IS CHILE A ROLE MODEL OF EXPORT DIVERSIFICATION POLICIES? A REASSESSMENT

1. INTRODUCTION

Although strong economic fundamentals have allowed Chile to experience economic growth and poverty reduction on par with East Asian countries, its continued dependence on copper exports nurtures a perception that the country has underperformed in promoting export diversification and structural transformation. This hypothetical failure is considered of particular importance by many economists who argue that developing other more labor-intensive export sectors (such as manufacturing and services) may have more direct social benefits than copper exports and that export diversification could further enhance Chile’s long term economic growth because it could lower output volatility (see for example Haddad and others, 2010). Nonetheless, Gonzalez and others (2020) counter this argument by noting that Australia and New Zealand prospered socioeconomically while preserving their export concentration on traditional exports of low complexity.

While the need to diversify Chile’s exports is still under debate, this paper reassesses this country’s in promoting export diversification. It finds that, though it is factually correct that Chile has an export basket highly concentrated in copper products, it is also true that it has superlatively developed non-hydrocarbon/mineral (NHM) exports (including of complex products, as defined in Hidalgo and Hausmann, 2009), which is the most direct goal of export diversification policy strategies. Chile’s traditional indicators of export diversification and
complexity are not favorable, reflecting its exogenous abundance of copper and high international copper prices, not the country’s ability to develop non-copper exports. The paper further shows that Chile’s positive performance in developing other exports is in line with its significant strength in often cited policy determinants of export diversification and complexity. In fact, its policy strength is such that, controlling for the negative effect of its remoteness to other markets, Chile’s per capita exports of NHM and complex exports are among the highest in the world.

Section 2 describes the analytical framework under which this study assesses the success of Chile’s export diversification policies. Section 3 discusses how Chile’s development of NHM exports is significantly better than implied by common export diversification and complexity indices while Section 4 shows how this performance is even more impressive considering its remoteness from large international markets, which most likely reflects its diversification policy strength. Section 5 describes how Chile’s development of NHM exports in recent decades happened while the country strengthened its export diversification policies, particularly of its governance and trade policy openness. Section 6 presents concluding remarks.

2. A NEW ASSESSMENT FRAMEWORK

This section, based on Salinas (2021), presents a more accurate and meaningful perspective in gauging Chile’s (and other commodity dependent exporters’) progress in developing other exports that can lead to export diversification and structural transformation. Specifically, it proposes switching focus from tracking commonly used indices of export diversification and
complexity to tracking levels of NHM and complex exports, because those indices are largely
determined by exogenous fluctuations in Hydrocarbon and Mineral (HM) reserves and
international prices, not just by policy frameworks. Furthermore, by switching focus from
indices to export levels, the identification of export diversification policy determinants can be
grounded on international trade models. In other words, and from a regression analysis
viewpoint, this proposed two changes to the analytical framework of export diversification
can be described as a change in the dependent variable from indices to export levels and the
inclusion of independent variables based on international trade models. The next paragraphs
deepen this discussion.

THE DEPENDENT VARIABLE

Most empirical attempts to identify the factors that foster export diversification use as
dependent variable an export concentration index, such as the Herfindahl-Hirschman Index
(HHI), while those aiming to identify the determinants of exports complexity use several
indices the Economic Complexity Index (ECI) (Hidalgo and Hausmann, 2009). Nevertheless,
these indices are substantially affected by exogenous factors, thus weakening their statistical
link to policy determinants. Take for instance the HHI of export concentration for country $j$
including exports ($x$) of several sectors ($s$):

\[
(1) \quad HHI_j = \sum_{s} \left( \frac{x_{sj}}{\sum_{s} x_{sj}} \right)^2
\]

This index is higher when the nominal export value of one or few commodities is high
relative to the total export basket, indicating more (less) exports concentration
(diversification). In most developing countries, partly due to their weak production capacity, a handful of hydrocarbon/mineral (HM) exports account for most of their total exports. Hence when aiming to diversify exports these countries seek policies to nurture NHM products. If successful, the value of these products will narrow the gap with respect to the dominant HM exports and this would reduce their HHI.

But the HHI can also significantly fluctuate in response to variations in the nominal value of their HM exports, which are commonly the result of largely exogenous events such as changes in international commodity prices or findings of additional HM reserves. Such fluctuations can considerably weaken the statistical relationship between policy frameworks and the desired development of NHM exports needed to diversify export baskets.

This is quite evident when looking at the evolution of the concentration index in a commodity exporting country. For instance, Chile’s HHI remained flat in the 1990s after a previously downward trend and then markedly reverted in the early 2000s. Assuming a significant connection between the HHI and the policy framework, Lebdioui (2019) argues that this end of the downward trend in export concentration is the result of the abandonment of some industrial policies in previous decades.
However, the evolution of per capita NHM shows a completely different picture. Its continued upward trend throughout the 1990s and 2000s confirms that the surge in export concentration was not related to a weakening in Chile’s NHM export policy determinants. The surge in concentration in the early 2000s is evidently related to the international copper boom, which multiplied the value of Chile’s copper exports from US$ 8 billion in 2003 to a peak of US$ 54 billion in 2011, when it accounted for half of its goods exports. Because most countries that seek export diversification are strongly dependent on HM exports, this disconnect between the HHI and policy determinants of NHM exports due to commodity fluctuations is highly consequential. 

A similar confusion occurs when trying to identify a statistical relation between export complexity and policy variables by using the ECI as dependent variable. This index can be broadly understood as the product of each exported product’s complexity (measured by the Product Complexity Index (PCI), defined in Hidalgo and Hausmann, 2009) times the product’s share in the country’s export basket. Because HM products have low PCIs, exogenous increases in international HM prices or HM discoveries lower the ECI without

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1 In a regression analysis with the concentration index as dependent variable and a set of policy variables as covariates, heterogeneity in HM abundance and prices could bias coefficients of policy variables that are correlated to HM heterogeneity and/or inflate error terms thus lowering estimation efficiency. In general, countries with high HM abundance could be unfairly judged as failures of pro-diversification merely because of their exogenous HM abundance.

2 Hidalgo and Hausmann (2009) argue that countries need to enhance the complexity of their export basket to attain sustained economic growth.
any change in the value of exports of higher complexity. Regression specifications that aim to identify a link between policies and complex exports using the ECI as dependent variable are thus weakened by exogenous commodity related fluctuations.

Chile during the early 2000s is also an illustrative case of how these indices can mislead the identification of policies that foster superior exports. Chile’s ECI plummeted from close to zero in 2000 to -0.6 in 2015, a considerable fall as the ECI broadly ranges between -2.5 and 2.5. This decline seems at odds with the sustained productivity growth that Chile experienced those years which, a priori, should have increased its capacity to produce complex goods for exporting. As was the case with the HHI, Chile’s ECI decline is most evidently related to the boom of copper (a low complexity product), thus showing how commodity fluctuations erode the relation between target variable (complex exports) and policy variables.³

The disconnect between the ECI and a country’s policy framework is similarly evident in very telling cross-country comparisons. A priori, the advanced Australian economy, with strong institutional and educational quality, should be more capable of producing complex products than Latin American countries. Yet, for example, the ECI of Australia is

³ As an example of a similar disconnect in oil exporting countries, Nigeria’s ECI has considerably deteriorated during oil price booms (in the early 1970s and early 2000s) and improved significantly in 2008, as a result of the oil price collapse of that year. At a regional level, as noted in Ding and Hadzi-Vaskov (2017), a growing trend in the share of complex exports in Latin American and Caribbean in the 1990s was reversed in the 2000s because of the commodity price boom, as the region is a major exporter of these products.
considerably below the ECIs of El Salvador and Honduras. According to its authors the ECI is a proxy for *productive capabilities* and measures the *knowledge of a society* (Hausmann and others, 2013), but it is questionable that Australia’s *productive capabilities* are inferior in this illustrative cross-country comparison, and the ECI appears unrelated to the technological readiness index of the World Economic Forum’s Global Competitiveness Report. Australia’s low ECI is clearly related to its exogenously high mineral endowment and consequent high exports of minerals (which are low complexity products), not to its complexity or to its policy framework.\(^4\)\(^5\)

The evident disconnect between the above discussed indices and policy determinants that foster exports diversification and complexity can be simply and effectively addressed by focusing directly on the evolution of the export products that lead to diversification or export complexity. Since export diversification is commonly sought in countries that are dependent on a handful of HM exports (such as Chile), the relevant dependent variable is the value of

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\(^4\) Another illustrative case of the limitations of the ECI as a measure of complexity due to natural resource abundance is the U.S. state of Texas. Despite being a global technology leader its ECI is only 0.29, similar to the Philippines. This evident inconsistency likely results from Texas superlative petroleum endowments and the extremely low (\(-2.57\)) Product Complexity Index (PCI) of Petroleum Oils in Hausmann and others (2013).

\(^5\) This dependency of the ECI on exogenous commodity developments is systemic across countries. Fixed effect regressions including most countries (Table A.1) indicate that the ECI is strongly associated with resource wealth as defined in Sachs and Warner (1995). It is thus likely that the ECI’s statistical relation with future GDP growth described in Hidalgo and Hausmann (2009) is related to the resource curse identified earlier in several studies including in Sachs and Warner (1995).
NHM exports.

Similarly, when aiming to foster export complexity the dependent variable can be directly defined as the value of exports of high complexity. Doing this filters out any effect of low-complexity HM export values, which policy makers have little influence over. For cross-country comparability the value of superior exports can be normalized by population or labor force to control for size. Thus, the following sections analyze complexity through the value of complex exports per capita, herby defining as complex exports those products with Product Complex Index (PCI) above zero (the top half of most complex products in Hausmann and others (2013) categorization).

Assessments based on this proposed framework change substantially when focusing directly on the evolution of the targeted export groups per capita. As seen above, although Chile’s HHI pointed to declining diversification in the early 2000s, NHM exports per capita continued to increase during that period. The picture similarly changes when looking directly at the value of per capita complex exports per capita. Unlike the ECI, the value of Chile’s complex exports per capita continued to grow during the copper boom and, as expected, complex exports per capita is higher in Australia than in Honduras and El Salvador and,
 unlike the ECI, the complex exports per capita ratio is higher in the countries with higher technological readiness.\footnote{The upper half of PCI includes products with a PCI above 0. Similar results as those described in this paper are observed when focusing on products with PCI above 1 (about a quarter of all tariff lines) or when focusing on complex exports per worker instead of complex exports per capita. Note that complex exports per capita measure neglects intra-temporal and cross-country variations in the average PCI of each country. An alternative approach that would capture PCI heterogeneity and filter out exogenous commodity related developments would be to calculate the average PCI only for NHM exports. However, that would not be an accurate measure of complexity (productive capability of a society) as it does not give a sense of the scale of complex exports production. Hence, countries with a small share of complex products that have a high PCI would appear more complex than countries with a large share of complex products but with a lower average PCI, no matter how minuscule the share of complex products would be.}{\footnote{Relatedly, according to Haver Analytics data, the volume of industrial exports grew faster than the volume of copper exports over the last two decades, also suggesting that the declining ECI during that period was driven by copper prices not by weakness to develop more complex exports.}

**INDEPENDENT VARIABLES**

Because the proposed dependent variables are levels of exports, independent variables can be defined based on traditional modelling of trade (exports and imports) levels. Specifically, regression specifications with export levels as dependent variables can have gravity equation specifications. This is particularly convenient as Arkolakis and others (2012) have shown that a large class of international trade models generate isomorphic gravity equations, and therefore the results of gravity equation-based estimates should be broadly robust to model selection.

For selection of covariates in addition to standard gravity equation variables, without loss of generality, we consider the main variables of an EK02 (Eaton and Kortum, 2002) Ricardian general equilibrium model. We can relate the target export categories (NHM, manufacturing, complex, and services) to the manufacture sector in EK02’s two-sector setting of manufactures and non-manufactures (equation 17 in EK02):
where the fraction of total expenditure of country \( n \) on manufacturing goods from country \( i \) \( \left( \frac{X_{ni}}{X_{n}} \right) \) divided by its total expenditure \( \left( X_{n} \right) \), is a function of country \( i \)’s state of technology \( (T_i) \), wages in country \( i \) \( (w_i) \), and prices in both countries \( i \) and \( n \). Note that while distance-related variables are mostly exogenous, those related to technology and wages are largely determined by public policies of the exporting economy. Other empirical studies on the determinants of export diversification and complexity include covariates related to productivity/technology (T-variables) of the exporting country \( (i) \), but do not include wage and gravity equation variables.

Regression specifications in most related studies include T-variables such as institutional development, educational attainment, trade policy openness, and infrastructure development. These four variables appear significantly (though not robustly) associated with diversification, sophistication, and complexity in several studies (for example

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8 Parameter \( \gamma \) is a measure of the sensitivity of local prices to foreign cost structures and geographic barriers. \( \theta \) represents product homogeneity across countries, which governs comparative advantage. A low \( \theta \) implies high product variability and in that case comparative advantage exerts a bigger force for trade. \( \beta \) is labor’s share in production, while \( (1- \beta) \) is intermediate inputs’ share in production.

9 Empirical findings from the GVC literature also hint at the importance of distance to large markets and other gravity equation variables in the development of complex exports. Raei and others (2019) and Kowalski and others (2015) identify gravity variables as key determinants of Global Value Chain (GVC) participation. Since participation in GVCs is seen as a major force behind the growth of more complex, manufacturing products, it is very likely that gravity-related variables are significant determinants of export complexity.

10 Trade policy openness and transport infrastructure can be alternatively considered proxies for effective distance between countries.
Hausmann and others, 2006; Weldemicael, 2012; Ding and Hadzi-Vaskov, 2017), including through Bayesian identification (Giri and others, 2019).

Within its gravity equation methodological framework, Salinas (2021) also identifies these four variables as the most economically and statistically significantly related to NHM exports (including exports of manufacturing, services, and complex products), in addition to a country’s proximity to other markets (PM).\textsuperscript{11} PM is particularly relevant, as reducing distance by half is associated with a 150 percent increase in NHM exports. Note that the PM of the remote SCC and OCE regions is about half of that of CAM, EE, and East Asian regions and therefore the exogenous distance factor on its own can explain a substantially lower level of NHM exports per capita in these remote regions.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|}
\hline
Dependent Variable: Log of exports of: & Non-hydrocarbon & Complex & Mannuf. & Services & Hydrocarb. \\
& mineral & & & & & Mineral \\
\hline Log GDP reporter & 0.693*** & 1.026*** & 0.391*** & 1.651*** & 1.241*** \\
Log GDP partner & 0.846*** & 0.769*** & 0.726*** & 0.741*** & 0.833*** \\
Log distance & -1.217*** & -1.513*** & -1.206*** & -0.541*** & -1.091*** \\
Common currency dummy & 0.23 & 0.411*** & 0.307* & 0.856*** & 0.429* \\
Common border dummy & 1.992*** & 1.506*** & 2.419*** & 0.871** & 1.704*** \\
Common language dummy & 0.612*** & 0.757*** & 0.676*** & 0.490** & 0.591*** \\
Common colonizer dummy & 0.366*** & 0.248*** & 0.09 & 1.944*** & 0.19 \\
Past colonial link dummy & 1.255*** & 1.079*** & 1.651*** & 0.893** & 1.131*** \\
Log GDP per capita & -0.09 & -0.770*** & 0.09 & -1.541*** & -0.442*** \\
Governance (WB Index) & 0.532*** & 0.748*** & 0.736*** & 3.153** & -0.467*** \\
Education (UN Index) & 5.689*** & 6.621*** & 5.341*** & 3.329*** & 0.59 \\
Infrastructure (GCR Index) & 0.155*** & 0.240*** & 0.222*** & -0.135* & 0.488*** \\
Average Tariff & -0.0363*** & -0.0564*** & -0.0532*** & 0.010 & 0.066 \\
Labor market flexibility (GCR Index) & 0.02 & 0.06 & 0.04 & -0.10 & 0.353*** \\
Constant & 1.96 & -3.72 & 2.78 & -58.88*** & -16.44** \\
\hline
Observations & 43,233 & 40,460 & 41,002 & 5,537 & 34,199 \\
\hline
R-squared & 0.94 & 0.90 & 0.93 & 0.93 & 0.90 \\
\hline
\end{tabular}
\caption{Determinants of exports by export type}
\end{table}

Notes: * p<0.1, ** p<0.05, *** p<0.01. Hausman and Taylor panel regressions with groups consisting of all combinations of exporter and partner countries in UN COMTRADE database and time periods consisting of non-overlapping 5-year averages.

Variables to control for multilateral resistance included, and policy variables of partner country included in all regressions. Columns 3-5 include policy variables of partner country although not reported. Manufactured exports included are STIC Rev2 6900 to 8899 products. Complex exports are products with a Product Complexity Index (PCI) above zero.

\textsuperscript{11} In that study, GDP per capita is added as an independent variable acknowledging that it can also approximate wage costs, but mainly to control for potential endogeneity between NHM exports per capita and T-variables. Higher NHM exports can foster GDP and higher GDP can help strengthening T-variables (for example, higher output can facilitate/finance higher educational attainment). Note though that GDP per capita is not included in the calculation of goodness of fit when estimating the predictive power of policy variables.
Education is also notably important. A one standard deviation increase in educational attainment is associated with a 170 percent increase in NHM exports. One standard deviation increases in governance and infrastructure quality increase NHM exports by also significant 65 and 20 percent, respectively, and reducing the average import tariff from 15 to 5 percent is associated with a significant 45 percent increase in NHM exports.

3. REASSESSING CHILE’S EXPORT DIVERSIFICATION PERFORMANCE

Within this framework, we reassess Chile’s success in promoting export diversification. Traditional quantitative measures of export concentration are high for Chile relative to the average in other Emerging Market regions, evidence of its strong dependence on copper exports (copper represents about half of Chile’s goods exports). With a Herfindahl-Hirschman index of exports concentration above 0.3 in 2015, Chile’s export basket appears less diversified than those of manufacturing powerhouse countries of Central America and Mexico (CAM), and East Asian Emerging Markets (EAEM).
Also, partly because of copper dominance, Chile ranks low in the Economic Complexity Index (ECI). Since copper appears in the bottom 5 percent of the Product Complexity Index (Hausmann and others, 2013), Chile’s ECI is lower than in most other Emerging Market regions. This is the case although Chile performs strongly in factors that are statistically related to exports diversification and complexity identified in Giri and others, (2019), Ding and Hadzi-Vaskov (2017), and Salinas (2021) such as educational attainment, institutional strength, and infrastructure development.

Switching the unit of analysis from indices to levels of relevant exports considerably improves Chile’s relative standing. Following its success in developing non-copper export products in recent decades, Chile’s NHM exports per capita now compares favorably to those of the manufacturing powerhouse regions of CAM and EAEM.

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12 The ECI of a country is calculated in Hidalgo and Hausmann (2009) based on the diversity of exports a country produces and their ubiquity, or the number of the countries able to produce them (and those countries’ complexity). According to its authors, this index aims to measure the productive capabilities and knowledge in a society as expressed in the products it exports.
Because some of Chile’s NHM exports are of natural resource-based products with low complexity, the country does lag CAM and EAEM in terms of complex exports per capita. But it is also noteworthy that the growth rate of Chile’s complex exports per capita is not too different from the average in emerging market regions with successful manufacturing export sectors (see charts below). Growing by a factor of eight in the last three decades since the mid-1980s, Chile’s complex exports per capita performance has been more similar to the average in CAM and EAEM countries, than to nearby Andean (Bolivia, Colombia, Peru, and Venezuela) and Southern Cone (Argentina, Brazil, Paraguay and Uruguay) subregions, which increased exports complexity by factors of
two and three, respectively.\textsuperscript{13} Thus, by 2014-16 Chile’s complex exports per capita were six times higher than in Andean countries (AND) and three times higher than in the average in other Southern Cone countries (SCC).

At least two methodological issues help explain CAM’s and EAEM’s higher complex exports per capita. One is that even though the production of copper is not particularly labor-intensive, the share of labor it demands directly and indirectly is not negligible. With less labor force available to non-copper sectors, the per capita level of complex exports is expected to be lower than in the absence of such large copper production. CAM countries do not have significant HM exports and although EAEM countries also have significant HM exports per capita, in 2017, Chile had a ratio about four times higher.

A second issue is that CAM and EAEM countries participate more intensively in GVCs than Chile, so that their gross NHM exports overstate their domestic value added. According to the OECD Trade in Value Added (TIVA) database (OECD, 2019), in 2018 the domestic value added of NHM exports of Mexico, Malaysia and Thailand, the CAM and EAEM economies with highest complex exports per capita, was around 60 percent.\textsuperscript{14} In comparison, the domestic value added of NHM exports of distant Australia and Chile was 81 and 88 percent of their gross exports, respectively. Thus, the difference in the value added of

\textsuperscript{13} Besides Central American countries (Costa Rica, Guatemala, Honduras, Nicaragua, and El Salvador) CAM includes Mexico. EAEM includes China, Indonesia, Malaysia, Thailand, and Vietnam.

\textsuperscript{14} Data on exports value added is not available for most countries, therefore the rest of the analysis centers on gross exports. Note that all indices of diversification and export superiority are subject to this caveat.
complex level per capita between EAEM and Chile is likely much lower (about 2 to 1) than the difference in gross complex exports per capita shown in the chart above (about 3 to 1).

While some of Chile’s complex exports are linked to its abundant natural resources, many others are not. Looking at a list of Chile’s top ten complex exports we see that only two of them, Processed Copper and Converted Paper, are products that industrialize natural resources. Most are manufacturing products, such as telecommunications products, vehicles, machinery and medicaments, that are not linked to natural resource abundance. This is a positive sign that Chile’s comparative advantage is not solely related to its natural resources but also to its strength in policies that nurture export complexity (which we discuss below).

Noteworthy also, Chile produces many highly complex products, with PCIs above two, such as medical equipment, electrical instruments, and metal working machine tools.
4. CHILE’S DIVERSIFICATION HAMPERED BY REMOTENESS

Chile’s major limitation in developing complex and non-mineral exports in general is most likely its remoteness from the main centers of global economic activity. Far from the large Asian, European, and North American markets, transportation costs of Chile’s exports are considerably higher than for countries that are located in the close periphery of these regions. Importantly, this limits its potential to join GVCs and therefore it is not surprising that its level of complex exports per capita is considerably lower than in other regions that are closer to the major world economic centers.

Interestingly, because non-tourism services are less sensitive to the distance factor Chile’s per capita exports of services compares favorably to other regions including EAEM. Chile’s service exports include those of its largest airline (the largest in Latin America), as well as Business, Information Technology, and financial services. These are skill-intensive products which show that the Chilean economy has the capabilities to produce high value-added exports especially when distance is not a major limiting factor.
Statistical estimates of the impact of geographic remoteness on export development in Salinas (2021), predict a large difference in complex exports per capita between Chile and less remote EM regions. Specifically, as Chile’s PM index is about half of the average of EAEM countries, these statistical estimates predict that its NHM, manufacturing, and complex exports per capita should be about a fifth of the EAEM average level.

Strengthening connectivity to other markets is thus crucial for Chile’s efforts to increase export diversification and complexity. Although geographic distance is a fixed variable, “effective” distance can be lowered through investments in transports and communications infrastructure that lower the cost of goods and knowledge exchange.¹⁵

For sure, Chile’s exports can also be fostered by strengthening diversification policy

¹⁵ Proximity to markets can also increase with higher GDP of nearby trading partners, but this is of course largely out of control of local policy makers.
fundamentals discussed above. In fact, Chile’s diversification policy framework appears relatively strong in comparisons to other Emerging Market countries (Panel Figure A.1).

Another indication of Chile’s strong diversification policy fundamentals is that its complex exports per capita are much higher than predicted only by the PM index (see chart below). This suggests that Chile’s policies may have helped it offset its distance disadvantage. In general, all countries that are significantly above the fitted line very likely have strong export diversification policy frameworks that allow them to surpass expectations anchored in geographic determinants and therefore hint at “role models” of export development policies.

The world maps in Panel Figure A.2 similarly indicate deviations from distance-predicted complex and NHM exports per capita. Countries in darker blue are those with higher upward deviation and those in darker red have higher downward deviation. In the case of complex exports, superlative countries include well known models of export development in East
Asia, such as Japan, Malaysia, South Korea, and Thailand. Remarkably, the upward deviation of Chile’s complex exports per capita with respect to the level predicted by distance is also among the highest in the world, as is the case for also remote Australia (AUS) and New Zealand (NZL). Chile’s upward deviation in NHM exports per capita is even higher, reflecting its success in promoting some natural resource based products (fisheries, agroexports, forestries).

Acknowledging Chile’s remoteness, its export promotion success is better judged by comparing it with other remote countries. In such comparison, Chile has the highest level of per capita complex exports among emerging market regions and only trails high-income Australia and New Zealand.  

A scatter plot comparing the level of complex export per capita predicted by distance plus policy variables (governance, education, infrastructure, and import tariffs) does a much better

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16 The comparator remote countries include those with an income per capita above 8,000 US dollars per capita, population above 1 million, and located at a southern latitude similar to Chile’s.
job at predicting Chile’s complex exports. This improvement in fit when adding policy variables is further evidence that Chile’s strong diversification policy fundamentals considerably improve its complexity.

5. CHILE’S STRENGTHENING OF DIVERSIFICATION POLICIES IN RECENT DECADES

Additional corroboration of the effectiveness of Chile’s diversification policy framework is that, in recent decades, its NHM and complex exports have increased relative to other regions at the same time as its policies have also significantly improve, particularly in the areas of governance and trade policy openness.
NHM exports per capita was within the average range of EM regional groups back in 1980. Since then, it has gradually surpassed the average level in most other EM regions, including the high performing EAEM region, despite its remoteness to the large economic centers. Its progress in fostering complex export development has not been as impressive, only surpassing SCC countries and lagging the EAEM average.

Chile’s less impressive development of complex exports relative to EAEM is likely related to its remoteness, as these exports commonly develop within GVCs, which are strongly dependent on proximity to large economies. Interestingly, Chile’s distance disadvantage relative to EAEM’s has increased, as its PM index relative to this region decreased from two thirds in 1980 to one half in 2017. This is likely because the large East Asian economic agglomeration (efficiently linked through sea-based transportation) benefits from a virtuous circle through which the high initial PM of these countries fosters their
intraregional exports and economic activity and this in turn increases the regions PM. As many of these countries still have significant room to converge to the income per capita of advanced countries this virtuous circle may be prolonged.

In contrast, Chile’s relatively isolated South American neighbors have low PMs and this limits their potential for intraregional export development and economic growth. Without the impulse from a nearby and fast-growing economic agglomeration, Chile’s development of non-copper exports has hinged on the strength of its policy determinants of export diversification and complexity.

An important area of progress has been the strengthening of political stability and governance. After a politically unstable period that included an almost two-decade long military government, Chile returned to a democratic system and experienced a long period of uninterrupted development of political and economic institutions. This is reflected in an improvement in its Polity IV index from a negative to the maximum score, same score as for Australia and New Zealand. And by 2016-19, the World Bank’s overall governance index indicates that Chile is considerably ahead the average in comparator EM country groups, as seen in Panel Figure A.1.
Chile’s progress in liberalizing its trade policies has been particularly outstanding. Its average Most-Favored-Nation (MFN) tariff has been reduced from about 100 percent in the 1970s to about 25 percent in 1980, and to low single-digit in 2017. This 95-percentage point reduction in Chile’s average tariff on its own is statistically associated to a twenty-fold expansion in complex exports per capita according to estimates in Salinas (2021). Chile is also one of few countries that wiped out non-tariff barriers, and did it ahead of most developing countries, in the 1970s. Moreover, Chile has been notably active in signing Free-Trade Agreements, especially with its largest trading partners, including the United States, East Asian countries, the European Union, Oceanian Countries, and other South American countries. Hence, most of Chile’s exports and imports are subject to the open trade conditions established in these agreements.

Chile’s educational attainment has been an important contributor to its export’s development for several decades. Although its educational attainment has been recently surpassed by the EE region, it remains above that of other EM regions, including EAEM. A comparison of its PISA test results with that of other EM countries (Panel Figure A.3) indicates that the quality of
education in Chile is similarly higher than in most other EM countries in Reading and Science, but it’s at a less superior standing in Math. Nevertheless, Chile has significant room to strengthen its education quality as pointed out in IMF (2021), with Chile being significantly below OECD countries in terms of both PISA tests and basic competencies.

Infrastructure coverage in Chile has rapidly expanded in recent decades and its quality is superlative in some areas. An index of infrastructure coverage that factors in electricity and phone line infrastructure going back to 1985, shows that Chile’s coverage has remained about average among EM regions but has closed the gap with respect to Eastern Europe. In addition, the Infrastructure Pillar of the Global Competitiveness Index (World Economic Forum), which factors in quality for a wider set of infrastructure areas, indicates that Chile infrastructure excels in most areas (see Panel Figure A.4). This is particularly the case on ports and electricity quality, identified in Salinas (2021) as the areas of infrastructure most strongly associated with export development.

In light of its geographic disadvantage Chile should aim to foster its exports diversification and complexity by strengthening its policy framework to reach Australia and New Zealand, remote countries that have successfully developed NHM and complex exports way above EE
and EAEM countries. Except for trade policy openness, Chile has significant room to catch up with these two advance countries in all the other three factors associated with export development.

According to regression analysis in Salinas (2021), strengthening these factors could increase Chile’s complex exports substantially. From these estimates it is inferred that eliminating the significant gap in the education attainment gap with respect to, for example, New Zealand is associated with 100 percent increase in complex exports. Eliminating the gap in governance and infrastructure relative to New Zealand could increase complex exports by 45 and 23 percent, respectively. And lowering average tariffs to New Zealand’s level could increase complex exports by 13 percent. Attaining all these improvements would triple Chile’s complex exports, considerably surpassing the average in EAEM although not attaining EE’s average largely because of remoteness.

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<thead>
<tr>
<th>Chile Complex Exports per Capita in 2015-17 with New Zealand Policies</th>
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<tbody>
<tr>
<td>Actual</td>
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<tr>
<td>Governance</td>
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Source: UN Comtrade and author’s calculations
6. CONCLUSIONS

Chile’s development of non-mineral and complex exports has been more successful than implied by commonly used diversification and complexity indices. When observing the level and long term growth of NHM and complex export categories, Chile’s performance appears as strong as its overall economic performance and more similar to the average in the high performing East Asian region than to other South American countries. This has been the case despite Chile’s remoteness from the large global economic centers and likely a result of its well-recognized efforts to strengthen its institutional development, educational attainment, trade policy openness, and physical infrastructure.

If Chile has low diversification and ranks low in terms of the ECI it is because of exogenous copper abundance and distance to large international markets, not because of an ineffective
policy framework. In fact, among remote countries, Chile has seen the fastest growth in exports complexity per capita, owing to its strong performance on governance, education, infrastructure quality, and trade policy openness.

For sure, as described in Lebdioui (2019), Chile has also relied on vertical policies for export promotion, but it did so avoiding now controversial industrial policies that generated major macroeconomic imbalances in many developing countries, such as SOEs or trade protectionism. In contrast, it relied on now widely recommended policies, such as technology transfer and diffusion, R&D support, and export marketing, which are unlikely to lead to macroeconomic disarray. In the 1970s and 1980s, it relied on more controversial credit subsidies, but less so in later decades without apparent impact on its development of NHM exports. Nowadays, with a much larger global capital pool and its very low sovereign spread, financing is not a bottleneck to Chile’s exports development.

Going forward, this analysis underscores the need to preserve Chile’s leadership in strengthening its economic fundamentals and redouble its efforts to overcome the hurdles imposed by distance to large markets. Australia and New Zealand are role models of high complexity development despite long distance from large international markets. With these countries and other advanced economies as benchmark, Chile should continue to strengthen governance, education, and infrastructure to reach higher degrees of complexity. Transports infrastructure is particularly important, as this can help reduce the cost imposed by remoteness.
Sectorally, Chile can focus on the development of exports of services and of high value-to-weight products, which are less affected by transportation costs. Improving telecommunications and electricity infrastructure towards the quality level of advanced countries would be key to foster complex exports services. Technology will clearly be Chile’s best ally in overcoming its distance hurdle.
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Exports Determinants in Chile and Comparators

Learning Adjusted Years of Schooling
(Years)

Governance
(Index -2 to 2)

Infrastructure
(Index 0 to 0.7)

Import Tariffs
(Percent)


Note: Country acronyms are ISO3.
CAM=Central America and Mexico; EAEM=East Asia Emerging Markets.
Regional subgroupings described in Table A.1.
PANEL FIGURE A.2: DEVIATION OF ACTUAL EXPORTS FROM PREDICTED-BY-DISTANCE EXPORTS

Deviation from Predicted Log of NHM Exports per Capita

Model 1
4.650745
-0.2933565
-5.237958
PANEL FIGURE A.3: EDUCATION QUALITY IN CHILE AND COMPARATORS

PISA tests by area

Reading

Math

Science

Source: OECD, PISA 2018 Database.
Infrastructure Components Chile and Comparators

( Index 0 to 7 )

Source: Global Competitiveness Report (World Economic Forum).
Note: Country acronyms are ISO3. CAM=Central America and Mexico;
EAEM=East Asia Emerging Markets
Regional subgroupings described in Table A.1. Values are averages of years 2016-2018