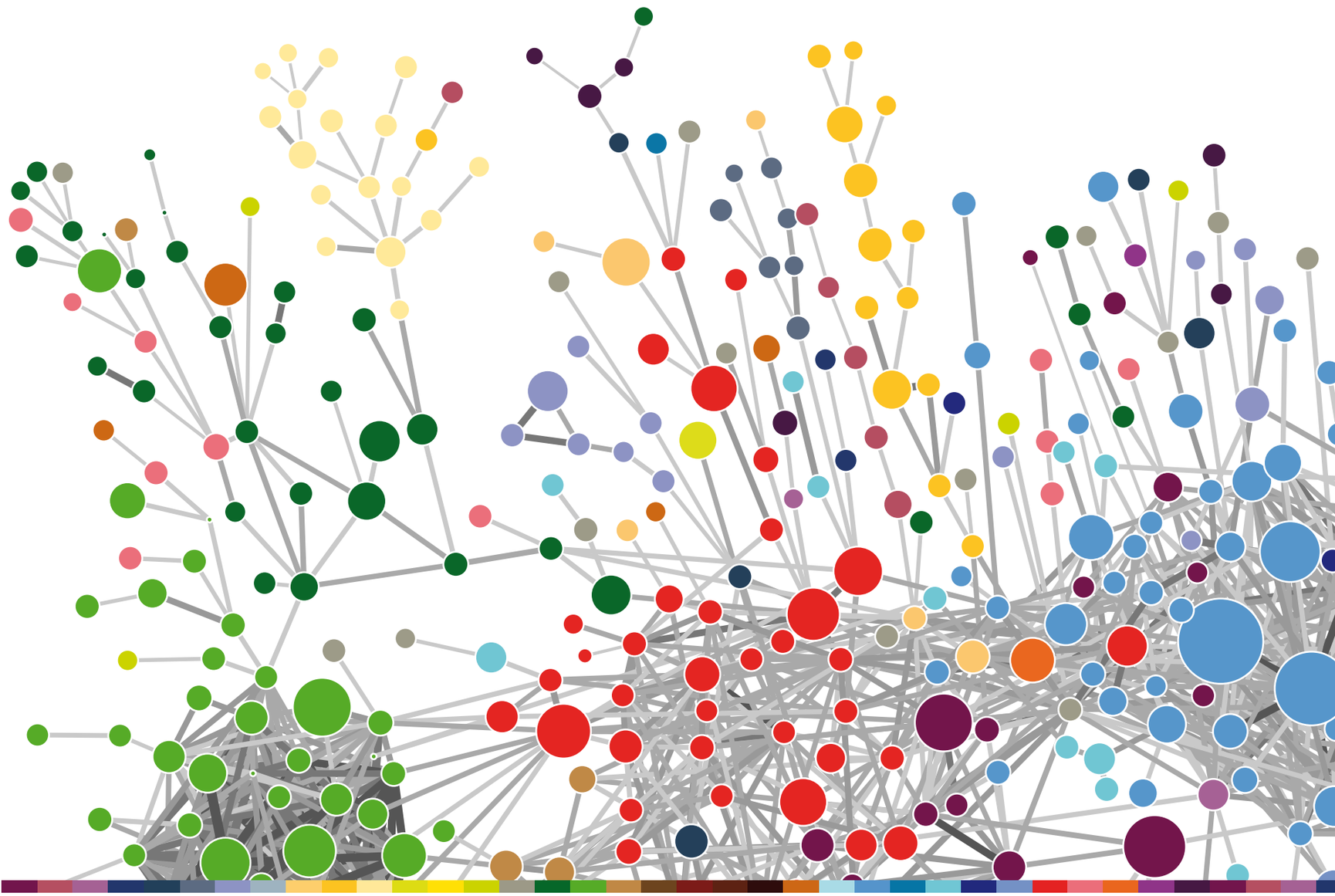
THE ATLAS OF ECONOMIC COMPLEXITY

MAPPING PATHS TO PROSPERITY

Hausmann, Hidalgo et al.



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PREFACE

Over the past two centuries, mankind has accomplished what used to be unthinkable. When we look back at our long list of achievements, it is easy to focus on the most audacious of them, such as our conquest of the skies and the moon. Our lives, however, have been made easier and more prosperous by a large number of more modest, yet crucially important feats. Think of electric bulbs, telephones, cars, personal computers, antibiotics, TVs, refrigerators, watches and water heaters. Think of the many innovations that benefit us despite our minimal awareness of them, such as advances in port management, electric power distribution, agrochemicals and water purification. This progress was possible because we got smarter. During the past two centuries, the amount of productive knowledge we hold expanded dramatically. This was not, however, an individual phenomenon. It was a collective phenomenon. As individuals we are not much more capable than our ancestors, but as societies we have developed the ability to make all that we have mentioned – and much, much more.

Modern societies can amass large amounts of productive knowledge because they distribute bits and pieces of it among its many members. But to make use of it, this knowledge has to be put back together through organizations and markets. Thus, individual specialization begets diversity at the national and global level. Our most prosperous modern societies are wiser, not because their citizens are individually brilliant, but because these societies hold a diversity of knowhow and because they are able to recombine it to create a larger variety of smarter and better products.

The social accumulation of productive knowledge has not been a universal phenomenon. It has taken place in some parts of the world, but not in others. Where it has happened, it has underpinned an incredible increase in living standards. Where it has not, living standards resemble those of centuries past. The enormous income gaps between rich and poor nations are an expression of the vast differences in productive knowledge amassed by different nations. These differences are expressed in the diversity and sophistication of the things that each of them makes, which we explore in detail in this Atlas.

Just as nations differ in the amount of productive knowledge they hold, so do products. The amount of knowledge that is required to make a product can vary enormously from one good to the next. Most modern products require more knowledge than what a single person can hold. Nobody in this world, not even the saviest geek nor the most knowledgeable entrepreneur knows how to make a computer. He has to rely on others who know about battery technology, liquid crystals, microprocessor design, software development, metallurgy, milling, lean manufacturing and human resource management, among many other skills. That is why the average worker in a rich country works in a firm that is much larger and more connected than firms in poor countries. For a society to operate at a high level of total productive knowledge, individuals must know different things. Diversity of productive knowledge, however, is not enough. In order to put knowledge into productive use, societies need to reassemble these distributed bits through teams, organizations and markets.

Accumulating productive knowledge is difficult. For the most part, it is not available in books or on the Internet. It is embedded in brains and human networks. It is tacit and hard to transmit and acquire. It comes from years of experience more than from years of schooling. Productive knowledge, therefore, cannot be learned easily like a song or a poem. It requires structural changes. Just like learning a language requires changes in the structure of the brain, developing a new industry requires changes in the patterns of interaction inside an organization or society.

Expanding the amount of productive knowledge available in a country involves enlarging the set of activities that the country is able to do. This process, however, is tricky. Industries cannot exist if the requisite productive knowledge is absent, yet accumulating bits of productive knowledge will make little sense in places where the industries that require it are not present. This "chicken and egg" problem slows down the accumulation of productive knowledge. It also creates important path dependencies. It is easier for countries to move into industries that mostly reuse what they already know, since these industries require adding modest amounts of productive knowledge. By gradually adding new knowledge to what they already know, countries economize on the chicken and egg problem. That is why we find empirically that countries move from the products that they already create to others that are "close by" in terms of the productive knowledge that they require.

The Atlas of Economic Complexity attempts to measure the amount of productive knowledge that each country holds. Our measure of productive knowledge can account for the enormous income differences between the nations of the world and has the capacity to predict the rate at which countries

will grow. In fact, it is much more predictive than other well-known development indicators, such as those that attempt to measure competitiveness, governance and education.

A central contribution of this Atlas is the creation of a map that captures the similarity of products in terms of their knowledge requirements. This map provides paths through which productive knowledge is more easily accumulated. We call this map, or network, the product space, and use it to locate each country, illustrating their current productive capabilities and the products that lie nearby.

Ultimately, this Atlas views economic development as a social learning process, but one that is rife with pitfalls and dangers. Countries accumulate productive knowledge by developing the capacity to make a larger variety of products of increasing complexity. This process involves trial and error. It is a risky journey in search of the possible. Entrepreneurs, investors and policymakers play a fundamental role in this economic exploration.

By providing rankings, we wish to clarify the scope of the achievable, as revealed by the experience of others. By tracking progress, we offer feedback regarding current trends. By providing maps, we do not pretend to tell potential explorers where to go, but to pinpoint what is out there and what routes may be shorter or more secure. We hope this will empower these explorers with valuable information that will encourage them to take on the challenge and thus speed up the process of economic development.

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