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Diversifying and Benchmarking Madagascar

Abstract

Because excessive specialization can be risky, diversification matters for sustainable development. A case study of Madagascar, this paper begins by briefly discussing economic and institutional diversification and presenting a simple model of production possibilities to illuminate the possible contribution of diversification to economic and social development in Madagascar and elsewhere. By comparing Madagascar with its peers, the paper aims to identify policies and strategies that can foster economic and institutional diversification and to suggest pathways for Madagascar to promote the welfare of its people through diversification, aiming also to mitigate climate change and its consequences.

JEL-Codes: O110, O130, O150.

Keywords: diversification, institutions, economic growth, natural resources, climate change.

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Diversifying and Benchmarking Madagascar

Thorvaldur Gylfason* and Jean-Pascal N. Nganou**

1. Introduction

There was a time, not long ago, when economic policy advice and policy making in developing and industrial countries alike revolved in the main around identifying ways to foster an upward trajectory of national output and income per person compatible with low inflation and adequate macroeconomic efficiency. Gross Domestic Product (GDP) was in the driver's seat. Scant attention was paid to the distribution of incomes and wealth within countries as this was widely considered irrelevant to overall economic prosperity. The use of social, institutional, and political indicators to broaden and sharpen the picture conveyed by traditional economic data was not common practice. Benchmarking – that is, cross-country comparisons – to identify country-specific issues and thereby also opportunities for economic advancement was the exception, not the rule. Even if the failure of national accounts to take environmental degradation into account was gradually becoming well understood, the production of internationally comparable green national accounts has remained elusive to this day. Even so, the United Nations Development Programme now issues a Planetary pressures-adjusted Human Development Index, computed as the basic Human Development Index (an average of measures of GDP per person, life expectancy, and schooling) adjusted by the level of carbon dioxide emissions and material footprint per capita to account for the excessive human pressure on the planet (UNDP, 2024), producing a ranking of countries quite different from the basic one.¹

Thus, much has changed in recent years. GDP is no longer generally viewed as the alpha and omega of macroeconomic analysis and advice as it is no longer generally perceived to provide an unobstructed overview of economic activity. This is no longer where the action is. For starters, it is generally not enough to know national income and wealth for it also matters

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¹ To wit, Norway's rank drops from 2 in the basic HDI to 14 in the planetary pressures-adjusted HDI.

for economic development how equitably they are divided among the people. Also, convenient though it is as a comprehensive summary measure of economic performance, GDP still leaves many important things out, including environmental degradation, and, therefore, needs to be supplemented by information on the natural environment as well as economic structure, education, public health, human rights, justice, gender equality, and democracy – to name but a few key considerations – to convey a fuller picture of the goings on in economic life. To this end, statistical comparisons with appropriate country peers can show the way toward increased overall prosperity. Further, specific challenges such as climate change at present may call for urgent attention alongside other considerations.

In this paper, we aim to compare Madagascar (pop. 30 million) with a selection of structural, aspirational, and vulnerable peers, ponder the lessons that can be drawn from those comparisons, and make some recommendations concerning economic and social policy and institutions, including ways to mitigate climate change and its consequences.

The peers selected for the comparisons to be made are divided into three groups. The eight *structural peers* selected – that is, countries at a similar level of economic development as Madagascar – are Burkina Faso, Burundi, Mozambique, Nepal, Niger, Tanzania, Uganda, and Zimbabwe. The eight *aspirational peers* selected – that is, countries mostly at a more advanced level of economic development, which Madagascar may aspire to emulate – are Cambodia, Côte d'Ivoire, Indonesia, Malaysia, Mauritius, Mongolia, Rwanda, and Senegal. The eight *vulnerable peers* selected – that is, countries facing similar vulnerability to natural disasters as Madagascar according to the International Disaster Database (EM-DAT) – are Central African Republic, Chad, Congo Democratic Republic, Congo Republic, Guinea-Bissau, Liberia, Mali, and Uganda. The aim is to use the comparisons to develop recommendations designed to help move the economy of Madagascar forward in ways intended to promote diversification and mitigate climate change and to address its local consequences.

To set the stage for those comparisons, we begin in Section 2 by discussing diversification in its various guises and present a simple economic model of production possibilities based on our earlier work to explore the possible contribution of economic and institutional diversification to the acceleration of economic and social development in Madagascar. We present our statistical comparisons of Madagascar with its three peer groups in Section 3. We conclude by discussing some of the issues raised by climate change and its mitigation in Section 4.

2. Double diversification²

Empirical evidence seems to suggest that export diversification and economic development go together across countries (see, e.g., Gylfason and Nganou, 2023, Figs. 1 and 2). At the same time, export specialization in accordance with comparative advantages encourages economic efficiency and growth through gains from trade. Even so, excessive specialization can exacerbate national risk. Damage to a dominant economic activity can adversely affect other sectors, especially in the presence of adverse spillover effects. Therefore, a balance needs to be struck between specialization and diversification.

Diversification can be of two closely related kinds. Economic diversification means diversification of export production away from excessive concentration on the production of a few commodities or a few export destinations. Institututional diversification means the development of sound societal institutions, including increased democracy, that is, diversification away from excessive influence exerted by narrow political elites toward political pluralism where all voices can be heard. Both kinds of diversification aim to reduce national risk and thus encourage economic growth, from different perspectives (for more, see Gylfason and Wijkman, 2016).

If economic diversification is desirable in itself as well as being good for growth and if economic and institutional diversification can be viewed as two sides of the same coin, then institutional diversification, including democracy, must also be good for growth as well as being desirable in itself.

a. Economic diversification

Economic diversification involves more than just the diversification of exports away from excessive dependence on a few typically natural-resource-based commodities, dependence that tends to grant disproportionate political influence to stakeholders in the resource-based industries concerned (Gylfason, 2017). Diversification involves also change toward increased complexity and quality of output (Hidalgo and Hausmann, 2009; IMF, 2014). Diversification as such is good because, as we have said, it reduces the risks associated with excessive emphasis on a narrow economic base. Economic complexity and product quality are good because they signal the ability to produce high-quality items attractive to foreign customers.

² This section draws in part on Gylfason and Wijkman (2016) and Gylfason (2017).

Well-diversified nations selling complex high-quality items abroad tend to be more open to trade than others and more efficient, with a greater capacity for sustainable growth. Hence, we presume, the observed inverse cross-country relationship between high natural-resource intensity and growth, re-launched by Sachs and Warner (1995). This phenomenon is especially apparent in the data when resources are not well managed and institutions are weak. The same applies to the observed direct cross-country relationship between diversity and growth. For a survey of the recent literature on economic diversification and growth, see Brenton *et al.* (2009) and Cadot *et al.* (2011, 2013).

Chart 1 provides a bird's-eye view of the cross-country empirical evidence on diversification and growth. In the left panel we show the cross-sectional relationship between per capita Gross National Income (GNI) in 2021, adjusted for purchasing power parity, and the multifaceted global economic diversification index (EDI) for 2000-2021 recently developed by researchers at The Mohammed Bin Rashid School of Government (MBRSG) in Dubai. The left panel covers all 112 countries for which the EDI is currently available. The EDI is a broad measure of economic diversification, including elements of revenue diversification, output diversification, and trade diversification. The scatter plot suggests a statistically significant positive cross-country correlation between economic diversification, thus broadly defined, and economic growth if by growth we mean past growth, which delivered each country to the level of per capita GNI achieved in 2021. Specifically, a ten-point increase in the EDI, spanning about one-seventh of the range of the index, goes along with a 50% increase in per capita GNI from one country to the next, if the slope of the simple regression line shown is taken at face value. Even so, it needs to be emphasized, no conclusion about cause and effect can be drawn from a bivariate correlation such as this one.

In the right panel of Chart 1 we show the corresponding cross-sectional relationship between PPP-adjusted per capita GNI in 2021 and the share of natural capital in total wealth, defined by the World Bank as the sum of produced capital, human capital, natural capital, and net foreign assets. The natural capital share is a commonly used measure of natural resource intensity in empirical studies of the relationship between natural resources and economic growth. The natural capital share offers a much narrower view of economic diversification, or rather the lack thereof, than does the EDI. All the same, the scatter plot in the right panel, covering 108 of the 112 countries shown in the left panel, conforms to many

such plots and multiple regression results reported in earlier studies, suggesting a statisitically significant inverse cross-country correlation between the natural capital share and economic growth. Specifically, a ten-point decrease in the natural capital share – for instance, from 0.3 to 0.2, spanning about one-sixth of the range of the share – goes along with a 50% increase in per capita GNI from one country to another like in the left panel. The earlier qualifications concerning the bivariate nature of the correlation reported as well as cause and effect still apply.

b. Links to climate change

In addition to its encouragement of growth, economic diversification can facilitate efficient mitigation of climate change due mainly to CO2 emissions and also limit the probable adverse effects of mitigation policies (UNFCCC, 2009). Natural resource policies aiming to promote diversification and derisking share several features with climate policies, both being rooted in the need for efficient and equitable management of common property resources (fish, timber, oil, and other minerals as well as climate). National laws, constitutions, and international covenants define natural resources, including climate, as common property resources. This makes natural resources susceptible to the danger of overexploitation, including climate change. Without appropriate policies and institutions in place, unregulated private interests or even public entities may have a stake in plundering common property resources. It takes government action and international cooperation to align private interests with the common good on a global scale, at least as far as the atmosphere is concerned. Therefore, economic diversification may, as far as it aims to improve the governance of natural resources and reduce their relative economic weight, go together with efficient and equitable mitigation of climate change around the globe (Keane, 2011). The challenge to policy making and institution building is essentially the same in both cases. The plea by the heads of the IMF and the World Bank for carbon pricing to mitigate climate change (Lagarde and Yong Kim, 2015) reflects the time-honored arguments offered by economists for marketbased methods of cleaning up the environment (see, e.g., Bergstrom, 1982; Blinder, 1987, Ch. 5; Mankiw, 2009; Sinn, 2012, 2015; Van der Ploeg (2014); and Stern, 2006, Ch. 15, and 2015, Ch. 3).

c. Insititutional diversification

Institutional diversification involves the build-up and development of institutional capital – including human, social, and cultural capital as well as infrastructure – aiming to make society more cohesive and thereby also more efficient in the sense of facilitating more national output being produced per unit of input, the hallmark of economic efficiency.

In this sense, efficiency is like technology. This makes increased efficiency tantamount to technological progress of the kind that plays a key role in neoclassical growth models. This is how investments in human capital are good for growth and how investments in social and cultural capital are also good for growth. The categories overlap. For example, air conditioning for all, empowered by universal electrification, can be seen as boosting all three: human, social, and cultural capital. Likewise, justice for all and respect for human rights, by not stifling voices that need to be heard in national debate and contributions to national life that need to be made, can be seen as a way to promote efficiency and growth.

d. Production frontiers³

Let us now put the different pieces of our story together within the framework of a simple two-sector model of Madagascar's production possibilities to illustrate some of the ways in which economic and institutional diversification can increase national output per person (as in Gylfason, 1999, Ch. 4, and World Bank, 2020, Annex 1).

In Chart 2, we show primary production originating in agriculture, forestry, and fisheries as well as in other natural-resource-based occupations along the vertical axis. Along the horizontal axis, we show secondary and tertiary production, i.e., manufacturing and services, which we call the modern sector for short. The initial production frontier is shown by the curve AFB. The distance OA along the vertical axis shows the maximum amount of primary output that the economy can produce when all available productive resources are devoted to the primary sector. The distance OB along the horizontal axis similarly shows the maximum amount of secondary and tertiary output that the economy can produce when all productive resources are confined to the modern sector.

Point C within the production frontier signals underemployment of resources, exemplified by college graduates working as street vendors (Madagascar's unemployment rate in 2022

³ This subsection draws on Gylfason and Nganou (2023).

was 2% of the labor force, well below the average of 7% for Sub-Saharan African countries). During resource booms, production is above and to the left of C, whereas during busts it is below and to the right of C. Successful stabilization by, for example, saving excess commodity revenue in a stabilization fund during booms for use during busts will keep production at or around C. The straight line through C inside the frontier and D on the horizontal axis has a slope equal in absolute value to the world price ratio between modern output on the horizontal axis and primary output on the vertical axis. This means that the distance OD along the horizontal axis shows the value of national output (i.e., GDP per person if the population is fixed) measured in terms of modern output. Private as well as public job creation efforts to better suit the labor force by eliminating mismatches will move the economy from point C inside the frontier to a point such as F where the new price line FE, which is parallel to CD, is tangential to the frontier. This will increase GDP by DE, from OD to OE. Most likely, output will increase in both sectors, primary and modern, as the economy moves from C to F. At the full-employment point F on the frontier, it is possible to expand modern output only by moving resources from the primary sector to the modern sector, and vice versa.

To fix ideas, let us assume that point A on the vertical axis is fixed so that technological progress and increased efficiency – e.g., through economic or institutional diversification – move only the point of intersection B on the horizontal axis to the right, shifting the production frontier from AFB to AHG. Suppose, first, that education reform doubles the proportion of each cohort attending secondary school from 30% to 60%. Then, if the mismatching issue has been taken care of, a better educated labor force will be able to deliver more output per worker, shifting the production frontier to the right, from AFB to AHG, leaving the point of departure F inside the new frontier. The economy will, therefore, move from F to H on the new frontier, where a new price line HJ, parallel to CD and FE, touches the new frontier at H. This will make GDP increase by EJ, from OE to OJ. Again, this may produce an expansion of output in both sectors.

The same story applies to other ways in which private enterprise and public authorities successfully promote efficiency. Take electrification that doubles the access to electricity from 35% of the population to 70%, with commensurately wider popular access to air conditioning. Labor productivity will rise, shifting the production frontier to the right as in Chart 2. Again, GDP will increase from OE to OJ. Less corruption, stronger rule of law, more

efficient banking, more democracy, you name it: whatever form it takes, economic and institutional diversification to increase efficiency will increase per capita GDP.

An algebraic formulation may help clarify the argument. Let the production frontier be represented by

(1)
$$y = a - \left(\frac{1}{2b}\right)x^2$$

where y is primary output, x is modern output, and a and b are positive parameters. This means that y = a when x = 0 and $x = \sqrt{2ab}$ when y = 0. We describe the outward shift of the production frontier in Chart 1 by an increase in b.

We set the relative world price of primary and modern output equal to one, which allows us to find GDP at point F by simply adding primary and modern output at this point. At F, the price line with slope -1 is tangential to the production frontier:

(2)
$$\frac{dy}{dx} = -\frac{1}{b}x = -1$$

Therefore, at point F we have

(3)
$$x = b$$

Substituting equation (3) into equation (1) gives

$$(4) y = a - \frac{b}{2}$$

Adding equations (3) and (4) gives GDP:

$$(5) \qquad GDP = a + \frac{b}{2}$$

Equation (5) describes the change in GDP resulting from outward shifts of the production frontier, illustrating how, in Chart 2, an increase in b reflecting increased efficiency through diversification increases GDP linearly from point F to point H. In this case, GDP rises as modern output rises and primary output falls. A more general specification of the production frontier in equation (1) would make it possible for all three to rise, modern output, primary output, and total output.

The model can be extended to describe, among other things, the effects of changes in the relative world price of primary and modern output on GDP, but this would take us beyond the scope of this paper (Gylfason, 1999, Ch. 4).

3. Benchmarking Madagascar

We begin our comparisons with per capita GDP and then extend our story in several different directions.

a. Stagnation amidst peers

Compared with its peers, Madagascar remains poor. The purchasing power of its GDP per person is among the lowest in the group of structural peers, with a similarly low ranking among aspirational as well as vulnerable peers (Chart 3). Moreover, the growth rate of its per capita GDP at PPP during 1990-2022 was slower than in most of the comparator countries (Chart 4). The root cause of Madagascar's weak per capita growth may lie more in volatile growth patterns than in population increases (Chart 5). Among structural peers, its growth volatility is particularly high, ranking just after Zimbabwe. Climatic shocks have exacerbated this volatility, making Madagascar's output highly unpredictable. Among aspirational peers, its population growth is the highest (not shown).

Madagascar also grapples with high inflation, positioning it third among structural peers and second among both aspirational and vulnerable groups (Chart 6). This matters because high inflation tends to hamper growth (Gylfason and Herbertsson, 2001). For this reason, among others, keeping inflation under control is always advisable. Also, high inflation tends to create a bias toward the overvaluation of the national currency, reducing the profitability of exports and hampering trade and growth through that channel as well.

b. Investment, exports, education, and public health

When incomes are low and their growth is slow, a natural place to start looking for reasons and remedies is among the key determinants of economic growth that have been identified in recent growth literature. In terms of investment in machinery and equipment, Madagascar lags its peers, whether in terms of domestic investment or net inflows of foreign direct investment, which is also limited (not shown). Investment is good for growth.

When it comes to exports, Madagascar outperforms its structural peers, though not its aspirational and vulnerable counterparts (Chart 7). Madagascar exports mainly commodities – graphite, chromite, shrimp, coffee, vanilla, and sugar – to China, France, Indonesia, and United States. Exports are good for growth, especially if they are well diversified across

commodities and destinations, and so are imports. Madagascar's export diversification is like that of several of its structural peers as shown by the Herfindahl-Hirschman index of export concentration, with higher values denoting more concentration. Madagascar ranks at the lower end among its structural and vulnerable peers, but improvements during 2011-2017 are worth noting (Chart 8). The Finger-Kreinin and Theil indices of export diversification, where higher values denote less diversification, reaffirm this pattern (not shown). Diversification is good for growth (Gylfason and Nganou, 2023).

In terms of secondary school enrollment, a common measure of education, Madagascar outperforms most of its structural and vulnerable peers but trails aspirational peers (Chart 9). Another way to gauge advances in education is through fertility as measured by births per woman, on the grounds that fewer children per family make it possible to upgrade the educational opportunities of each child. By this measure, Madagascar's trajectory compares favorably with its structural and vulnerable peers but remains elevated compared with its aspirational comparator countries (Chart 10). The Human Capital Index (HCI) and Human Development Index (HDI) place Madagascar at or above average among its structural and vulnerable peers but below average among its aspirational peers (not shown). All this matters because education is an important pillar of economic development. Within all three peer groups, the human development rankings remain virtually the same when the planetary-pressures adjustment is included (not shown).

Life expectancy in Madagascar is commendable, having increased from 52 years in 1991 to 66 years in 2021, standing high among structural and vulnerable peers, and being comparable with countries such as Rwanda in the aspirational group (not shown). A steadily rising life expectancy by six months a year on average since 1991 is an unmistakable sign of economic and social progress even when per capita GDP is stagnant (recall Chart 3).

c. Institutional capital: Declining yet redeemable

Sustained long-run economic growth requires more than the accumulation of physical and human capital as well as vibrant external trade. It requires, also, the accumulation of social capital through sound institutions and infrastructure.

In relative terms, Madagascar has seen its institutional strength wane in recent years. Five examples will do. Notably, first, as far as corruption control is concerned, Madagascar is among the bottom three when juxtaposed with its structural and aspirational peers and trails

all except Cambodia among its aspirational peers (Chart 11). This matters because transparency is an effective disinfectant against corruption, which tends to undermine economic and social efficiency (Mauro, 1995; Bardhan, 1997). Second, while Madagascar's 2022 rule of law metric issued by the World Justice Project exceeds those of many vulnerable countries, it lags aspirational peers (Chart 12). A sound rule of law is good for growth (Acemoglu and Johnson, 2005). Third, Madagascar's financial sector raises concerns about efficiency in view of its interest rate spread, which is among the highest compared with its peers, with the sole exception of Zimbabwe (Chart 13). An excessive interest rate spread is always and everywhere a sign of inefficient banking, including insufficient competition among financial institutions, domestic and foreign, retarding economic development (Levine *et al.*, 2000).

Fourth, with only 35% of its population having access to electricity in 2021, Madagascar hovers in the middle of all three peer groups on this metric (Chart 14). For comparison, the average for Sub-Saharan African countries is 51% (and for the world, 91%). This matters because electrification is a key contributor to economic progress by, for one thing, making air conditioning of homes and workplaces possible and affordable. Air conditioning for all is an economic necessity in tropical countries, not a luxury. In an interview with <u>New Perspectives</u> Quarterly (2009/2010 issue), Lee Kuan Yew, Prime Minster of Singapore 1959-1990, describes how air conditioning catapulted his country to prosperity when stifling heat gave way to cool air indoors. When asked what he considered to be the key to Singapore's rapid growth, he stressed the peaceful coexistence of different ethnic groups (Chinese, Indian, and Malay). He was then asked: Anything else? He answered: "Air conditioning. Air conditioning was a most important invention for us, perhaps one of the signal inventions of history. It changed the nature of civilization by making development possible in the tropics. Without air conditioning you can work only in the cool early-morning hours or at dusk. The first thing I did upon becoming prime minister was to install air conditioners in buildings where the civil service worked. This was key to public efficiency." This insightful conclusion applies with full force to Madagascar and most of its peers under review here.⁴

Fifth and last, one in five in Madagascar uses the Internet. This puts Madagascar in the middle of its structural and vulnerable peers but at the bottom of the aspirational group

⁴ The number of air conditioners in use around the world, including Africa, rose by a factor of four from 1990 to 2023, or from 576 million units to 2.2 billion units. Source: International Energy Agency (2024).

(Chart 15). This matters because Internet use reflects the technological standard of economic activity as well as the computer proficiency of the population. Technology is good for growth.

On the upside, Madagascar ranks favorably on democracy and global freedom metrics, outperforming most of its structural and vulnerable peers as recorded by the Polity IV Project (2019) (Chart 16) as well as by Freedom House (not shown). Both sources place Madagascar's democracy scores in the middle of the aspirational group. However, Madagascar's liberal democracy score according to the V-Dem Institute of Democracy at the University of Gothenburg, Sweden is not quite as robust (not shown). This matters on its own and, also, because experience suggests that democracy with its many facets is good for growth (Acemoglu *et al.*, 2019). In the realm of income inequality, as measured by the GINI coefficient, Madagascar is comparable to its peers (not shown).

d. Nature, diversification, emissions, deforestation, and vulnerability to disasters

Madagascar's rich natural capital is notable among structural and aspirational peers while the share of its human capital in total wealth is about average among its peers (Chart 17). Even so, its resource dependency, measured by the share of natural resource rents in GDP, is lower than among most of its peers (Chart 18). Efficient and equitable management of resource rents is essential to keeping socially counterproductive rent seeking at bay. While Madagascar's forests constitute a smaller proportion of total land area than in several though not all its peers, its rate of deforestation since 1991 has been slower than among most of its peers (Chart 19). Even so, illegal logging needs to be stopped (Suzzi-Simmons, 2023). Leveraging renewable resources for a diversified investment and export strategy is advisable.

In Madagascar, CO2 emissions, at 0.1 metric tons per capita in 2020, are minuscule, even compared with its structural and vulnerable peers (0.2 metric tons per capita), let alone the aspirational peers (2.3 metric tons per capita). By contrast, the United States emitted 13 metric tons of CO2 per capita in 2020, Russia 11.2, China 7.8, and the European Union 5.5 (source: World Bank, *World Development Indicators*).

The share of agriculture, forestry, and fishing in GDP declined from 35% in 1995 to 22% in 2022 to make more room for manufacturing and services. Even so, Madagascar's dependence on agriculture remains about average compared with its structural and vulnerable peers, but higher than in all but two in the aspirational group, Cambodia and

Rwanda (not shown). For further comparison, the average share of agriculture, forestry, and fishing in GDP in Sub-Saharan African countries is 17%. There is room for more diversification in Madagascar.

Death rates from natural disasters, measured as the number of deaths per 100,000 people, have in recent years been lower across the globe than at any time since 1900. Even so, economic damages caused by disasters as a share of GDP have increased since 2000. In particular, the economic costs of climate change are large and, according to recent research findings, perhaps significantly larger than previously thought (Bilal and Känzig, 2024).

Based on a composite World Risk Index ranking 193 countries in terms of their exposure to natural disasters, vulnerability, susceptibility, lack of coping capacities, and lack of adaptive capacities, The World Risk Report (2023) ranks Madagascar 17th. The sole other African country to be listed among the top twenty entries on the list is Mozambique (rank 7). Among the group of vulnerable peers (Chart 20), Madagascar has had a larger proportion of its population affected by natural disasters than all other countries except for Chad and Mali. This brings home the importance of economic diversification, education, and increased trade to support growth and enable Madagascar to better cope with recurrent disasters.

e. Diversification: A barrier to climate shock resilience? No!

There are essentially two ways to deliver a short-run boost to economic activity: (a) Ways that may slow down long-run development (e.g., via short-sighted public spending on white elephants for political gain), and (b) Ways that will encourage sustained growth, also on the supply side of the economy (e.g., by promoting efficiency through external trade and more and better education as well as diversification). The key to sound economic advice for the short and long run is to give priority to recommendations that fall into the latter category.

Similarly, an appropriate strategic emphasis for Madagascar at present would be on policy recommendations that help move the economy forward in ways that also aim to encourage economic development, protect the natural environment, and mitigate climate change as well as addressing its local consequences. By strengthening the foundations of the national economy, economic and institutional diversification appears well suited to complement the government's efforts to mitigate climate change and its consequences.

Hausmann (2022) proposes several imaginative ways to accomplish this under the heading Green Growth Opportunities, all of which can be relevant to Madagascar:

- (i) Generate more electricity from green sources (i.e., wind and solar) to reduce the need for burning fossil fuels. Green sources are now on their way to pushing oil and gas aside as the leading energy sources. Solar energy is a continuous and renewable resource. All that is needed to harness it is to generate electricity from it, as is now being done all over the world by methods that have been known for a long time. Wind energy is also a continuous and renewable resource. Together, solar energy and wind energy accounted fo 13% of total world energy production in 2023, compared with a 14% share for hydropower. Wind energy now grows faster than solar energy and costs about the same. Clean renewable energy has reached 30% of total world energy output. But the flow of primary energy from the sun or wind is extremely variable, calling for energy storage (e.g., batteries and intermediate reservoirs in the case of hydropower) as well as for variable electricity prices to bridge the gap between electricity demand and supply and to smooth fluctuations.
- (ii) Embrace the move of energy-intensive industries toward places rich in green energy to contain transport costs. Oil and coal are inexpensive to store and transport from producer to consumer compared with clean renewable energy, which is more expensive to store and transport. There is, therefore, a global need for relocating energy-intensive industries (e.g., paper, cement, metals, chemicals) in windy and sun-soaked places to reduce storage and transport costs, an elementary application of the law of comparative advantage.
- (iii) Foster good institutions and policies to minimize country risk and keep the cost of capital low. Strong institutions are always desirable, including sound and efficient central and commercial banks commited to keeping inflation low and offering a low spread between lending and deposit rates (recall Charts 6 and 13). Renewable energy production in a new location is costly to launch, especially if inefficient local banks without exposure to foreign competition offer excessive lending rates.
- (iv) Pursue new technologies that can help reduce costs. Decarbonisation, security of supply, and sustainability are essential to the development of clean renewable energy and the interconnection of energy networks in Africa and elsewhere. Up-to-date information on technological development is essential to attaining these goals, including a pan-African energy grid. For example, new metal-free batteries lighter, less costly, more efficient, and more easily disposable than the lithium batteries now in use seem likely to

produce significant efficiency gains in many areas. But you never know for sure, which is why it pays always to keep abreast of developments.

- (v) Think of different ways to capture carbon. Catching many readers by surprise, Chami et al. (2019) stress the contribution that wildlife preservation can make to climate change mitigation. Marine biologists have found that each giant whale that dies in the ocean and sinks to the bottom binds an average of 33 tons of carbon dioxide, thus removing the carbon from the atmosphere for centuries. One dead whale sequesters as much carbon dioxide as a forest of 1500 trees. The IMF draws attention to this comparison in recent reports, signaling that the Fund, like the World Bank, takes climate issues seriously in its economic advice in member countries. These reports claim that whale populations must be quadrupled, meaning a reversal of the 75% decline in the number of whales in recent decades, because, among other things, the restoration of whale populations would significantly limit climate change. If whales are like rain forests as these studies suggest, elephants and other large mammals can play a corresponding role in the fight against climate change in Africa.
- (vi) Keep evolving, keep learning. These recommendations presuppose a reorientation of public and private expenditures and priorities toward greener pastures. The longstanding and overwhelming consensus of natural scientists coupled with ever more common exposure of ordinary people to extreme weather calls for decisive and timely action as well as new ideas (Isachsen and Gylfason, 2022).

4. Conclusion

Madagascar faces persistent low growth and high poverty due to weak governance, low capital accumulation, and slow economic transformation, worsened by climate events and COVID-19. The country's high exposure to cyclones, droughts, floods, and sea level rise makes climate resilience crucial (World Bank, 2023). The National Development Plan (PEM) prioritizes economic diversification, recognizing it as essential for development in the face of increasing climate risks.

Economic diversification and mitigating various risks, including climate risks, are two sides of the same coin. Economic diversification will not happen without accompanying reforms, including the ones ongoing with the support of the World Bank and the IMF. These reforms include enhancing fiscal management by strengthening contingency funds through robust

financial mechanisms that address both immediate and long-term climate adaptation and reconstruction needs. Integrating comprehensive disaster risk strategies into fiscal planning and improving climate impact assessments will better prepare the country for future climatic events. Implementing digital tax systems, such as an e-VAT program, will strengthen the revenue base, improve efficiency, reduce tax evasion, and provide accurate fiscal data for better policymaking.

Additionally, it is vital to bolster social safety nets using revenues generated from environmental tax reforms. Developing a mechanism to recycle these revenues can mitigate the adverse impacts of price adjustments on vulnerable populations. Incentivizing sustainable practices through a "feebate" system and expanding insurance coverage for climatic risks will further enhance financial resilience among the population and businesses.

Structural reforms should focus on supporting climate-resilient investments and attracting green technology. Revising Free Economic Zones legislation to favor sustainable practices and reforming public-private partnerships to prioritize climate resilience in renewable energy and infrastructure projects are crucial steps. Enforcing strict environmental standards in mining, particularly for critical minerals essential for the energy transition, and ensuring large mining projects comply with sustainability standards will contribute significantly to climate resilience.

By combining economic diversification with these comprehensive reforms, Madagascar can improve its resilience to climate risks and promote sustainable economic growth.

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Chart 1. Economic diversification, natural capital, and growth, 1995-2021

Note: The natural log of PPP-adjusted per capita GNI in 2021 is shown on the vertical axes. On the horizontal axes, we have the EDI index of economic diversification during 2000-2021 in all 112 countries for which the EDI is available (left panel) and the average share of natural capital in total wealth 1995-2018 in 108 countries due to missing data on the natural capital share for four of the 112 countries (right panel). Madagascar is marked in red.

Source: Authors' computations, based on the <u>Global Economic Diversification Index</u> and World Bank, <u>World Development Indicators</u>

Chart 2. Production possibilities









Aspirational peers

















Chart 7. Exports of goods and services 1990-2022





Aspirational peers



Vulnerable peers



1 0,9

0,8

0,7 0,6

0,5

0,4 0,3

0,2

0,1

1995, 1091





2014 2016 2018 2020

- Congo, Dem, Rep

Liberia

🗕 Uganda

Chart 10. Fertility rate 1990-2021 Chart 9. Secondary school enrollment 1990-2021

Central African Rep.

Congo, Rep.

Madagascar

- Chad

— Mali

Guinea-Bissau

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Chart 12. Rule of law 2022 (index from 0 to 1)





0,1

0

Coneo, Den, Reb.

Usanda

Coneo Rep.

Mali

Madagascar

Liberia



Chart 14. Access to electricity 1995-2021 (% of population)



Aspirational peers



Vulnerable peers



Mongolia —— Rwanda

7005

200

2012 201

Cote d'Ivoir

Malaysia

1002

2020

Indonesia

Mauritius

- Senegal

2017

30

20

10

0 --10⁹⁹⁰

1996

Cambodia

Madagasca

~9⁹



















Chart 18. Total natural resource rents 1990-2021 (% of GDP)



Chart 19. Forest area (% of land area)





Vulnerable peers







Vulnerable peers

Indor

Senegal Astar

Cambodia

Moneolia



0

Cote divoire

Mauritius

Mala

Sources

Chart 1: Global Economic Diversification Index, https://economicdiversification.com/the-index/ and World Bank, *The Changing Wealth of Nations* (2021), <u>https://www.worldbank.org/en/publication/changing-</u> <u>wealth-of-nations/data</u> and *World Development Indicators*

Chart 2: Gylfason (1999)

Chart 3: World Bank, World Development Indicators

Charts 4-5: Authors' computations based on World Bank, *World Development Indicators*

Charts 6-7: World Bank, World Development Indicators

- Chart 8: UNCTAD, https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=120
- Charts 9-10 World Bank, World Development Indicators

Chart 11: Transparency International, https://www.transparency.org/en/cpi/2022

Chart 12: World Justice Project, Rule of Law Index, https://worldjusticeproject.org/rule-of-law-index/

Chart 13-15: World Bank, World Development Indicators

Chart 16: Polity IV Project (2019), http://www.systemicpeace.org/polityproject.html

Chart 17: World Bank, *The Changing Wealth of Nations* (2021), <u>https://www.worldbank.org/en/publication/changing-wealth-of-nations/data</u>

Charts 18-19: World Bank, World Development Indicators

Chart 20: International Disaster Database, https://www.emdat.be