technological change). However, while the description is similar, the causal links and therefore the way such an economy could be initiated are quite different.

In a zero growth economy, aggregate demand (Y_d) has to stay constant over time. This implies that either all components of it (*C, G, I*) need to stay constant or that while one increases, another one has to decrease. A stable zero growth economy is possible when each stays constant over time. We have seen earlier that investments depend on the demand from private and governmental consumption ($C + G$). If total consumption stays constant over time, firms have the incentive to neither expand nor contract – investments would solely be used to replace depreciated capital or to modernise the capital stock. That implies that net investments are zero, while gross investments (*I*) are positive and constant. In sum, aggregate demand would be constant. The other possibility – that one component shrinks while another one grows – is only possible in a certain case. Private consumption and government consumption could be substituted. For example, the government could increase taxation, reducing private consumption but using the additional revenues for government expenditures. However, the taxation would need to be of such kind that the sum of the shrinkage in private consumption and growth in government consumption is zero. On the other hand, it is not possible that private consumption and/or government consumption grows while investments decline (or the other way around). The reason is that investments are highly influenced by total consumption. If for example, private consumption would rise, investments would rise too – and if private consumption declines, so do investments. Therefore, the economy would go into a self-reinforcing feedback loop in case that one component rises continuously.

When technological change takes place and is labour-saving, such a zero growth economy would lead to continuously increasing unemployment: When less labour is needed per unit of production and total production stays constant, a smaller amount of workers is needed. However, this analysis assumes that hours per worker stay constant. If average working hours decrease, the amount of people employed stays constant, while overall hours worked decline (see Larsson and Nässén, this volume). Such working hours reductions would have to be at the same speed as technological change increases labour productivity. In addition, the reductions in working hours would have to go along with a constant real wage, implying rising hourly real wages. A constant real wage is necessary in order to keep consumption demand constant over time.

In sum, a zero growth economy would be initiated by working hours reductions at the speed of increases in labour productivity. These would lead to constant private consumption. In addition, government spending has to stay constant over time. Combined, these two aspects lead to constant demand of final goods so that firms have an incentive to have zero net investments. With consumption, government spending and investments staying constant over time, aggregate demand stays constant as well. Aggregate supply stays constant as well because the capital stock neither increases nor decreases and the labour applied decreases at the speed of labour productivity.

Note that the causal relation is very different to the one in section "Redirected technical change – based on neoclassical growth theories" on neoclassical approaches. There, a reduction in labour supply is the cause and zero growth is the effect. From a demand-side

perspective, constant demand is the cause and zero growth the effect. Decreasing working hours are a necessary condition for this relation to stay stable over time. In addition, reductions in average working hours are not initiated due to changes in preferences, as was the case for the supply side. Instead, it is the outcome of a societal bargain, in particular between trade unions and firm unions (with a role of the government that sets the rules of the bargaining game).

Most Keynesian frameworks assume technological change that increases labour productivity. In this case, reductions in average working hours are necessary for stable sustainable economies with zero growth, as has just been depicted. However, as we have seen earlier, two developments could change this situation. First, a change in relative prices of production factors, in particular labour and natural resources, would incentivise firms to invest in resource-saving, rather than labour-saving technologies. This could lead to a slower increase in labour productivity, or even to a reversal of the trend, making reductions in average working hours less or even unnecessary. Second, a shift from dirty towards cleaner products would not only decrease the environmental intensity but could also increase labour intensity (in other words, decrease labour productivity). This would require, however, that the cleaner sectors have not only a lower environmental intensity but also a higher labour intensity (cf. Lange, 2018).

Sustainable zero growth economies

Applying several theories to the question of sustainable economies without growth makes clear that asking the question for sustainable zero growth economies leads to quite different answers than taking an a-growth position. Environmental regulation is still necessary, but it does not suffice.

In sustainable zero growth economies, "getting the prices right" is still essential – in particular regarding the supply side. Environmental policies such as environmental taxation or limiting the exploitation of natural resources and emissions would make environmental throughput more expensive and the usage of labour (relatively) cheaper. This creates important incentives for households and firms. Households would consume less environmentally harmful products and firms would produce such a different set of products. In addition, firms would have incentives to develop and introduce technologies that focus on increases in environmental productivity. As long as there is a technological trade-off between environmental and labour productivity, the latter will grow more slowly, stagnate, or even decline. So far, the results are very near a-growth positions. In order to obtain a zero growth economy, average working hours need to be reduced, kept constant or increased, depending on how labour productivity develops (assuming a constant population size).

Preventing capital accumulation is the essential element for sustainable zero growth economies from the perspective of Marxian economics. Two aspects are central here. First, by introducing diseconomies of scale, the coercion to expand on a firm level can be avoided. Second, capital accumulation on the macroeconomic level can be countered by collective firm ownership, so that firms' revenues go into the hands of the stakeholders of firms, in particular employees. As such stakeholders have a wider set of interests than solely increasing sales and profits, collective ownership would also dampen the sales effort and its effect of fostering consumption.

From Keynesian perspectives, increases in labour productivity do not only need to be balanced out by decreases in average working hours to keep production constant but also need to keep income at the same level over time. Such a constant wage income enables constant private consumption. Combined with constant government spending, the demand for final

goods stays constant as well. This incentivises firms to engage in zero net investments – so that production capacities do neither increase nor decrease.

The insights from the Marxian and Keynesian approaches show that a-growth positions do not suffice, if strict environmental regulations actually lead to very low, zero, or negative economic growth. If solely environmental regulations were implemented and they do lead to zero or negative growth, Marxian and Keynesian theories indicate economic instabilities and conflicts. From a Marxian perspective, the drive for capital accumulation would oppose a tendency for zero growth. Firms would have both an incentive and a pressure to find ways to expand production nonetheless – including strategies to circumvent or even prevent environmental regulation by influencing political decisions. Keynesian approaches show that private consumption, as well as government spending and firms' investments would have to stay constant over time. This has far reaching consequences regarding each of the three underlying economic and social systems. Consumers need to be satisfied with constant consumption and the question of distribution of income needs to take constant overall income into account. Governments need to keep spending constant, rather than increasing it – a major change compared to established conventions within modern governments and their bureaucracies. Firms have to become acquainted to the end of expansion, also implying a major change compared to current habits. The analysis of sustainable zero growth economies hence shows that an a-growth position of simply "getting the prices right" is not enough. Various economic institutions need to be adjusted if strict environmental regulation is to be implemented and future economies have to deal without growth.

Notes

1 The term "clean" refers to products or technologies with relatively low emission and resource intensities.
2 The term "dirty" refers to products or technologies with relatively high emission and resource intensities.
3 And maybe more physical capital, this is an ongoing debate, see below.

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