Growth Lab

Export-led Growth

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Growth Lab Working Paper Series
No. 231

July
2024

GROWTH LAB
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This paper may be referenced as follows: Hausmann, R., (2024). “Export-led Growth.” Growth Lab Working Paper, Harvard University Kennedy School of Government.

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Export-led growth

1. Exports and The Washington Consensus

Should exports be an important focus of economic growth strategies? The Washington Consensus, summarised by John Williamson some 35 years ago, would have answered in the negative. In the 1980s, when the consensus was forged, many countries had highly protective trade regimes, multiple exchange rates with large black-market premia, interest rate controls and high inflation. The consensus was that if countries unified exchange rates, reduced barriers to trade and brought inflation under control, exports would follow naturally. According to the Lerner symmetry theorem, import tariffs are equivalent to a tax on exports. Exchange controls act as an additional tax by forcing exporters to sell their earnings at an artificially appreciated exchange rate. If such policy-induced distortions were eliminated, the Washington Consensus suggested, exports would naturally reach their efficient level.

Today, many countries have unified their exchange rates, eliminated exchange controls, brought inflation to single digits, reduced trade barriers and signed free trade agreements with many of their main trade partners, and yet, the median country has not narrowed its income gap with the United States. Export performance matters for growth, with countries that grow exhibiting more than proportional export growth. In many developing and emerging economies, growth is highly correlated with exogenous movements in their export prices and on fluctuations in international capital flows. Moreover, sustained fast-growing economies change the composition of their export basket substantially towards new, more complex products.

Regional differences in growth and export trajectories confirm these observations. Countries in East Asia – including China — have managed rapid changes to their export baskets, increased their global export shares in new industries and achieved fast growth. In Latin America, by contrast, even good performers like Chile, Colombia and Peru stabilised inflation, opened their economies to international trade (tariffs are negligible and they have signed numerous free trade agreements) and capital flows. Yet, they have been unable to diversify their export baskets and achieve sustained growth. The experiences of many nations in Africa and the Middle East resemble those of Latin America.

Export-led growth has been a topic of discussion at least since the 1980s when East Asian economies were undergoing growth miracles that contrasted with the dire performance of debt-stricken Latin America. A central question was whether the growth miracles in the East were associated with their so-called export-led industrialisation (ELI), which was different from the import-substitution industrialisation (ISI) strategy adopted in Latin America since the 1950s. Clearly, something was amiss in Latin America, but what exactly had worked well in East Asia was

less clear. For some, like Balassa,[1] Krueger[2], Bhagwati[3] and Birdsall et al[4]., the invisible hand of the market and its discipline had done most of the miracle in the East. For others, like Amsden[5], the visible hand of activist industrial policies did the trick.

More recently, Dani Rodrik has argued that the success of export-led industrialisation may no longer be replicable. In the past, manufacturing was low-skill labour intensive, which allowed it to absorb large numbers of workers who were leaving agriculture. Today, manufacturing is much less labour intensive, leading to premature de-industrialisation (measured as declining employment shares) and, hence, will not have the aggregate reallocation benefits of the past.

Acemoglu, Johnson and Robinson,[6] Rodrik et al[7] also asks us to look deeper than the so-called proximate causes of growth - like exports and technology - towards more fundamental determinants of growth such as the quality of institutions. They argue countries do not adopt technology because their institutions do not generate the right incentives. For other scholars like Galor[8] and Weil,[9] the demographic transition, as countries shift from high birth and death rates to low birth and death rates, comes along with improvements in life expectancy, reductions in fertility rates, improvements in education, declines in dependency ratios (the average number of children and elderly per 100 working age population), increases in female labour force participation and urbanisation, which all facilitate human capital accumulation, the adoption of technology and economic growth. The implicit message of this literature is that growth policies should focus on either institutions, demography or education.

In this essay, I argue that a focus on exports, both at the intensive margin (where existing products increase their volume), but especially at the extensive margin (where new products start being exported), can help countries figure out what policies to adopt in order to achieve sustained growth. I present five stylised facts about growth and its trends in the decades that followed the Washington Consensus. The first stylised fact relates to convergence. Since 1990, there has been massive convergence in all the factors associated with the demographic

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[1] Balassa, Bela. 1964. "The Purchasing Power Parity Doctrine: A Reappraisal" Journal of Political Economy, 72:6, pp. 584-596.

[2] Krueger, A. (1998). Why trade liberalisation is good for growth. *The economic journal*, *108*(450), 1513-1522.

[3] Bhagwati, J. (2004). *In defense of globalization: With a new afterword*. Oxford University Press.

[4] Birdsall et al (1997). *Pathways to Growth: Comparing East Asia and Latin America*. Inter-American Development Bank.

[5] Amsden, A. H. (2001). *The rise of" the rest": challenges to the west from late-industrializing economies*. Oxford University Press, USA.

6 Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a fundamental cause of long-run growth. Handbook of economic growth, 1, 385-472.

[7] Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: the primacy of institutions over geography and integration in economic development. *Journal of economic growth*, *9*, 131-165.

[8] Galor, O. (2005). From stagnation to growth: unified growth theory. *Handbook of economic growth*, *1*, 171-293. Galor, O. (2022). *The journey of humanity: The origins of wealth and inequality*. Penguin.

[9] Galor, O., & Weil, D. N. (1999). From Malthusian stagnation to modern growth. *American Economic Review*, *89*(2), 150-154; Weil, D. N., & Galor, O. (2000). Population, technology, and growth: From Malthusian stagnation to the demographic transition and beyond. *American Economic Review*, *90*(4), 806-828.

transition: life expectancy, fertility, employment per capita, and female labour force participation. There has even been massive convergence in workers per capita, capital per worker, education, and urbanisation. According to the Solow framework, these trends should have generated convergence in income if technological gaps had remained constant, while according to Galor and Weil, these trends should have generated technological convergence. Both logics should have delivered massive income convergence.

But that has not happened. The median country has not narrowed its income gap. The only way to make sense of this result is that there has been widespread technological divergence, despite the demographic transition, urbanization and impressive narrowing of education gaps. This calls into question the idea that technology adoption will just naturally follow if we address certain deeper underlying causes. Instead, countries seem to have institutions that can sustain all the dimensions of the demographic transition, including a massive improvement in education, health and female labour force participation, but apparently cannot sustain technology adoption. What is missing?

The second stylised fact is that poor countries are cheap, meaning that a dollar buys more in poor countries than in rich ones. I show that this is not only true across countries, but also within countries: as countries get richer, they become more expensive. This is known as the Balassa-Samuelson effect and can be explained not only by the fact that poor countries are less productive - that is why they are poor - but that this productivity gap is much more pronounced in tradable industries (e.g., agriculture, manufacturing, mining and tourism) than in non-tradable industries (e.g., construction, retail trade, social services). Countries that grow consistently see faster improvements in productivity in tradables than in non-tradables, which is why they become more expensive. This implies that whatever is difficult about technology adoption seems to matter more for tradables; and countries that grow consistently also improve the relative productivity of tradables.

The third fact is that the elasticity of exports to GDP per capita is greater than 1 both between and within countries, meaning sustained growth is associated with a more than proportional growth of exports, at least since WWII.

The fourth fact is that countries differ radically in the basket of tradable goods they can produce. Poor countries can usually only produce few ubiquitous products, while rich countries are able to make those same products, but also make many additional products that are less ubiquitous.

The fifth fact is that, at least in the 1980s, only about 20 percent of the countries that grew substantially also changed significantly their export basket in the direction of more complex, less ubiquitous products.

I interpret these last two facts considering the theory of technology that underpins the economic complexity approach. According to this theory, technology is really about productive knowledge, but the implementation of this knowledge requires not just the codification of knowledge into shareable codes, recipes, formulas, algorithms and how-to-do manuals, or the embodiment of

that knowledge into tools and materials, it requires tacit knowledge or know-how in brains. However, the know-how that is missing does not reside in a single brain, that if brought into the country, could ensure technology adoption. Individual brains have a limited capacity to acquire know-how, so we put different bits of knowledge in different heads. The required know-how resides in teams of brains spread out between the employees of every firm and that of its suppliers, including institutions that provide public goods.

This makes technology adoption concrete, and not just an abstract parameter that changes the productivity of general factors of production. Technology adoption is rife with market failures arising like coordination failures, knowledge spillovers and externalities associated with public goods. These issues are more severe and impactful for tradables than for non-tradables, and more serious at the extensive margin than at the intensive margin. Complementarities among technologies mean that problems in the adoption of one technology, say electricity, will make it more difficult to adopt other technologies that rely on the availability of electricity. This can help explain widening technological gaps in most countries.

I then explore the policy implications of this theory. The Washington Consensus prescribed that market failures were the exception rather than the rule. The bulk of the attention was put on policy-induced distortions that could be addressed through liberalisation of trade, labour markets, investment and finance. Our alternative approach starts from the presumption that market failures are rife, they come in many different types, they are highly interacting and are hard to predict or address without contextual information, which must be revealed to policy makers by engaging with the real world.

Since productivity problems are more important for tradables than for non-tradables and more difficult to address at the extensive than at the intensive margin, a focus on the competitiveness of exports with a special attention to its extensive margin is appropriate. L

Economic growth requires a search process into the opportunities and obstacles faced by existing industries and into the adjacent possible: i.e., industries that do not yet exist and that are promising in terms of their feasibility and attractiveness, but remain undeveloped. The policy question becomes how to organise these two search processes at the intensive and extensive margins, given the institutional and corporate structures with which history has bequeathed each country. Policy tools such as industrial zones, special economic zones, R&D subsidies, training subsidies, development banks, investment promotion agencies and business associations, are no panacea but can usefully be adapted, to solve the challenges that the search process faces.

The paper will proceed as follows. Section 2 presents the 5 stylised facts. Section 3 provides an interpretation of these facts. Section 4 discusses what this means for policy. Section 5 concludes.

2. Five stylised facts

1. Convergence in fundamentals, but not in income

Literature has emphasised several channels through which growth and development happens. Richer societies possess more physical capital: installations and machines that make human effort more productive. They also have better health outcomes in terms of life expectancy and have fewer children on whose education they can afford to invest more, leading the next generation to have more human capital. Fewer children also imply lower dependency ratios, hence, more working age population per capita capable of providing potential labour effort. With fewer children and more education, women can participate more fully in employment, giving the economy more human resources to expand production. Finally, a more educated labour force should make it easier to adopt technology. Developed societies are more urbanised, enabling them to sustain a deeper division of labour, greater human interaction and more accessible markets. So, investment, health, demographic change, education and urbanisation are key to development because they increase the availability of physical and human factors of production, and because they facilitate technology adoption.

If we focus on fundamental aspects of development, paraphrasing the Washington Consensus, exports will naturally rise to their efficient level. By contrast, without progress in these more fundamental areas, exports alone cannot make a difference.

To show what happened in the world since the advent of the Washington Consensus, I borrow the idea of measuring gaps with respect to the US from Hall and Jones.[10] I ask myself whether countries have widened or narrowed the gap vis-a-vis the US in all these aspects of development. Table 1 shows the degree to which countries that started below the US in 1990 narrowed their gaps with the US in the subsequent three decades. It also measures the degree and speed of absolute convergence in each selected development indicator, showing how much of the change in the gap is explained by the initial size of the gap.

The results are puzzling, reporting massive convergence in many seen aspects of development seen as fundamental. The capital to output ratio has narrowed in 83 percent of the 83 countries that started below the US in 1990 and the speed of convergence has been massive. Regarding life expectancy, the gap narrowed in 93 percent of the countries that started below the US, with the convergence term alone explaining 68 percent of the variance. The gap in fertility rates declined in 91 percent of the 120 countries that started above the US. With lower fertility gaps, female labour force participation gaps narrowed in 74 percent of the 117 countries that started below the US. Employment per capita gaps narrowed in 80 percent of the cases. The gap in urbanisation narrowed in 59 percent of the cases.

Regarding education, the convergence has been even more impressive. Whether you look at years of schooling of the labour force, tertiary enrolment or the Penn World Table's measure of human capital (see Table 1), the gap narrowed between 1990 and 2020 in 97 percent, 92 percent and 95 percent of the 132 cases considered, with a high convergence speed and a significant correlation between the initial gap and subsequent progress.

[10] Hall, Robert E. & Charles I. Jones, 1999. "**Why do Some Countries Produce So Much More Output Per Worker than Others?**," The Quarterly Journal of Economics, Oxford University Press, vol. 114(1), pages 83-116.

Table 1. The evolution of development gaps vis-a-vis the United States since 1990

	N	N(¡US)	Sh_conv(¡US)	Beta_conv	R2	75pctl/25pctl
K/GDP_(kd)	146	83	.83	-.38	.34	1.75
Life_Expectancy	155	135	.93	-.45	.68	1.19
Fertility_Rate	155	120	.91	-.2	.2	2.29
Fem_Laborforce_Part	155	117	.74	-.18	.15	1.46
Urbanization_Rate	121	108	.59	-.18	.22	2.29
Employment/cap	146	123	.8	-.27	.16	1.37
Yrs_of_Schooling_BL	132	132	.97	-.39	.76	1.67
Tert_Enrollment_BL	132	132	.92	-.26	.27	4.19
Human_Capital_(PW)	133	132	.95	-.19	.25	1.59
GDP/cap_(kd)	134	130	.55	-.05	.02	9.51
TFP	95	86	.44	-.23	.06	1.83

Sources: World Development Indicators, Barro-Lee, Penn World Tables.

With so much progress in all these dimensions of development, it makes sense to expect massive convergence in incomes. Yet, we do not observe this. Instead, barely 55 percent of the countries narrowed the income gap post 1990. The estimated absolute convergence term is almost zero and not statistically significant.

To make sense of this, standard growth accounting requires a divergent total factor productivity (TFP) gap, with 56 percent of countries diverging, rather than converging. Economists usually refer to TFP as "technology": a shift parameter that makes other factors more productive.

So, what does this mean? Countries have been massively converging in all the dimensions we associate with development - except income. This can only be explained by a widening technological gap, which is unrelated to standard measures of human capital such as education and health, on which there has been massive convergence.

One popular explanation for income differences between countries is the institutional approach associated with Douglass North, Daron Acemoglu and James Robinson. This approach accepts that income differences are mainly due to differences in technology but argues that institutions create the incentive structure that determines whether technologies get adopted. But this bes the question of how can it be that institutions are good enough to achieve convergence in demography, health, education, female participation and urbanisation, but not in income and technology? Moreover, there are huge technological and income differences between regions of a country. How can we account for this within-country variance, given that many institutional aspects are national? Another popular explanation emphasises issues of education quality. But what do we need to assume about divergent education quality to overwhelm the fact that education quantities, including in higher education, have been converging so strongly?

2. Poor countries are cheap

It is commonly known that a dollar tends to buy more in poor countries than in rich ones (see Figure 1). The graph shows the relationship between income per capita relative to the US for 2021 measured at purchasing power parity (PPP), and the PPP adjustment factor. Low-income countries have a PPP of 3, and middle-income regions are at around 2, meaning that a dollar buys, respectively, 3 and 2 times more in those countries than in the US.

Intuitively speaking, poor countries are less productive, hence, they should face higher costs. But because poor countries are less productive, they pay lower wages, hence, they should be cheaper. Combine the first and second intuition and you may think that poor countries should be just as expensive as rich ones with their lower productivity compensated by lower wages. So why are low-income countries three times cheaper?

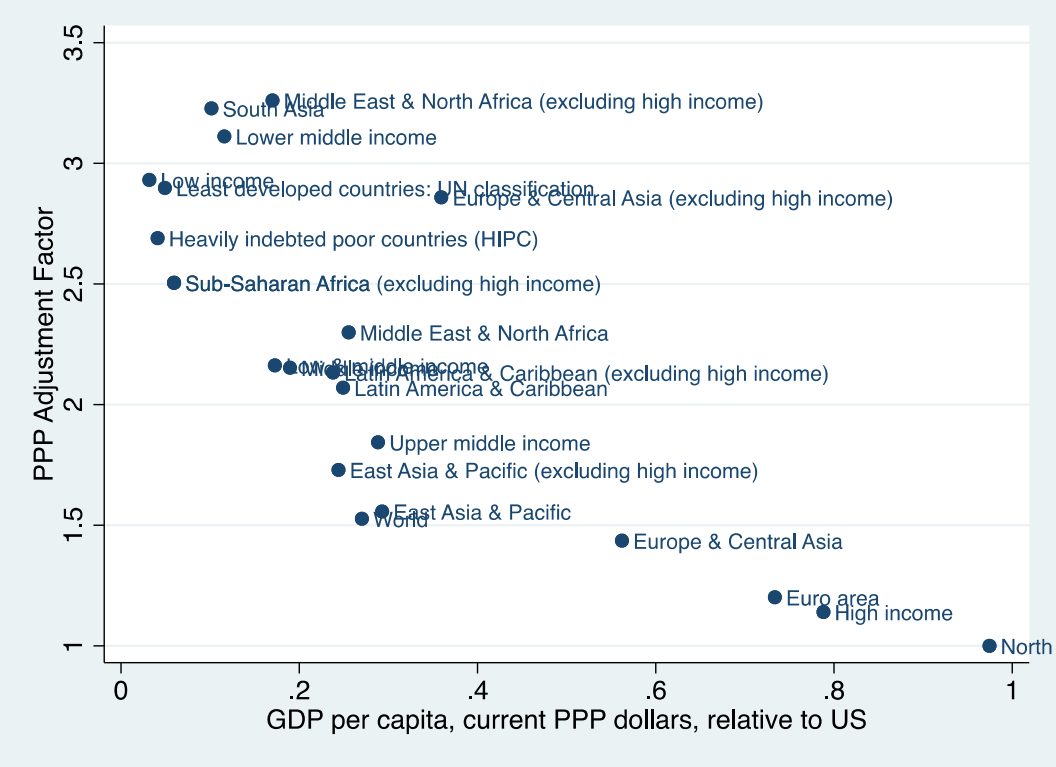
Balassa[11] and Samuelson[12] ask us to consider splitting the economy into two types of products, according to their international tradability. Tradable goods, like scissors, are those that are relatively easy to ship. Non-tradable services, like haircuts, tend to be sold domestically only. Tradable goods tend to be subject to the "Law of One Price", meaning that international consumers will not be willing to pay more for a scissor if they can get a similar one from somewhere else, thus, disciplining the price. Non-tradable goods are not subject to this arbitrage, so their prices vary much more.

To square the puzzle, we need to accept that poor countries are *absolutely* less productive than rich countries - that is why they are poor - but *relatively* much less productive in tradable goods than in non-tradable activities. Whatever explains the difference in productivity between rich and poor countries is particularly concentrated in the productivity of tradable (hence, exportable) products.

[11] Balassa, Bela. 1964. "The Purchasing Power Parity Doctrine: A Reappraisal" Journal of Political Economy, 72:6, pp. 584-596.

[12] Samuelson, Paul A. 1964. "Theoretical Notes on Trade Problems," Review of Economics and Statistics, 46:2, pp. 145-54.

Figure 1. Purchasing Power Parity Adjustment Factor and GDP per capita at PPP, 2021



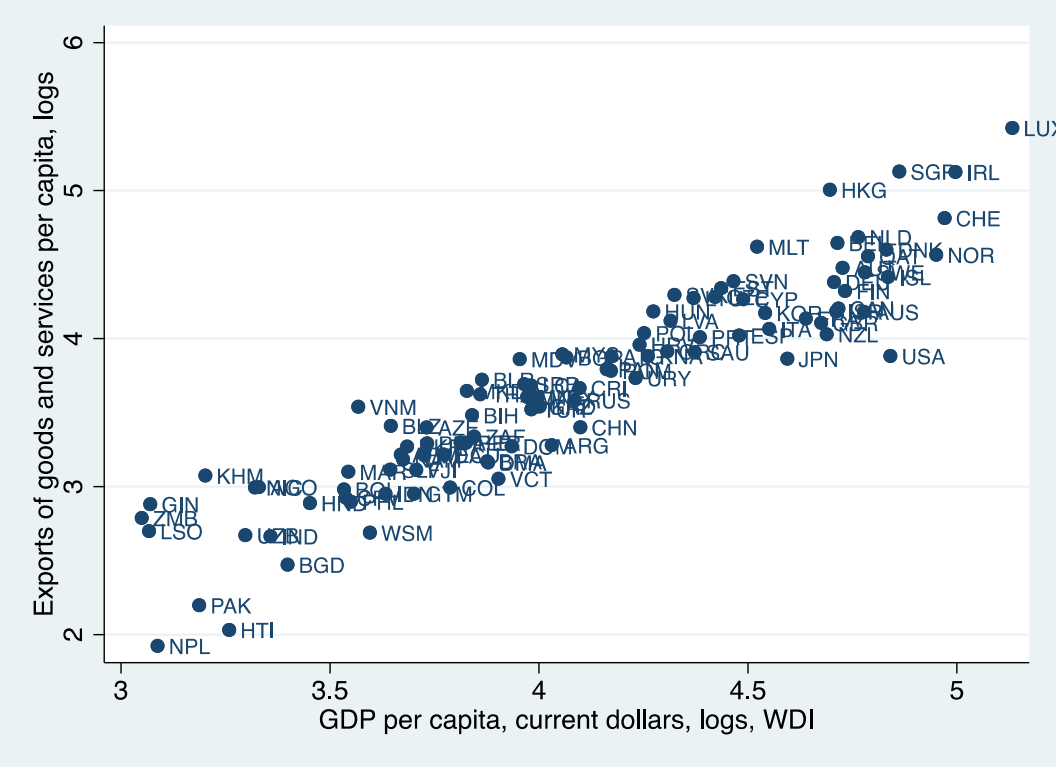
The negative relationship between the PPP adjustment factor and GDP per capita is not just a characteristic of the cross-country variation: countries that grow become more expensive.[13] This means that when countries grow, they tend to improve their relative productivity of the tradable sector more than the non-tradable sector.

3. The elasticity of exports to GDP is higher than 1 both between and within countries

Rich countries tend to export proportionally more than poor countries. To show this, we first look at the cross section, plotting the log exports per capita to the log of GDP per capita for a sample of 171 countries in 2019 (Figure 2). The slope of this curve implies an elasticity of 1.53 with a standard error of 0.09. This means that the gap in export per capita grows more than proportionally with income per capita.

[13] An estimation of the impact of GDP growth on the PPP adjustment factor, controlling for fixed country characteristics and year effects, delivers an elasticity that is slightly smaller than that implied by the cross-section.

Figure 2. Exports of goods and services per capita and GDP per capita 2019, logs



This high export elasticity is not just a feature of the comparison between countries. Within countries, a dynamic estimation of this slope over time delivers an elasticity of 1.37 with a standard error of 0.06,[14] meaning that as countries grow, their exports tend to grow faster than GDP. Empirically, growth is "export-led" in the sense that exports grow more rapidly than GDP.

3. Growth in many developing countries is strongly dependent on external conditions, such as terms of trade and access to finance

In a paper[15] on growth accelerations with Lant Pritchett and Dani Rodrik, we found that improvements in the terms of trade of countries tend to generate growth accelerations that eventually peter out. By contrast, sustained growth accelerations require more substantial changes. Extending this work, Gruss, Nabar and Poplawski-Ribeiro show the great sensitivity of country-specific external demand, terms of trade and particularly external financial conditions in triggering growth accelerations and preventing reversals.

Why is growth so sensitive to external conditions? External conditions determine how much imports countries can afford, whether they pay for them with exports or with borrowed money. Imports embody technology that make firms more productive. This suggests that the availability of foreign exchange is a binding constraint in many settings and that exogenous relaxations of

[14] These are the results of an estimation of the impact of the log of exports on the log GDP, controlling for fixed country characteristics and year effects.

[15] Hausmann, R., Pritchett, L., & Rodrik, D. (2005). Growth accelerations. *Journal of economic growth*, *10*, 303-329.

that constraint - whether due to terms of trade movements or the availability of capital - are associated with temporary growth accelerations.

4. Richer countries have the capacity to make a greater variety of complex products

The presence of a product in the export basket of a country indicates that the country has adopted whatever technologies are necessary for making that product. How much of that product it decides to make will depend on the country's comparative advantage, demand and other factors. Here, I will explore the basic capacity to make the product.

To do this, in ongoing work with Ulrich Schetter and Muhammed Yildirim, and building on Hidalgo and Hausmann,[16] we look at world trade. Consider a matrix of countries and their exports, classified into about 1,200 different products. The matrix has about 200 rows and 1,200 columns. We fill the matrix with ones and zeros depending on whether the country exports more than an epsilon of that product, where we consider epsilon to be just 1 percent of what it would have exported if it exported with the same intensity as the global average.[17] We order the countries by how many 1s they have (i.e., we sum the rows and reorder them according to this measure). We order columns by how ubiquitous products are (i.e., we sum the columns and reorder them according to this measure).

Figure 3 shows the results for the year 2019. Countries at the top make at least an epsilon of almost everything. Countries at the bottom make few things. Products at the left are made in many places (they are ubiquitous, which suggests they are easy to make). Products at the right are made in fewer places. What emerges is a triangular shape where lower rows tend to be subsets of upper rows.[18] This happens because the poorly diversified countries make ubiquitous products, and more diversified countries make more unique products.[19] Countries at the top include Austria, Czech Republic, Denmark and Sweden. Countries at the bottom include Bangladesh, Ethiopia, Guinea-Bissau, Nigeria and Sudan.

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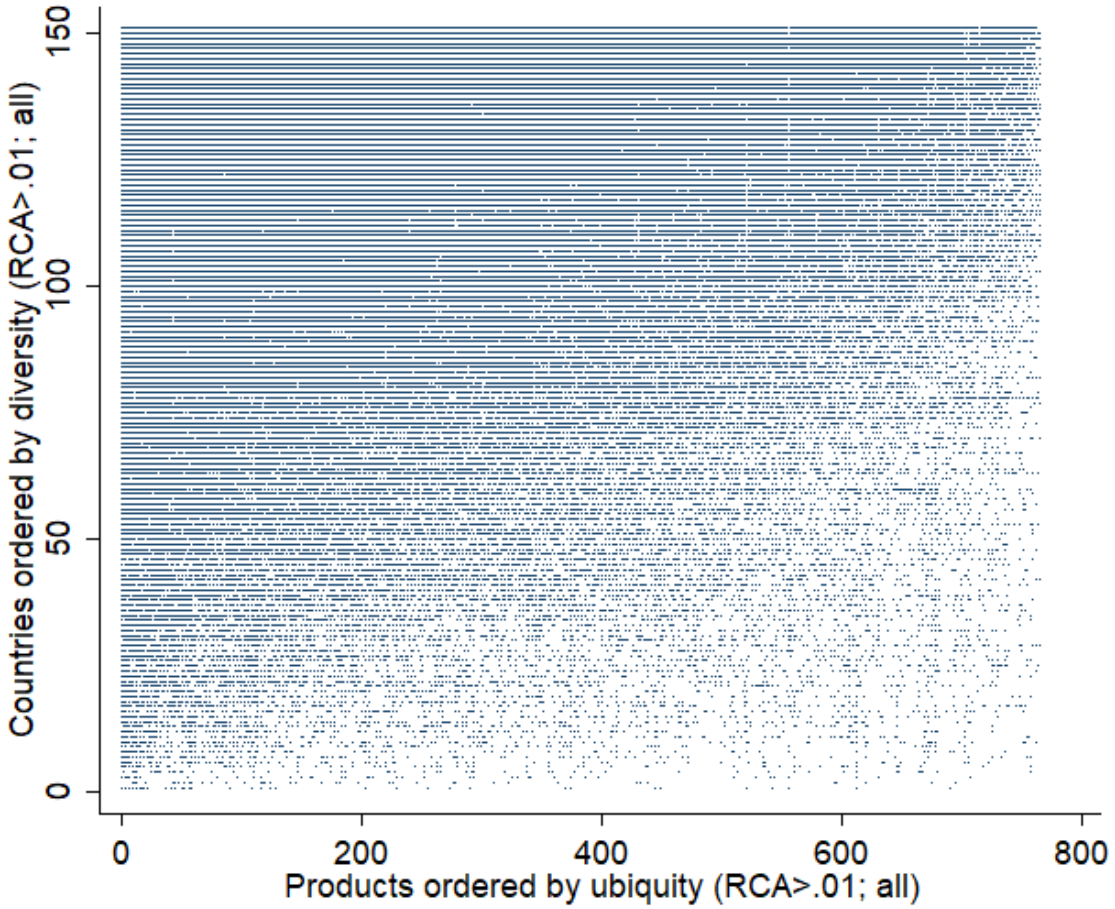
[16] Hidalgo, César A., and Ricardo Hausmann. "The building blocks of economic complexity." *Proceedings of the national academy of sciences* 106, no. 26 (2009): 10570-10575.

[17] More precisely, we use Balassa's measure of revealed comparative advantage which is the ratio of the share of the product in the country's export basket to the share of the product in world exports. A ratio of 1 would mean that the country exports what would be expected given the size of the country's total exports and the size of the product's world market. Our epsilon implies a ratio of just 0.01.

[18] In mathematical terms, this means that the matrix is nested. The literature on ecology has found that ecological networks tend to be nested in the sense that rare species tend to live in highly diversified places while ubiquitous species inhabit both (Hulten, 1937). Bustos et al (2012) show that the nestedness is stable in international trade data such as that in Figure 3.

[19] This observation was first demonstrated in Hidalgo and Hausmann (2009), where they used a revealed comparative advantage of 1 rather than 0.01 to binarize the matrix. We focus on a lower cutoff to emphasize that we are focusing on the extensive margin.

Figure 3. Presence and absence of products in the export basket of countries (2019)



Source: UN-COMTRADE

5. Fast growers significantly upgraded the composition of their export basket

This is not just a feature of the cross-section. Hidalgo and Hausmann developed a method to measure of a country's effective use of technology from matrixes such as Figure 3, which they called the Economic Complexity Index (ECI).[20] Hausmann et al. show a strong association between growth improvements in the economic complexity index.[21] To illustrate this, I focus on the period of the Washington Consensus and look at the developing world, defined as the bottom 75 percent of countries in 1990 in terms of income per capita. I calculate the cumulative percentage growth of these countries between 1990 and 2019 and split the countries into quintiles according to their 1990-2019 growth rate.

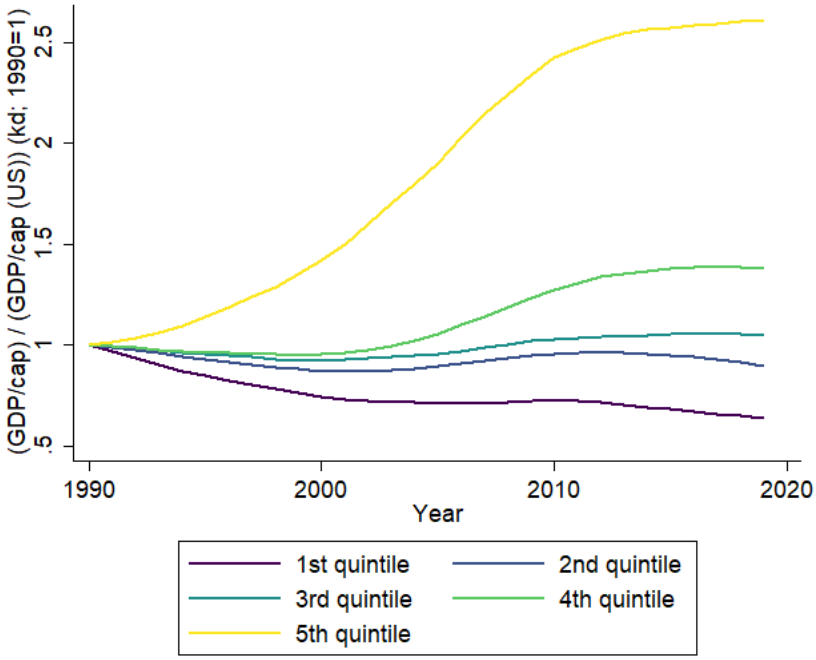
[20] Hidalgo, César A., and Ricardo Hausmann. "The building blocks of economic complexity." *Proceedings of the national academy of sciences* 106, no. 26 (2009): 10570-10575.

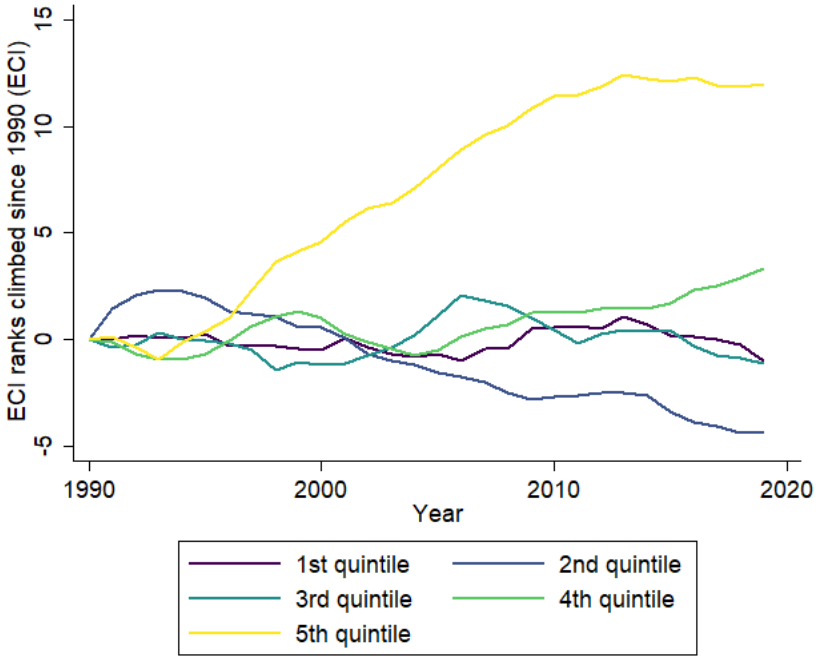
[21] Hausmann, R., Hidalgo, C. A., Bustos, S., Coscia, M., & Simoes, A. (2014). *The Atlas of Economic Complexity: Mapping paths to prosperity*. MIT Press.

Figure 4a shows the evolution of an index of GDP per capita relative to the US, normalized to 1 in 1990, for each of the quintiles. The figure shows that only the top quintile significantly narrowed the gap with the US. The second quintile had modest gains, the third quintile made essentially no progress and the bottom two quintiles fell further behind.

Figure 4b shows the evolution of the economic complexity index for those same quintiles of countries. The graph tells a very similar story: only the top quintile significantly improved its economic complexity. The second quintile shows modest gains and the others fell behind.

Figure 4. (a) average income per capita by quintile of growth. (b) Change in the rankings of the Economic Complexity Index by quintile of growth





This means that the countries that narrowed their income gap with the US also acquired the necessary capabilities to expand the extensive margin of their exports towards more complex goods.

3. Making sense of the stylised facts

There has been no unconditional convergence in incomes despite massive unconditional convergence in many broad-based fundamentals such as demography, health, education, investment, urbanisation and female labour force participation. This suggests that the typical country exhibits divergence in technology adoption, despite convergence in broad-based fundamentals.

The fact that poor countries are cheap indicates that the productivity gap in tradables is larger than in non-tradables. When countries grow, they tend to become more expensive, suggesting that sustained growth requires technology adoption that is biased towards tradables. Whatever limits technology adoption hurts tradable industries more, and sustained progress requires the ability to revert this technological challenge.

The fact that the elasticity of exports to GDP per capita is greater than 1, both in the cross-section and in the time-series, also suggests that sustained growth is associated with more than proportional growth of exports: it is de facto "export-led".

Facts 4-5 suggest that technology is adopted in chunks: it is embedded in the capability to implement specific productive processes that go into subsets of products. According to neo-classical growth models, rich and poor countries have the capacity to make everything, but rich

countries have a comparative advantage in some products and poor countries in others. That is not what we observe: rich countries do have the capacity to make nearly everything, but may choose not to use that capacity intensely. Poor countries have capacity to make fewer and more ubiquitous products. Figure 5 suggests that sustained growth requires an expansion of the capacity to make more products and products that are more complex.

An alternative interpretation of technology

In some versions of economics, technology is defined by its outcomes: it causes factors of production to become more productive[22]. In other versions, such as in Paul Romer's view[23], technology is defined as ideas or recipes. The first definition does not help us understand how to act on technology. The second assumes that the hard part is coming up with the idea or the recipe. It is relatively easier to adopt the idea or implement an existing recipe. So why not just adopt the ideas that others have already developed, for free?

In our alternative interpretation, technology is the productive knowledge we use to transform the physical and social world to our liking. This knowledge has grown exponentially for many centuries. However, our individual capacity to absorb knowledge has not. The number of books, scientific publications and patents shows impressive exponential growth. Our ability to read is no greater than that of Adam Smith or Isaac Newton. To be able to use more knowledge at the societal level, given our limited individual capabilities, the world has used three complementary mechanisms. First, the division of knowledge; we put different bits of knowledge in different heads. By doing so, the whole can know much more than its parts.

Second, modularisation splits the production processes into stages. Each stage requires the coordination of a diverse group of workers that span the productive knowledge to execute that stage. However, each stage relies on inputs that were performed by other organisations in previous stages. The recipe to make a brownie cookie does not include the instructions to make sugar, chocolate, nuts, eggs, pans, ovens or energy. These are other modules that use and embed different knowledge.

Third, codification converts tacit knowledge in brains into other forms that can more easily be shared through documentation, standardisation, classification, and a deeper scientific understanding of the mechanisms involved. Codification tries to extract the cook's knowledge into a set of recipes. A lot is lost in translation, but something remains that enhances the ability of others.

Tools and codes can easily be moved around. Tacit knowledge moves much more slowly into brains: according to Malcolm Gladwell,[24] it takes 10,000 hours of practice to become good at something.

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[22] Solow, R. M. (1957). Technical change and the aggregate production function. *The review of Economics and Statistics*, *39*(3), 312-320.

[23] Romer, Paul M. (1994) "The Origins of Endogenous Growth." *Journal of Economic Perspectives*, 8 (1): 3-22.

[24] Gladwell, M. (2008). *Outliers: The story of success*. Little, Brown.

So, implementing technology means being able to put together the human team - with their differentiated know-how - that spans the knowledge necessary to perform that stage in the production process and secure all the relevant inputs and codified knowledge.

For the human inputs, there is an important distinction between the intensive and the extensive margin of know-how. A violinist can train another violinist, and a baker can train another baker. But what do you do if you do not have a violinist to begin with? This creates a chicken-and-egg problem in the process of diversification, to which we will return.

Two important distinctions must be made about other inputs to the production process; first, some inputs are tradable and others not. To use a modern machine, a firm in a poor country does not need to know how to make the machine. It can simply buy it abroad, provided the country has access to foreign exchange, ports, roads, logistical services and a legal framework that underpins international trade and finance. To be able to operate the machine, the electricity and repair services need to be provided locally. Hence, operating an imported machine still requires local availability of non-tradable goods and services, which must be provided locally. An entrepreneur in a poor country can take the idea of Amazon and decide to make a similar company in her country. However, the Amazon business model presumes that potential customers have access to the internet, that they have credit cards and that some delivery firm exists. Hence, the Amazon business model requires the prior diffusion of other industries on which it depends.

The second important distinction is between private and public goods. Private goods can be acquired in markets. Public goods have no markets: either some non-market organisation, like a government, provides them or society will have to operate without them. There is a market for cars, but there are no markets for roads, traffic lights, traffic signs, traffic rules or traffic cops.

Hence, industries can exist if they can secure the necessary capabilities, including workers that span the know-how required, non-tradable market inputs and public goods. The process of technology adoption implies growth in the availability of these non- tradable capabilities.

Problems with capability accumulation at the extensive margin

It is not easy for economies to provide the capabilities that their existing industries demand. Workers could have better skills, providers of non-tradable inputs could be more efficient and the relevant public goods could be better. But these capabilities have been enough for incumbent industries to survive and even for some of them to thrive. More importantly, as time passes, these industries have the potential to improve through learning by doing and through lobbying they might secure a better supply of public goods.

But industries that do not yet exist face a different problem. It is hard to operate a new plant without workers that have industry experience. But how can there be workers with experience in industries that do not yet exist? You cannot make watches without watchmakers, but how do

you become an experienced watchmaker in a place that does not make watches? Without this experience, how can new industries get started?

It is much easier if the pioneer industry can bring workers with industry experience from a place where the industry already exists. Interestingly, a growing literature has shown the importance of human mobility,[25] migration[26] and return migration for growth industries in general[27] and for pioneer firms[28] in particular.

Unfortunately, many developing countries have restrictive immigration policies that are typically biased against high-skill workers. In most countries, the number of foreign workers that a firm can have is limited. Professional accreditation often restricts work to those that have obtained a local diploma, thereby excluding foreigners.

The required non-tradable inputs of a new industry are the output of industries that may not yet exist, partly because the industries that would use their output as an input are also absent. This is the proverbial chicken-and-egg problem: you need car parts to run an original equipment manufacturer (OEM), but how do you set up an OEM if there are no car part producers? This may be why countries with car manufacturing capabilities got OEMs through explicit industrial policy that provide assurances to address these issues.

Regarding public goods, governments have enough trouble providing for the needs of existing industries. They have other priorities than worry about the needs of industries that do not yet exist. But without these public goods, those industries may never get started.

These are all examples of coordination failures. They are the norm rather than the exception at the extensive margin, and can be addressed by coordinating activities in non-market ways. Solving these problems may even generate positive externalities that markets fail to consider, and hence, do not fully exploit. If a country acquires a capability because it is demanded by a particular industry, that capability is now available to other industries. Developing the capabilities needed by one industry may cause positive spillovers to other potential industries.

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[25] For example, Coscia et al (2020) study the impact of business travel on the evolution of productivity, employment and exports at the country-product level. Coscia, Michele, Frank MH Neffke and Ricardo Hausmann. "Knowledge diffusion in the network of international business travel." *Nature Human Behaviour* 4.10 (2020): 1011-1020.

[26] For example, Bahar and Rapoport (2018) study the impact of migration on the evolution of comparative advantage in receiving countries.

[27] For example, return migration as a source of industry dynamism has been studied by Hausmann and Nedelkoska (2018) for Albania, Bahar et al (2019) for the former Yugoslavia and by Diodato et al (2023) for Mexico.

[28] For example, Mostafa and Klepper (2018) show how the garment industry was seeded into Bangladesh by one Korean company that trained 126 workers who went on to start 56 new high-performing companies. Hausmann and Neffke (2019) study regional pioneer firms in Germany. They find that pioneer firms intensively hire workers with industry experience from other regions. This was particularly important for the re-industrialisation of Eastern Germany post-reunification.

Learning-by-doing can also generate positive spillovers. A pioneer may train workers that are then hired by new entrants, meaning the discovery process creates positive externalities, hence, the market underprovides them[29]. The newly trained workers may even be hired by other new industries that have similar know-how requirements.

Such distortions differentially impact the tradable visa-vis the non-tradable sector. Workers and firms improve as they produce, something known in the literature as Wright's Law.[30] They experience cost reductions as they acquire experience. Contrast a pioneer firm in a non-tradable industry with one in a tradable industry. The first one, being a pioneer, is by definition a monopolist in its industry. It will be able to appropriate monopoly rents that may be enough to finance the learning process. The local pioneer in a tradable industry is not a global pioneer. It enters a market with foreign suppliers that have already gone through a learning process, improved their productivity and lowered costs. The local pioneer cannot expect to earn equivalent monopoly profits to finance the learning because it faces competition from abroad from the beginning. This may make innovation harder in tradable industries, explaining why poor countries are relatively less productive in these industries.

Lucas[31] argues that growth depends on learning-by-doing, but this process peters out within existing industries. To sustain growth, countries need to move to new industries where they can then benefit from new rounds of learning-by-doing. But entering new industries is difficult because of market failures.

4. What does this all mean for policy?

Clearly, the policy-induced distortions that were the focus of the Washington Consensus — misaligned exchange rates, financial repression, protectionism and unsustainable fiscal policies— remain a relevant concern, although in a dwindling number of countries. These issues affect stability and short-term efficiency. But long-term growth requires sustained adoption of technology, which is rife with market failures. This explains why the Washington Consensus has been ineffective on this front.

So what should policies be like in a world rife with market failures? The standard economics answer, going back to Pigou[32], is that you need to specify the market failure and figure out if externalities are positive or negative. Activities that generate positive externalities should be subsidised while negative externalities should be taxed.

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[29] icardo Hausmann, Dani Rodrik,
See Hausmann, R. and Rodrik, D. (2003) "Economic development as self-discovery"*, Journal of Development Economics*, Volume 72, Issue 2, 2003, Pages 603-633, ISSN 0304-3878.

[30] Wright TP (1936) Factors affecting the costs of airplanes. Journal of Aeronautical Sciences 10: 302–328.

[31] Lucas Jr, Robert E. "Making a miracle." *Econometrica: Journal of the Econometric Society* (1993): 251-272.

[32] Pigou, A. C. (1912). *Wealth and welfare*. Macmillan and Company, limited.

But this is a simplification that takes poor account of what markets do and what their failure implies. Instead, it is useful to recall what a well-functioning market does - to better understand what happens when it fails. First, **the market is an information system** that reveals highly decentralised and dispersed information. Every good or service has a price that conveys information about willingness to pay, relative costs and much more. Externalities and other distortions imply that prices may not fully convey the right information.

Second, **the market is an incentive system**. Firms try to make profits by maximizing the gap between the value of the output they produce and the value of the inputs used to produce it. Those values embed the information contained in prices. Third, **the market is a resource mobilisation system**: decentralised financial markets try to make money by funding activities that are expected to be profitable because they correctly respond to information contained in prices.

A few market failures have to do exclusively with distorted price signals that can be addressed through taxes and subsidies or through competition policy. But this presumes that the government can figure out what prices are distorted and how.

A couple of examples of such distortions come to mind. Research and development (R&D) create positive externalities that imply that markets tend to underprovide them in general. This justifies some form of subsidy. This is the argument that has made R&D tax credits ubiquitous in developed countries.[33] Out of the 38 OECD countries, 34 countries offered R&D subsidies in 2021, up from 20 in 2000. It is not obvious what should count as R&D spending across industries as different as software, steel and medicines, or whether they generate the same positive spillovers. It is also not obvious what should count as R&D at different levels of development: setting up a new venture in a developing country involves initial setup and self-discovery costs that generate economies of scale and potential positive externalities for followers. Yet, to solve this, a relatively simple rule[34] could be included in the tax code, as many OECD countries do with R&D expenditures.

Industrial zones can also serve as a generic solution to a class of problems. At the highest level, industrial zones address the fact that manufacturing needs to take place in urban settings, which are highly regulated. Manufacturing requires access to roads, ports and airports so materials and products can be brought in and out, and it requires urban transport to allow workers to commute. It requires power, water, water treatment plants, security and other services. Markets cannot ensure that all inputs will be provided simultaneously and continuously everywhere, but governments can make sure that they are provided at a particular spot.

Special economic zones (SEZs) include some exceptions to the general legislation of a country, especially to avoid distortions for export-oriented activities. Their free zone status can reduce

[33] OECD, "Mapping Business Innovation Support (MABIS), OECD R&D Tax Incentives Database, 2021.

[34] The rule typically involves allowing accepted R&D investments to be deducted from taxable income at a rate greater than 100 percent.

transaction costs associated with getting imported inputs through customs for products that are expected to be re-exported. The SEZs avoid value-added taxes and tariffs on imports avoiding the need to request their reimbursement when exporting. Sometimes they include lower corporate income tax rates that are justified by the fact that optimal tax rates should be sensitive to the elasticity of tax bases to tax rates, and that tradable activities are more mobile than non-tradable activities. In other instances, like Panama, SEZs are exempted from the general immigration law.[35] On the downside, SEZs create a border with the rest of the country and can limit the integration of domestic value chains.

Agglomeration economies can be created in backward regions through a combination of tax incentives, the location of government activities, government procurement preferences and infrastructure investments. The state of Colorado grew through the relocation of important federal government agencies, the development of the airport and the highway system. The states of Arizona, New Mexico, Nevada and California have had similar developments. Yet, there is still no consensus on place-based policies.

R&D subsidies, industrial zones and SEZs exemplify a common class of problems. Other market failures are more **systemic** as they involve disruptions in all three functions of the market. Public goods are a good example as they have no price; they are not supplied with a profit motive; and they are expressed in millions of pages of legislation, thousands of government agencies and highly localised and diverse infrastructure. Where is the government supposed to get information about what specific public goods are needed? What is the incentive to respond to the information? And how will resources be mobilized for that purpose?

Missing markets pose a similar systemic challenge: they have no price, there are no profit motivated firms and there is nothing for capital markets to fund.

Consequently, to overcome systemic market failures policies need to address the information, incentives and resource mobilisation functions that markets provide. We need to clarify how to handle highly decentralised information, how to implement incentives to respond to that information and how to respond and allocate resources.

Defining such policies is highly context and industry specific. First, we must distinguish between existing industries and potential new industries. Second, we distinguish between mature technologies and emerging technologies. Third, we distinguish between technologies and processes in terms of the degree of local adaptation they require. Fourth, we need to consider that industries emerge with different minimum scale requirements. Fifth, we consider differences amongst the agents of change that can initiate or participate in an industry:

[35] In the case of Panama, SEZs have exemptions from the rule that firms cannot have more than 10 percent foreign workers and the SEZs benefit from several special visa regimes. See Hausmann, R., Obach, J., & Santos, M. A. (2016). *Special economic zones in Panama: Technology spillovers from a labor market perspective* (No. 326). Center for International Development at Harvard University.

established large organisations vs. start-ups, global corporations vs. SMEs. Finally, different industries need different types of public goods.

These distinctions mean that horizontal policies, i.e., policies that are industry agnostic, such as the ones emphasized in the World Bank's Doing Business indicators, are woefully inadequate and impractical. Governments should deal with challenges and opportunities at the most appropriate level. Electrical vehicles, mining and pharmaceuticals need very different public goods and face different coordination challenges and externalities. Policies to address industry needs should be as horizontal as possible but as vertical as necessary.

Governments must help reveal the information that is required to identify opportunities and obstacles for expanding into new industries amidst a context of systemic market failures. This critical information revelation process depends on how governments can embed themselves in information flows needed to act effectively. Existing industries tend to form chambers of commerce and other associations that lobby for the provision of the public goods they need. The United States has over 20,000 registered lobby groups that speak to 224 committees and sub-committees of the United States Congress. The existence of these associations indicates that there are private gains from influencing policy. A large literature, starting with George Stigler[36], looks at these activities as rent-seeking and unproductive. However, since many public goods are complements of privately owned productive assets, improving their provision could create value. Rent-seeking can be contained through competition between lobby groups, procedural transparency and mechanisms of accountability.

It is easier for incumbent industries to coordinate and form lobby groups than for industries that do not yet exist. If a government wants to promote diversification, it must develop mechanisms to learn about agents that explore the adjacent possible, the opportunities they encounter and the obstacles and market failures they face. A network of public and semi-public entities has evolved to play this role. For example, investment promotion agencies talk to potential investors in firms that do not yet exist. Managers of industrial zones talk to potential tenants that uncover possibilities and obstacles. Development banks offer funding to pioneer firms and get access to their business plans. Agencies that authorise R&D-related tax expenditures get information regarding firms' innovation efforts. Vocational training entities, often organised with the participation of firms and worker representatives, try to align training programs with business needs. Major investors, as in aerospace in Mexico, medical devices in Costa Rica or green hydrogen in Namibia, demand university programs that align with their needs. State-owned enterprises expose the government to information about new markets, technologies, and opportunities. Some governments perform technological surveillance to keep them abreast of challenges and opportunities. The media informs of problems, initiatives and opportunities that different members of society are facing or considering.

[36] See Stigler, G. J. (1971). The Theory of Economic Regulation. *The Bell Journal of Economics and Management Science*, *2*(1), 3.

But without incentives to respond, information can go to waste, just like the tragedy of September 11 is said to have occurred because intelligence agencies failed to connect the dots. Connecting the dots between the myriad of information flows that governments possess could do wonders.

The Washington Consensus policies prescribed 10 simplified commandments for government action. A new consensus should recognise that while governments may have clear goals, they often do not know what opportunities can take them there and what obstacles they will face. Government strategy must consider how to find out about such new opportunities and obstacles.

This is similar to climate change policy, where the goal is clear, trade-offs are difficult and the instruments to deploy are up for grabs (e.g., carbon taxes, science, technology and R&D subsidies, regulations, government-run labs, government procurement). Policies require the capacity to do real-time assessments of trends and impacts of adopted policies, so they can be adjusted in light of the learning process. In contrast with monetary policy, where one institution has the bulk of the responsibility, climate change policy involves a network of institutions that must coordinate and align.

Most governments aspire to shared and sustainable prosperity as an ultimate goal of growth policy. But they need smart intermediate policy goals to help them achieve these aspirations. The goal of expanding exports both at the intensive and the extensive margin could be an appropriate intermediate goal that forces governments to figure out how to increase productivity in tradable activities, which is where the gaps are largest. It will force society to explore the extensive margin where externalities, chicken-and-egg problems and missing public goods are more severe.

To achieve this intermediate goal, governments need to reveal information about opportunities and obstacles and connect the dots between the information that reaches growth-promoting entities– like development banks, investment promotion entities, export promotion agencies, SEZs, business associations, universities, research centres, vocational training institutions, science and technology policy entities and diaspora organisations to promote problem identification and capability building.

I propose a guide to the search process for action with the below set of questions.

Question 1: On current trends, are existing exports poised to grow at a significant pace, compatible with the growth aspirations of the country? If yes, an export focus may not be the right frame for this country's growth strategy. If the answer is no, the country is unlikely to sustain a decent growth rate unless it addresses the export question. One reason for a negative answer may be that the current export basket does not have the capacity to move the country forward. For many countries, such as Saudi Arabia, the United Arab Emirates, Kazakhstan, Colombia and Venezuela, oil has been a large share of exports, but oil production (measured in barrels per capita) has been falling for decades. For a while, declining production was compensated by high oil prices, but since 2014 that is no longer the case. Given global decarbonisation ambitions, oil exports are unlikely to grow much, if at all. Copper, fruits, forestry and salmon will not be

sufficient to power the Chilean economy forward and the soybean revolution cannot bring much more gains to Argentina's economy.

Question 2: What constrains the export potential of existing industries? Are existing industries constrained by insufficient supply of skills, infrastructure, energy or other public goods? Or does the country need better access to foreign markets? A diagnostic approach could help identify the binding constraint[37]. For example, South Africa's export performance has been disappointing. The most obvious reason is a recent collapse in the country's electricity, transport and port capacity due to mismanagement of state-owned enterprises[38]. The concern starts with exports, but the solution may point to other policy areas.

An important aspect of existing activities is that they exist. Incumbent firms understand what matters to them and will complain and lobby for solutions. Many governments engage the private sector constructively at the industry or cluster level to identify and resolve issues such as deliberation councils in Japan and Korea, Black-Belt teams in Albania[39], *Mesas Ejecutivas* in Peru and Argentina,[40] cluster initiatives in Colombia[41]. Other governments engage through export promotion and investment retention institutions. In other cases, a strong private sector lobby can de facto coordinate the government, as is the case with the Dominican Association of Free Zones (ADOZONAS)[42].

Question 3: **What new ideas in tradable goods and services are in the adjacent possible, given existing capabilities?** Which ideas are currently being explored by pioneering investors? What obstacles are investors bumping against? Is there a clear pipeline of potential new industries in gestation or is the scene relatively barren? Policy makers may face a costly information revelation problem. The industries that policy makers want to promote may not yet exist for reasons that are hard to pin down. Is it a chicken-and-egg problem among feasible private sector investments that just needs to be coordinated? Or does the new industry require capabilities the country does not yet have and is unlikely to acquire? Are their missing public goods and can they be identified and provided? Can you attract foreign investors to explore the industry's feasibility? Will you be able to negotiate a reasonable deal with investors? Is it worthwhile to risk public resources in the attempt?

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[37] Hausmann, R., Klinger, B., & Wagner, R. (2008). *Doing Growth Diagnostics in Practice: A" mindbook"*. Center for Internat. Development at Harvard University.

[38] See Hausmann et al (2023) "Growth through inclusion in South Africa", CID Faculty Working Paper No. 434 November.

[39] Andrews, M., & Harrington, P. (2023). *Facilitating learning and discovery-oriented industrial policy in Albania* (No. 431). Center for International Development at Harvard University.

[40] Ghezzi, Piero. "Mesas Ejecutivas in Peru: Lessons for productive development policies." *Global Policy* 8.3 (2017): 369-380.

[41] Llinás, M. (2021). Iniciativas cluster una forma concreta y efectiva de «mover la aguja» de la productividad. *Bogotá DC*.

[42] Jiménez, J. A., et al (2012). Reporte Harvard: Construyendo un mejor futuro para la República Dominicana: Herramientas para el desarrollo. *Ministerio de Economía, Planificación y Desarrollo. República Dominicana*.

These questions can only be answered by organisations that are dedicated to addressing them. Such organisations take several forms: investment promotion agencies such as Ireland's IDA and Costa Rica's CINDE engage with new and incumbent investors to figure out what industries they want to attract, what instruments seem most effective, what it takes for the investment to happen and whether it would be valuable for the country to make the effort. Another approach is the use of investment development corporations such as South Africa's Industrial Development Corporation (IDC) or Chile's CORFO. While IDC has been used for other purposes, it has the mandate to look at new opportunities and consider providing debt or equity. As part of the government, IDC can influence public policy to secure needed public goods. The government does not need an ex ante view on what investments it wants to attract in order for these approaches to work. Instead, it has an open window for actors to contribute relevant information, so the government can figure out what opportunities are attractive. This is the idea behind "Smart Development Banks".[43]

ADOZONAS, the Dominican Association of Free Zones, is another organisational form with similar effects. The business association of privately-owned free zones stand to benefit from attracting new investors that will rent out their industrial real estate. To do so, it engages closely with investors, connects them with capabilities in the private sector and lobby the government for changes in the provision of public goods.

The fundamental problem is that this information is costly to reveal and acquire. It is not obvious what opportunities are feasible, attractive or strategic, and finding out involves significant costs. Hopefully, incurring these costs is an investment that creates valuable information. While these investments are risky, not doing them is potentially extremely costly in terms of forgone feasible growth opportunities.

Question 4: Who are the potential agents of change that can lead structural change? Economists tend to assume that things happen if the incentives are right. Many have even defined economics as the science of incentives. According to this view, people either avoid actions because of a lack of incentives. Seldom in this approach is the possibility that things do not happen not just because people may not have the incentives: they may just not have the capabilities.

Countries differ in the types of capabilities they possess and in the organizations that possess them. Most places do not have an ecosystem of start-ups, venture capital firms, incubators, accelerators, private equity firms and stock markets. For the few places that do, exploring new business ventures can be done from the proverbial home garage. Most other places require firms that can internalise those functions. In the United States, before the emergence of Silicon Valley, innovation mostly happened inside large corporations, such as AT&T that was a private regulated monopoly.

[43] Fernández-Arias, E., Hausmann, R., & Panizza, U. (2020). Smart development banks. *Journal of Industry, Competition and Trade*, *20*, 395-420.

Structural breakthroughs often happen within large conglomerates that have the balance sheet to make large investments - meaning they possess an internal capital market. They also have experienced managerial capital that can be reallocated to new ventures. They have the reputational capital to reach complex deals with other organisations and with the government. Toyota, Samsung, Turkey's Koç group, Colombia's Grupo Empresarial Antioqueño are examples of this.

State-owned enterprises can play a similar role. Companies such as OCP Group in Morocco, Sasol in South Africa, Empresas Públicas de Medellín in Colombia, ARAMCO in Saudi Arabia and many examples in China (e.g., CNPC, China Mobile, ICBC, CNOOC, Chem China) are organisations that have the capacity to execute strategic diversification bets. In other contexts, the attraction of a multinational corporation can have transformative effects such as INTEL in Costa Rica, De Beers in Botswana and Namibia, and Volkswagen in Slovakia.

Very often, growth strategies do not spell out who are the agents of change that will execute the strategy. These agents are often the bequests of the past and differ markedly between across countries and over time. They constitute the organisational endowment that countries have to mobilise in order to catalyse the growth process.

5. Concluding remarks

Technology adoption is critical for long-term growth, but it cannot be delegated to the proverbial invisible hand of the market. Technology adoption is rife with market failures that only concerted actions can address. Technology adoption seems to be more challenging and impactful in tradable activities. The fact that poor countries are cheap reflects that the productivity gaps are larger in tradables than in non-tradables. The fact that when countries grow sustainably, their exports grow more than proportionally and they expand the basket of feasible products towards more complex goods, suggests that it us good to focus technology adoption on tradable activities.

The resulting policy implication is not a new list of concrete policies that all countries can adopt in the way the Washington Consensus was formulated. Instead, it is an organised and costly search process for growth opportunities, both at the intensive and extensive margins of production. This does not require a list of policies, but rather a set of processes that can endogenously generate such policies by actively exploring opportunities and obstacles. A country cannot walk away from the institutional and organisational structure that has been bequeathed by history. Instead, societies need to incur the risks of exploration in a responsible way. This process might be difficult, but its absence is bound to make growth impossible.