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Serving From Hermosillo: Opportunities in Cross-Border Trade of Services

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Executive Summary

Technological advances have increased the general tradability of services, leading international trade in services to outpace trade in goods, especially after the global financial crisis and the COVID-19 pandemic. Services once considered less tradable due to the necessity of physical proximity between consumer and provider are now increasingly digitized and delivered remotely. Cross-border services now represent 79% of all internationally traded services, and digitally deliverable activities like engineering, accounting, database and other information services are experiencing yearly U.S. imports growth rates over 15%. This report analyzes how Mexico has been capitalizing on some of these trends over the past five years using the most granular data available. Then, we analyze opportunities from the perspective of Hermosillo.

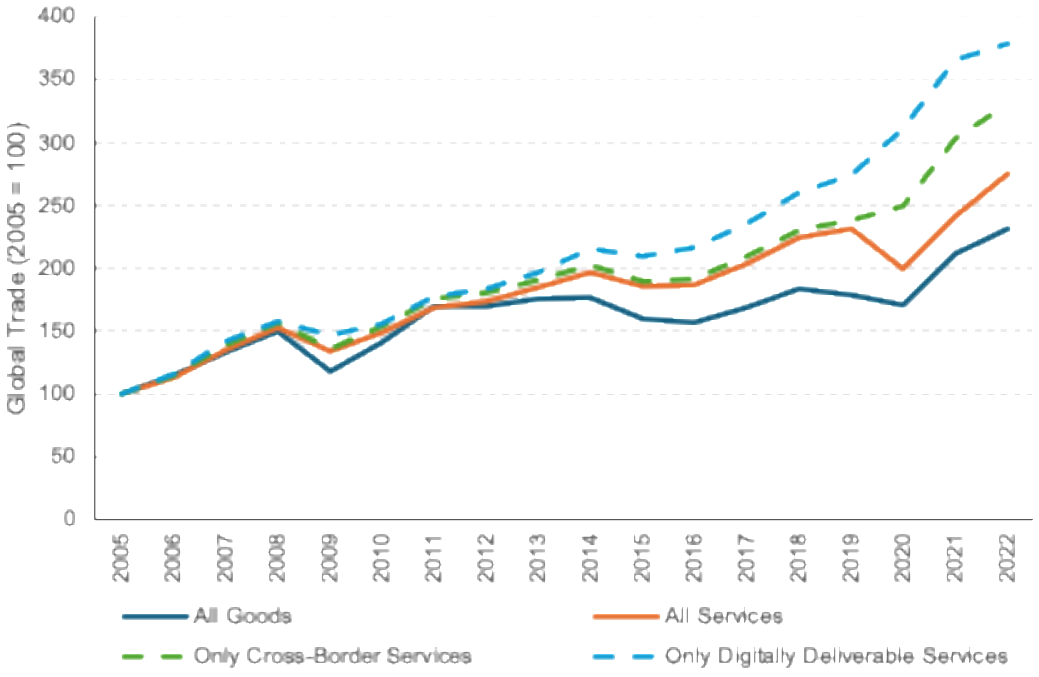
Hermosillo is poised to benefit from this global expansion due to its comparative advantages and existing productive capabilities in potentially tradeable services. We estimate the revealed comparative advantage of Hermosillo in each tradeable service category and find that the city is better positioned than similarly rich and complex cities in Mexico to take advantage of several of these opportunities. This is because Hermosillo is currently intensive in these opportunities, and also because Hermosillo has other industries that are similar to the opportunities in terms of their occupational structure (which could potentially supply additional labor in case tradeable service industries were to expand rapidly). Moreover, Hermosillo's wage differentials compared to the U.S. are significant for most industries and occupations, including all tradable service industries and teleworkable occupations. This provides a cost advantage for foreign firms seeking to outsource part of their operations. Hermosillo also boasts a well-educated workforce with high levels of schooling and a strong emphasis on STEM fields, positioning it well to meet a potential expansion in educated labor demand.

Some tradable services represent bigger opportunities for Hermosillo, but the city will need to develop new capabilities in cross-border service provision in order to take advantage of them. In particular, engineering services, database and other information services, business and management consulting, research and development, education, and accounting services require attention and further research to inform effective strategies. To realize these opportunities, local firms may need to overcome sector-specific challenges related to internationalization. Policymakers can play a pivotal role by fostering strategic partnerships, attracting multinational service providers to bring in knowhow, and creating supportive enabling environments for teleworking and digital service provision.

1. Introduction

Technology has enabled a global expansion of trade in services. Services had long been considered less tradeable than goods because they may require physical proximity between providers and consumers (Sampson, G. P., & Snape, R. H. 1985). The thinking was that if only goods were tradeable, opportunities for participation of developing countries in more mature globalized supply chains would have been restricted to the export of goods and trade-related services such as transport and logistics. However, over time, technological advances have reduced the relevance of distance between service providers and consumers. The internet and advances in telecommunications have enabled global trade in services to grow faster than trade in goods. As shown in Figure 1, this is especially true following the Global Financial Crisis. International trade in goods stagnated for much of the next decade, while trade in services grew. The COVID-19 pandemic also dramatically affected trade patterns. Service exports overall fell sharply, but certain types of service exports accelerated. As of 2022, services overall accounted for 36.9% of international trade, up from 29.8% in 1995 (Atlas of Economic Complexity).

Figure 1: Global Trade in Goods and Services (2005-2022)

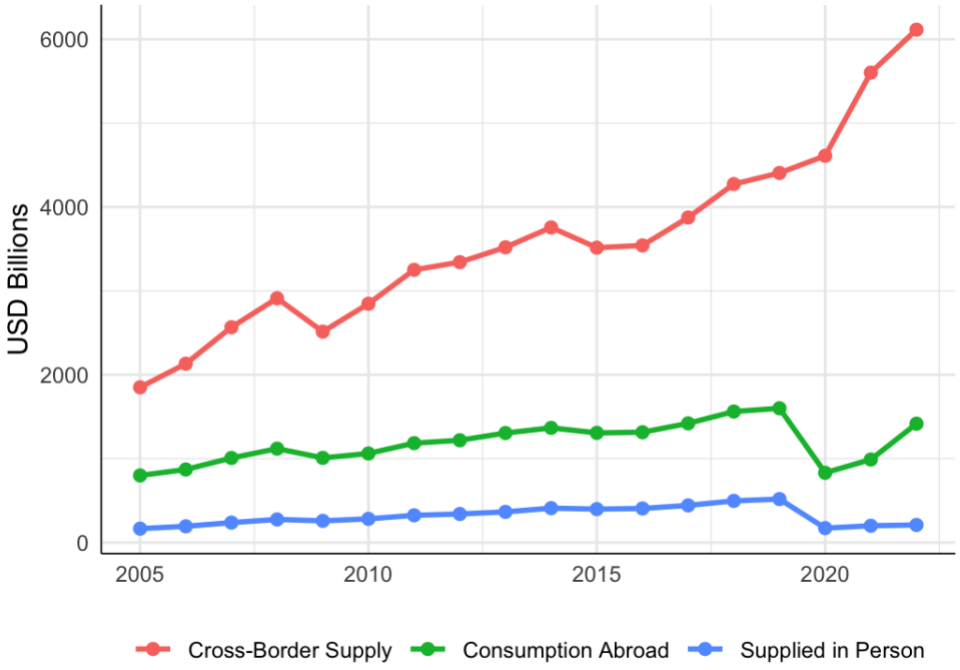


Source: Atlas of Economic Complexity; WTO Trade in Services by Mode of Supply Dataset

Most of international trade in services occurs across borders, where the service itself travels without the physical travel of consumers or suppliers, and this difference has widened since the COVID-19 pandemic. By 2019, 67% of services were

traded across borders, while 25% were consumed abroad (i.e., the consumer crossed a border) and 8% were supplied in person (i.e., the supplier crossed a border).[1] Not surprisingly, as shown by Figures 1 and 2, the pandemic had asymmetric impact by mode of service delivery. Cross-border services grew 39% from 2019 to 2022, and they rose to 79% as a share of all internationally traded services. Meanwhile, services supplied in person contracted by two-thirds in 2020 and then had a very timid recovery. In 2022, its share shrank to less than 3% of all services. Services consumed abroad halved during 2020 but quickly bounced back, especially as global travel and tourism recovered. The pandemic is expected to have lasting effects because performing some tasks remotely was proven to be feasible as employees and suppliers were forced to work from home, and some remotely performed tasks can potentially be done from anywhere in the world.

Figure 2: Global Service Trade by Mode of Supply (2005-2022)



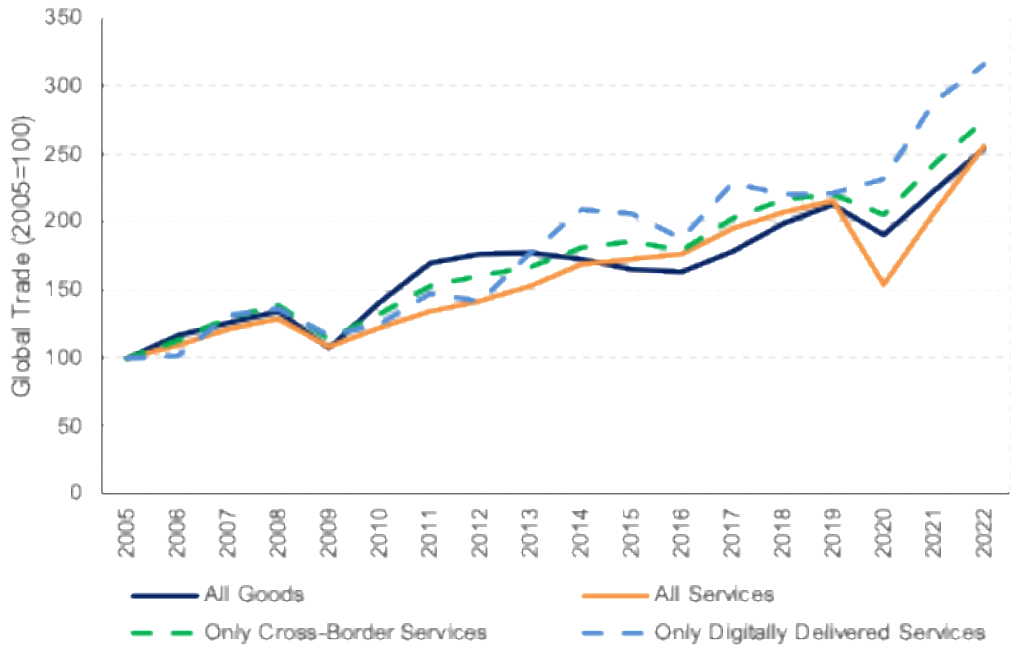
Source: WTO Trade in Services by Mode of Supply Dataset

Mexico appears to be benefiting from the post-pandemic digital services boom, which may create new opportunities. Figure 3 visualizes the evolution of Mexican exports in goods and services, again highlighting cross-border and digitally deliverable services. Mexican exports show several similar dynamics to the global patterns discussed above for these four categories. However, one difference is that Mexico saw limited growth

[1] The World Trade Organization (WTO) also publishes data on services supplied by established foreign subsidiaries, but for the purposes of this paper we will consider those as FDI, not exports.

in digitally provided services from 2014 to 2019, before the sector grew 43% in the following three years. This weak growth in digitally delivered services likely goes a long way in explaining why Mexico's cross-border service exports have grown less overall during this nearly 20-year period compared to the global average. The potential upside of this is that Mexico may now be catching up in capitalizing on technology for services trade, which may generate new additional opportunities. The purpose of this report is to explore what opportunities could be most promising for Hermosillo in particular.

Figure 3: Mexican Exports of Goods and Services (2005-2022)



Source: Atlas of Economic Complexity; WTO Trade in Services by Mode of Supply Dataset

The drivers of recent tradable service growth remain active, but new technological developments may introduce uncertainty into future trends. Baldwin, R. and Forslid, R. (2023) argue that technological innovations are simultaneously reducing the labor-intensiveness of manufacturing and increasing the tradability of services. This has marginally raised the relative importance of services vis-à-vis manufacturing as a source of growth for developing countries. Since low wages are a source of comparative advantage for developing countries, this enables the direct export of that comparative advantage in cheaper labor without first having to turn it into low-cost labor-intensive goods. In addition, digitally delivered services face lower transport costs than goods. These costs may be more complicated than they appear at first glance, however, due to cybersecurity concerns and other challenges such as the cost of maintaining long-distance commercial relations. Technological development continues to flourish in many

ways, but these do not all point in the direction of increased services trade. Baldwin, R. (2022) argues that providers of remote services and teleworkers face competition from AI and other forms of *robotic process automation* in the future. In essence, low-cost labor in developing countries will often be in competition with automation in developed countries.

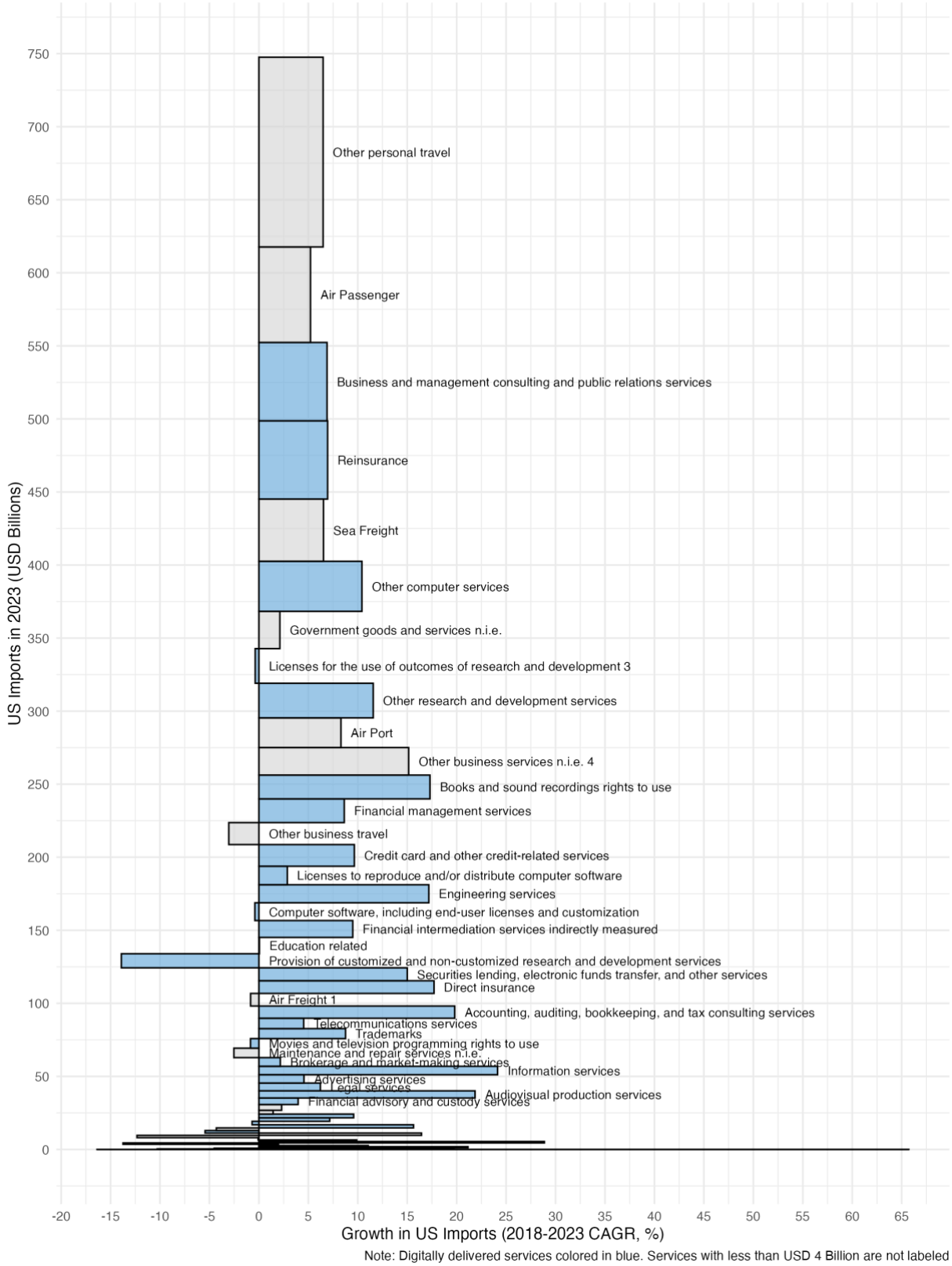
This paper leverages the most granular data available to identify opportunities in cross-border service trade, and how well they align with Hermosillo's productive capabilities. Chapter 2 decomposes recent growth trends into 60 service categories based on data from the U.S. Bureau of Economic Analysis (BEA) and assesses Hermosillo's wage advantage in various tradeable services and teleworkable occupations. Chapter 3 explores how feasible it would be for Hermosillo to export specific tradable services. Chapter 4 summarizes the most salient opportunities for Hermosillo and explores some of them in more detail to begin to inform possible economic strategies. Finally, Chapter 5 provides concluding remarks.

2. Decomposing International Trade in Services and Wage Differentials

This report utilizes BEA data on international service trade. The dataset consists of bilateral service flows between the U.S. and its global trade partners and is the best source in the world in terms of number of service categories and quality of data. According to another source, the WTO-OECD Balanced Trade in Services dataset, 65% of Mexico's service exports were supplied to the U.S. in 2021. Hence, BEA's data allows us to explore Mexico's relationship with its largest export market. These findings should not be interpreted as only relevant for the U.S. market. Service export costs do not necessarily increase with distance, and opportunities outside the U.S. should also be explored.

Among BEA's 60 service categories, 39 are digitally deliverable. **Many of these services have had impressive recent growth.** Digitally delivered services include ICT, professional services, finance, insurance, intellectual property, and many others. Non-digital service categories are associated to transport, travel, place-based services (education, health, construction, agriculture, extraction or waste management), or goods-related services (trade services, maintenance and repair). Figure 4 shows each service category by its size in 2023 (Y axis) and its compound annual growth rate (CAGR) from 2018 to 2023 (X axis). Services are colored blue if they are digitally deliverable.

Figure 4: Current Size and Recent 5-Year Average Growth of U.S. Service Imports



Source: Own calculations using BEA International Services (Expanded Detail)

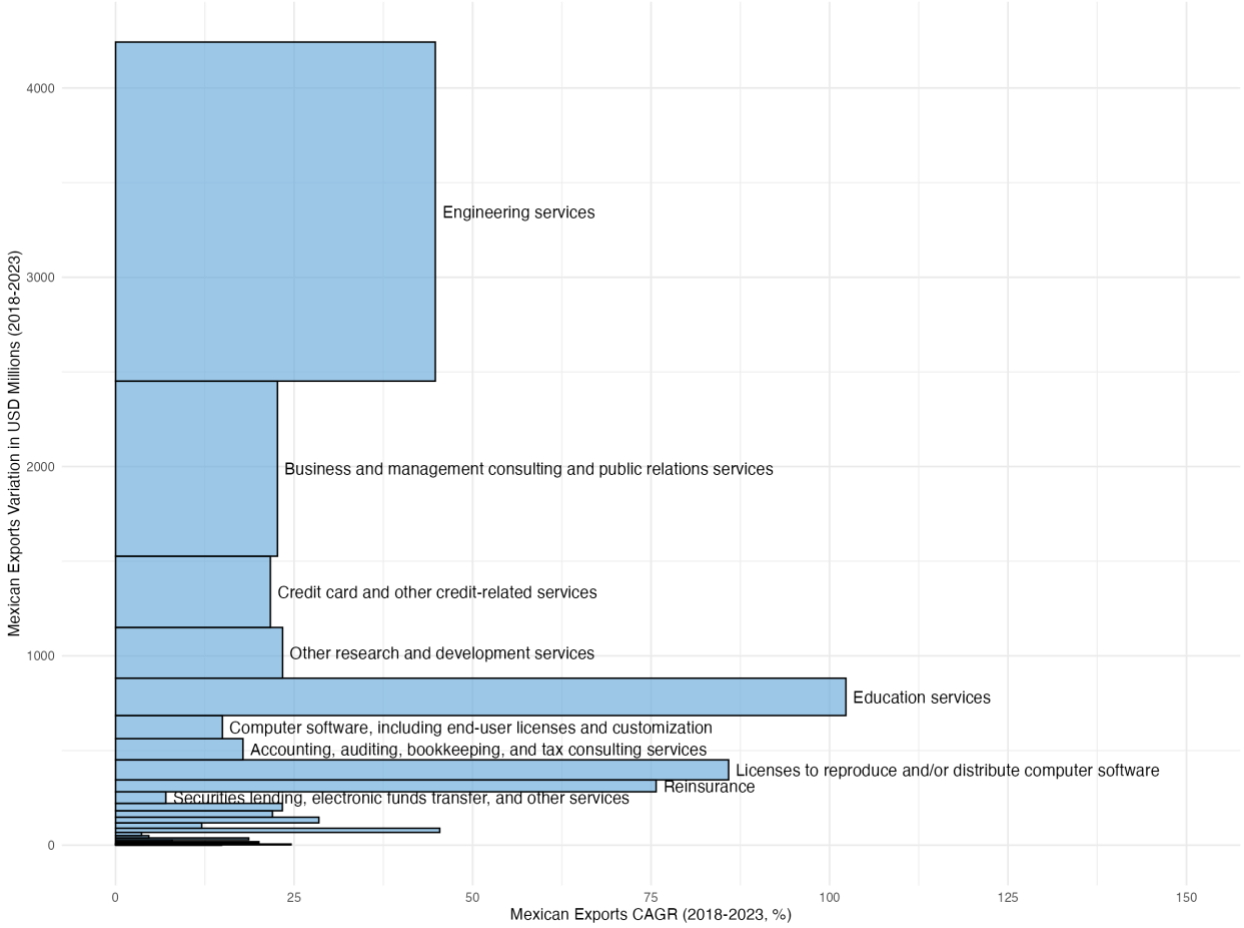
U.S. demand for digitally delivered cross-border services grew at varying rates, but most services grew quite rapidly. Figure 4 shows compound annual growth rates, which imply that engineering and accounting services grew by 17% and 20% per year on average, respectively. Smaller services including information and audiovisual production grew even more rapidly. The largest two digitally delivered imports to the U.S. — business services and reinsurance — grew at a lower, but still strong pace above 6% annually. As an organizing principle, we consider faster-growing markets to be more open to new entrants. For instance, entering the U.S. market for engineering or accounting services will likely be more plausible than entering the U.S. market for legal services.

Mexico's exports of engineering and other digitally delivered services have experienced exceptional growth over the last five years. We can analyze the growth of Mexican service exports to the United States using bilateral data. Figure 5 shows the CAGR for each category in the X axis and their dollar value growth in the Y axis, from 2018 to 2023. Engineering services were the largest contributor to growth, adding USD 1.8 billion in exports value and growing 45% on average for the past 5 years. Business & management consulting services[2] is also impressive, growing nearly USD 1 billion during this period with a CAGR over 20%. Some Mexican service exports have seen spectacular growth from a lower base. For example, education services had a CAGR over 100% for the past five years. This means that the service has been more than doubling on average each year. These rapid growth rates capture how new technologies are changing the way in which these services are delivered, and thus who can provide them competitively to the U.S. market.

Mexico has also been able to gain market share in other services. For instance, computer software license distribution grew at a yearly average of 86% in Mexico while US imports were growing less than 3%. However, this is still quite a small market slightly above USD 100 million for Mexico. The case of reinsurance is similar. Despite being the fourth largest service import for the US and growing at a 76% CAGR in Mexico, it still only represents USD 67 million for Mexican exports. More importantly, Mexico grew more than twice as fast than US imports in three large categories: "business & management consulting and public relations", "credit card and other credit-related services", and "other research and development services". That said, the story is not entirely rosy. Mexican exports of telecommunications, cloud computing and data storage shrank over the past 5 years.

[2] Including public relations services.

Figure 5: Growth of Mexican Digitally Deliverable Service Exports



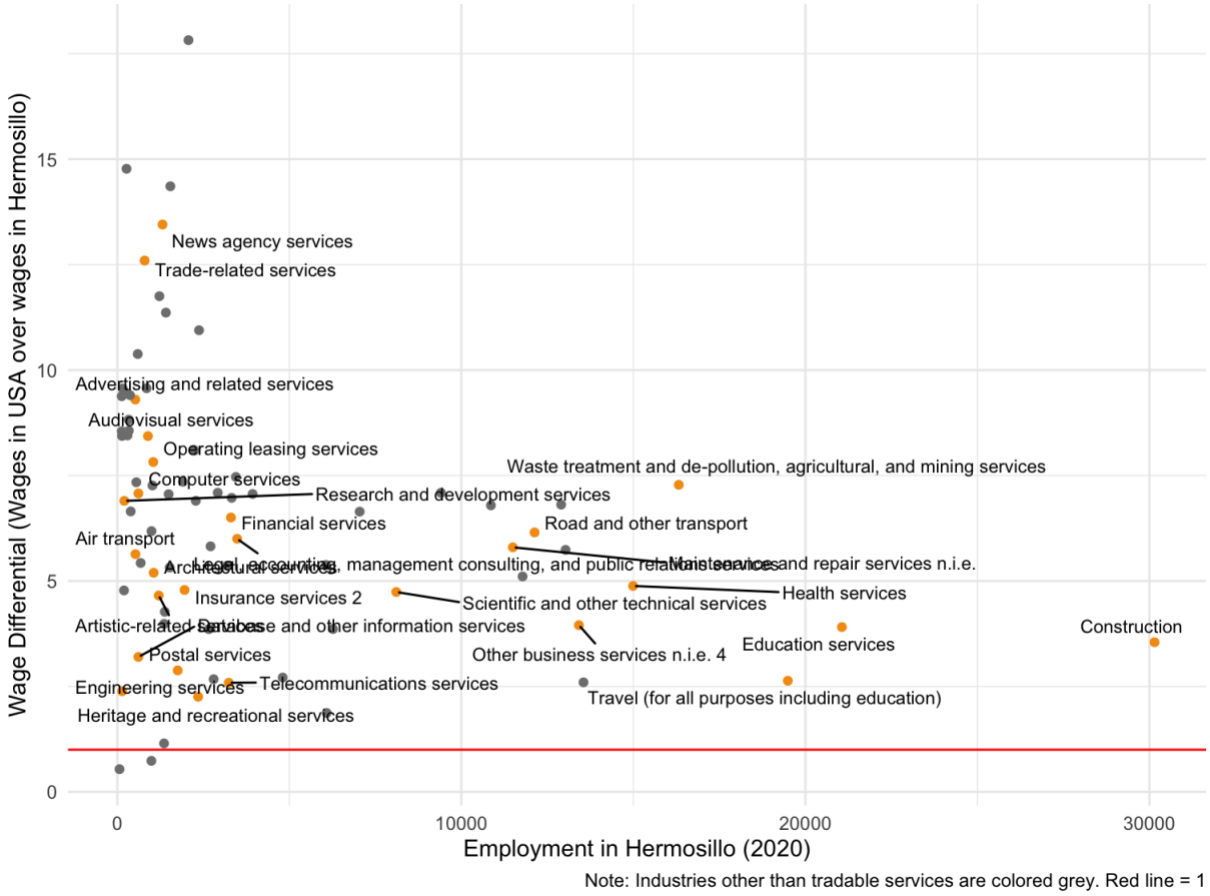
Source: Own calculations using BEA International Services (Expanded Detail) Note: Excludes service categories that had negative growth or are not digitally deliverable. Also excludes books and audio usage rights. Unlabeled if Mexican exports growth < USD 50 million.

Wage differences between Hermosillo and the U.S. are generally large for tradable services. Although workers in Hermosillo have relatively high incomes by Mexican standards, these wage levels are only a fraction of what is paid by the same industries and occupations in the United States. As services become more tradeable, this means that firms in the U.S. and similar markets can reduce costs by outsourcing some tasks and departments to offshore alternatives and/or swap their service providers for less expensive alternatives in places like Hermosillo. Thus far, we show that Mexico has already started to take advantage of some opportunities, but new opportunities may be increasingly possible for Mexico and Hermosillo in particular.

Hermosillo's average wage differences versus the U.S. are substantially larger in some services compared to others. To estimate Hermosillo's wage advantage at the

industry level required a process of rigorous data homogenization.[3] Figure 6 shows these wage differences for all industries, and tradable services are labeled and highlighted in orange. The horizontal red line at the value of one represents the level at which average incomes in both locations are equalized. Nearly all industries are above the red line, indicating that the average worker is paid more in the U.S. For most industries the differences are very large. For example, incomes in trade-related services and news agencies are more than 12 times larger in the US compared to Hermosillo. Some services appear to have a smaller wage differential. However, even a value of two on this figure indicates that wages are twice as high in the United States. This is the case for engineering services, for example, where wages in the U.S. are 2.4 times higher than in Hermosillo.

Figure 6: US-to-Hermosillo Wage Differentials by Industry (2020)

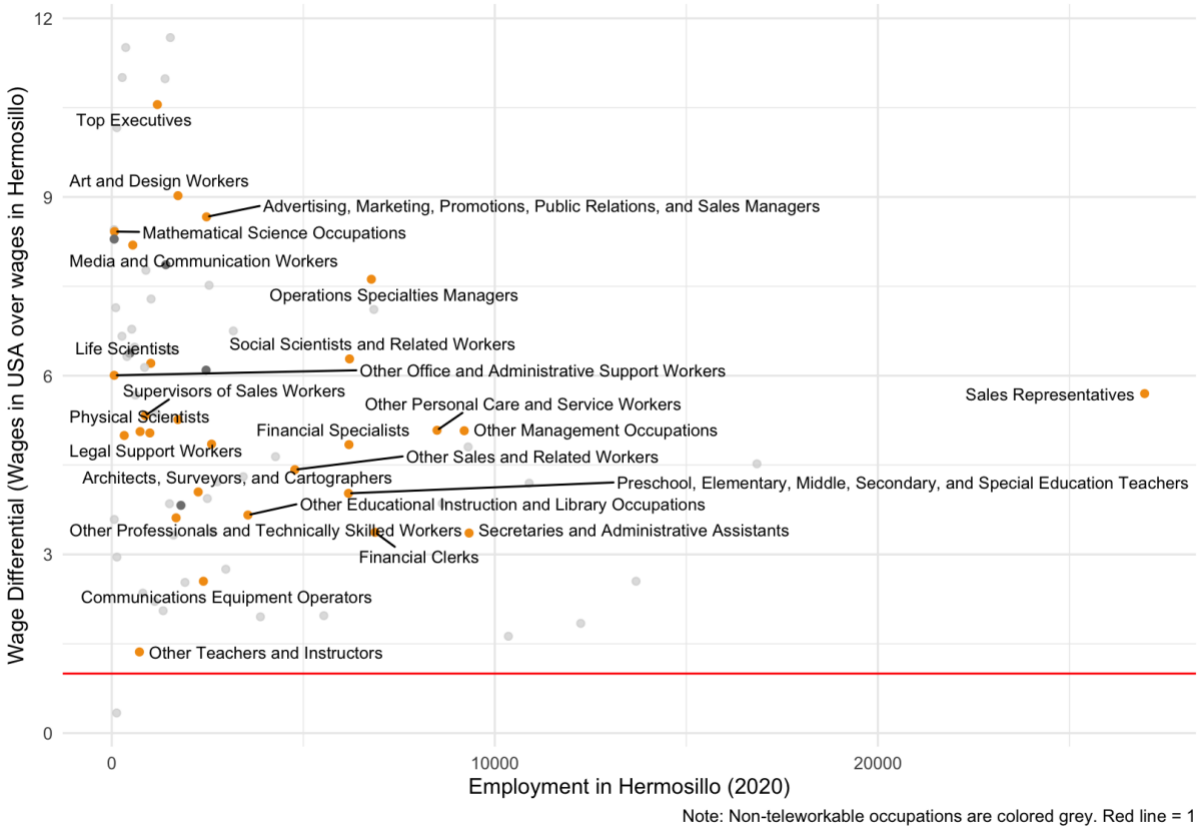


*Source: O*NET; Censo de Población y Vivienda 2020*

[3] We mapped BEA's service categories to specific industries or industry-occupation pairs in Mexican and U.S. employment data. In some instances, the process involved aggregating granular categories to a common one to facilitate matching precision. Re-aggregating BEA categories resulted in 27 tradeable services that directly match into US and Mexican industries or industry occupation pairs. However, the U.S. and Mexico do not share industrial or occupational classifications, so we developed concordance tables to be able to compare income levels.

Similarly large wage differentials exist for teleworkable occupations, which may be present in any industry. This means that Hermosillences with experience or expertise in industries that may or may not be associated with tradeable services may still be able to benefit from the internationalization of services by becoming a remote labor provider (teleworker). Figure 7 shows these wage differences for all occupations, and teleworkable occupations are labeled and colored orange.[4] Within teleworkable occupations, the largest differences exist for top executives, artists, advertisers and scientists, while the occupations with most similar pay are non-traditional or supplementary educators, and communication equipment operators. Overall, wage differences are very large, and American firms could save substantial costs by utilizing remote workers in places like Hermosillo.

Figure 7: US-to-Hermosillo Wage Differentials by Occupation (2020)



*Source: O*NET; Censo de Población y Vivienda 2020*

[4] We followed standard procedures from the literature to determine the teleworkability of occupations. Following Dingel and Nieman (2020) and Hausmann and Bustos (2021), occupations were deemed to be teleworkable if survey respondents declared that their job characteristics did not require being physically present in the workplace or operating some type of localized machinery.

Despite earning relatively lower wages, Hermosillo's workforce is well educated. Gaps in education levels are smaller than gaps in wage levels versus the U.S. As argued by the Harvard Growth Lab's latest growth diagnostic on Hermosillo (Fortunato, A. et al., 2024), human capital is one of the city's comparative advantages. Hermosillenses have more years of schooling than their peers in other diversified cities in Mexico, on average, and they are more likely to have completed high school, tertiary, and doctorate-level education. During Growth Lab conversations with top executives from multinationals with subsidiaries in Hermosillo, human capital was consistently praised as world class. This was attributed to the quality of Hermosillo's university ecosystem and to the *Instituto Tecnológico de Hermosillo* (ITH) in particular. Hermosillo has relatively high university enrollment rates compared to its peers, and its students disproportionately pursue STEM degrees. Hence, educational levels appear sufficient for Hermosillences to competitively provide their services abroad.

3. Feasibility of Opportunities in Hermosillo

Economic complexity measures can be used to understand Hermosillo's productive capabilities in tradable services. Data is not granular enough to decompose Mexican service exports by city or state, but we can identify capabilities in Hermosillo based on employment patterns by industry and occupation using INEGI's *Censo de Población y Vivienda (2020).* This data is used to estimate two metrics for each tradable service category in Hermosillo: revealed comparative advantage (RCA) and density. RCA is calculated as the quotient between the service's share in Hermosillo's employment and the service's share in Mexico's employment. It reflects the relative intensity of the sector in Hermosillo vis-à-vis the national average. The second measure, density, reflects Hermosillo's comparative advantage in activities that are similar in their occupational structure to a given service of interest. We consider the internationalization of a service to be more feasible if Hermosillo already has a high local RCA, or if proximate industries with similar occupational structure have high RCAs that are reflected in high density.

Hermosillo is relatively competitive in numerous potentially tradeable services when compared to peer cities and the rest of Mexico. We consider any industry in which Hermosillo has an RCA greater than one as competitive. This threshold represents the Mexican average share of employment dedicated to a given industry. This does not necessarily imply that Hermosillo would be competitive among cities globally, but these cases are still noteworthy, especially if Mexico is already rapidly growing its service exports in these categories. Figure 8 shows the distribution of RCAs from Hermosillo's

peer cities in the form of box plots for each category.[5] Boxes show 25th percentile to 75th percentile values and the extended lines show 10th and 90th percentile values. Among 27 tradable services in total, Hermosillo has an RCA above one in 20 of them and an RCA above the median of its peer cities in 22 of them. Hermosillo's RCA is at or above the 75th percentile among peer cities in 16 tradable services. This contrasts with the Growth Lab's diagnostic, which highlights Hermosillo's struggles to keep up the pace with many peer cities in manufacturing. Hermosillo underperforms in only a few tradable services, such as computer services.

Figure 8: Hermosillo's Revealed Comparative Advantages

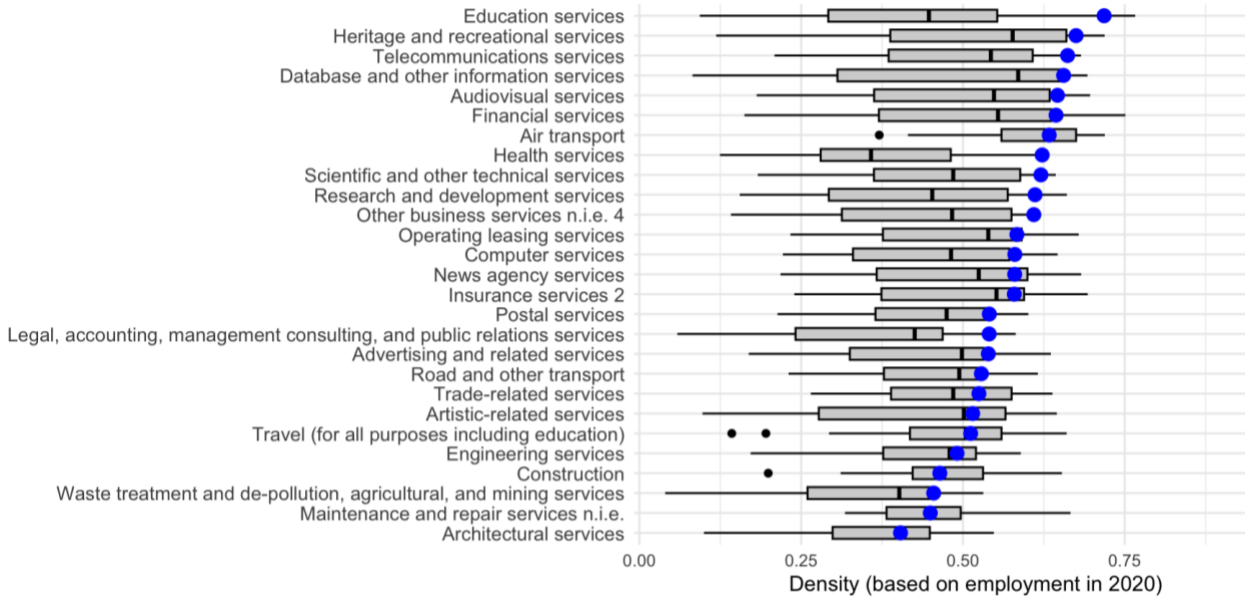
Source: Own calculations using Censo de Población y Vivienda (2020)

Hermosillo also has high densities in most tradable services, indicating a strong 'fit' with the cities overall productive capabilities. Figure 9 compares the city's densities to those of its peers. In 20 categories, Hermosillo's density is much higher the median of its peers. In the remaining 7 categories, density is close to the median. When density is high, this implies the city is present in related industries and would have sources of labor with knowhow and talent in the occupations that are required by these tradable services. For several tradable industries, like database and information services, RCA and density are high, indicating a strong presence that fits well within Hermosillo's productive structure.

[5] Hermosillo's peers include the following 13 Mexican commuting zones: Aguascalientes, Chihuahua, Guadalajara, Juarez, La Laguna, Mexicali, Monterrey, Puebla-Tlaxcala, Queretaro, Reynosa-Rio Bravo, Saltillo, San Luis Potosi, and Tijuana. Their selection methodology is explained in further detail by Fortunato, A. et al. (2024).

However, service industries can also have a low RCA but high density, which implies potential to grow. This is perhaps most noteworthy for education services, where Mexican exports are growing substantially and Hermosillo's RCA is below the median for its peers, but density is high.

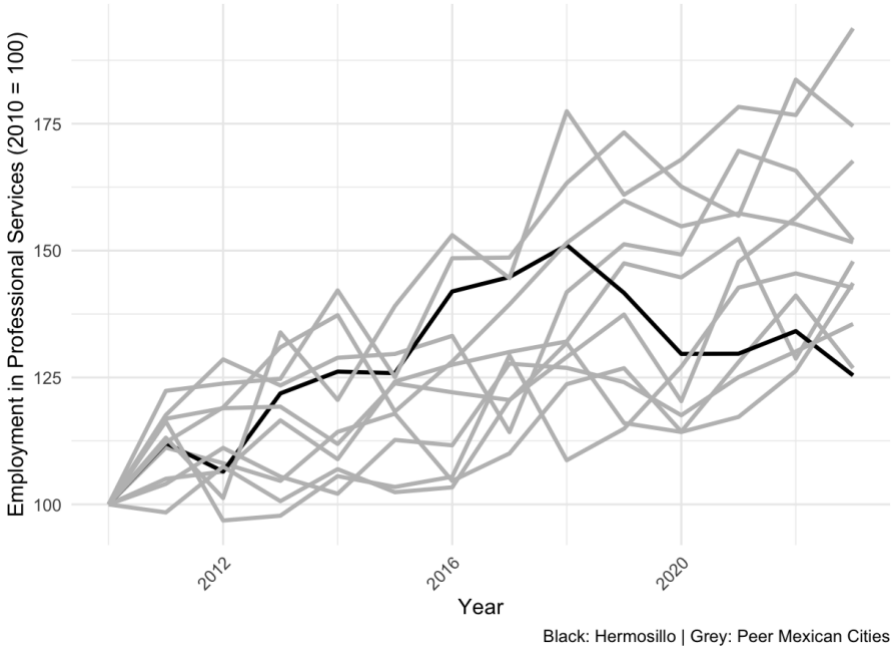
Figure 9: Hermosillo's Density by Tradable Service



Source: Own calculations using Censo de Población y Vivienda (2020)

The internationalization of service provision may require additional capabilities that are not necessarily present in Hermosillo at this moment. Measuring capabilities through employment-based RCA and density may not capture important capabilities necessary for success. This is because international trade in services requires additional market knowledge and different skills or technology compared to local service provision. Exporting services to the U.S. market entails using the English language, competing with locals and other providers from the rest of the world, advertising the service and closing deals in a new market with different characteristics, and maintaining a remote commercial relationship, among multiple other factors. Hermosillo might need to address gaps by expanding strategic partnerships in the markets it seeks to enter, attracting professional service multinationals with necessary knowhow, or other strategic approaches. Figure 10 indicates that there are significant gaps because Hermosillo's employment in professional services is shrinking, precisely when it would be expected to be capitalizing on new export opportunities in these services. Professional services include major growing sectors such as engineering services, business and management consulting, accounting services, and R&D services, among others.

Figure 10: Professional Services Employment in Hermosillo and Peer Cities



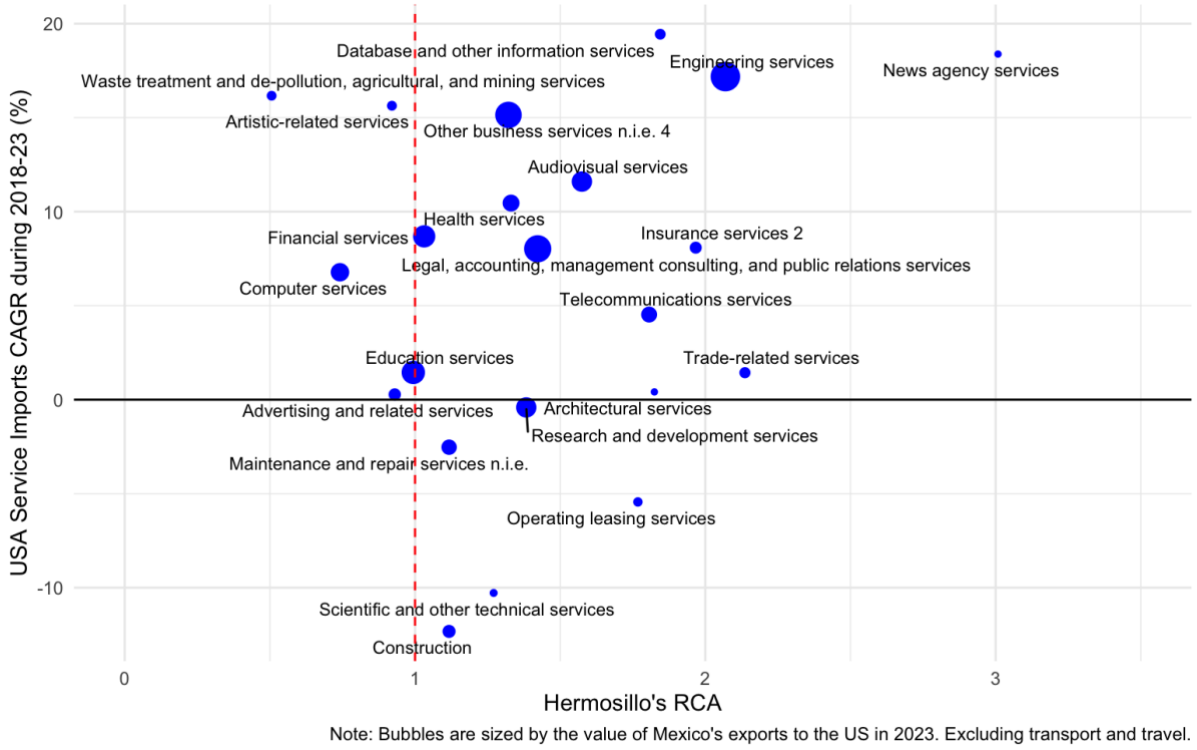
Source: Own calculations using ENOE

4. Hermosillo's Most Important Tradable Service Opportunities

We can identify clear opportunities in digitally deliverable service exports for Hermosillo. Figure 11 can be a valuable initial guide to understand where Hermosillo's opportunities lie. The Y axis shows the growth of U.S. imports of a given tradable service, while the X axis shows its RCA in Hermosillo's, and each dot in the scatterplot is sized based on Mexican exports of the service in 2023. Figure 12 is a more detailed table with the variables of interest that were introduced in sections 2 and 3. The metrics are shown for all digitally deliverable BEA service categories excluding royalties on books and sound recordings.[6] The first four columns of the table account for the relative and absolute growth of U.S. imports and Mexican exports by category. U.S. imports are interpreted as a proxy for demand for each service, while Mexican exports are interpreted as a proxy for what has been tested to be plausibly supplied from Mexico in the recent past. These four variables were normalized with a mean of zero and a standard deviation of one and averaged to create an *attractiveness score* by service category. In addition, the table shows Hermosillo's wage advantage in the form of a wage multiple capturing what was previously shown in Figure 6, as well as the service's RCA and density. The order in which service categories are sorted is determined by this combined attractiveness score.

[6] This category was excluded to avoid noise. It is a very large Mexican export that feeds from royalties on a pre-existing legacy stock of art.

Figure 11: US Imports Growth and Hermosillo's RCA by Service



Source: Own calculations using Censo de Población y Vivienda; BEA

Figure 12: Summary Table for Service Opportunities

Description	US Imports Growth (USD Million, 2018-23)	US Imports CAGR (2018-23)	Mexican Exports Growth (USD Million, 2018-23)	Mexican Exports CAGR (2018-23)	Attractiveness Score	US/MX Wage Multiple	Hermosillo's RCA	Hermosillo's Density
Engineering services	6770.00	17.2%	1791.00	44.8%	1.88	2.39	2.07	0.49
Business & mgmt consulting and public relations	15206.00	6.9%	925.00	22.7%	1.21	6.00	1.42	0.54
Reinsurance	15274.00	6.9%	63.00	75.7%	1.16	4.79	1.97	0.58
Education services	920.00	9.6%	197.25	102.3%	0.89	3.91	0.99	0.72
Other research and development services	9986.00	11.6%	268.00	23.4%	0.65	6.90	1.38	0.61
Information services	3816.00	24.1%	34.00	22.0%	0.51	13.45	3.01	0.58
Accounting, auditing, bookkeeping, and tax consulting	4983.00	19.8%	112.00	17.8%	0.46	6.00	1.42	0.54
Credit card and other credit-related services	5480.00	9.7%	376.36	21.7%	0.43	6.51	1.03	0.64
Direct insurance	4834.00	17.7%	2.00	24.6%	0.39	4.79	1.97	0.58
Audiovisual production services	3066.00	21.9%	28.42	12.1%	0.31	8.43	1.57	0.65
Financial intermediation services indirectly measured	4212.00	9.5%	30.00	28.5%	0.20	6.51	1.03	0.64
Financial management services	5500.00	8.6%	39.00	23.4%	0.20	6.51	1.03	0.64
Securities lending, electronic funds transfer, and other	4450.00	15.0%	61.14	7.0%	0.17	6.51	1.03	0.64
Auxiliary insurance services	702.00	7.2%	22.00	45.4%	0.13	4.79	1.97	0.58
Other computer services	13387.00	10.4%	-196.98	-13.8%	0.10	7.08	0.74	0.58
Artistic-related services	1108.00	15.6%	9.30	7.9%	0.00	4.66	0.92	0.51
Underwriting and private placement services	315.00	11.1%	1.00	14.9%	-0.10	6.51	1.03	0.64
Legal services	1390.00	6.2%	12.00	4.7%	-0.27	6.00	1.42	0.54
Advertising services	1136.00	4.6%	17.00	3.6%	-0.33	9.30	0.93	0.54
Computer software, incl. end-user licenses	-252.00	-0.4%	122.00	15.0%	-0.35	7.08	0.74	0.58
Sale of proprietary rights arising from R&D	64.00	7.6%	0.00	0.0%	-0.35	6.90	1.38	0.61
Telecommunications services	1409.00	4.5%	-13.00	-0.8%	-0.38	2.59	1.81	0.66
Financial advisory and custody services	797.00	4.0%	-1.00	-1.4%	-0.43	6.51	1.03	0.64
Brokerage and market-making services	603.00	2.2%	-6.00	-4.1%	-0.51	6.51	1.03	0.64
Architectural services	3.00	0.4%	-	-	-0.54	5.20	1.82	0.40
Cloud computing and data storage services	81.00	2.0%	-9.88	-8.1%	-0.59	7.08	0.74	0.58
Scientific and other technical services	-121.00	-10.3%	2.00	24.6%	-0.59	4.74	1.27	0.62
Operating leasing services	-550.00	-5.4%	2.00	2.1%	-0.70	7.82	1.77	0.58
Movies and television programming rights to use	-285.00	-0.8%	-285.00	-0.8%	-0.79	8.43	1.57	0.65
Market research and public opinion polling services	-1022.00	-13.7%	-16.00	-22.9%	-1.21	9.30	0.93	0.54
Provision of customized and non-customized R&D	-10752.00	-13.9%	-90.00	-4.9%	-1.55	6.90	1.38	0.61

*Source: Own calculations using O*NET; Censo de Población y Vivienda; BEA,*

Several categories often catalogued as "professional services" represent some of the greatest opportunities for Hermosillo. However, not all professional services are equally relevant. Engineering services are growing fast at the global scale, and they are also a large driver of service exports growth for Mexico. Hence, they have the highest attractiveness score. Despite having one of the lowest wage differences among the list, wages in engineering services are still more than twice as high in the U.S. compared to Hermosillo. The city educates high-quality engineers at one of the highest rates in Mexico, and also has a large RCA in engineering services compared to peers. Business & management consulting and public relations services have the second highest attractiveness score, large wage differences and a high RCA. R&D services are also highly attractive and feasible. Hermosillo could leverage its strong university ecosystem to establish deeper connections between academics, innovators, and both local and foreign firms. Accounting and tax services are also an attractive and feasible opportunity, with consolidated multinational players that could be attracted to Hermosillo. Other professional services such as legal, advertising, market research & polling, architectural, or computer services do not appear represent opportunities of the same caliber.

Since these service classifications are often broadly defined, understanding the nature of each opportunity often requires a closer look. We explore two of the most promising opportunity areas — (1) engineering services and (2) database and other information services — in greater detail and note observations for several other relevant service categories. Public efforts to capitalize on these opportunities will require additional qualitative investigation of this kind to inform support strategies. These strategies could include expanding business support and striking strategic partnerships for existing companies in Hermosillo to reach export markets, targeted investment promotion activities to attract new companies that could thrive in Hermosillo, resolving service-specific constraints, and other innovative public-private actions to catalyze more business start-ups, entrepreneurship, or digital nomads.

Engineering Services

The industry classification of engineering services is quite broad for the purposes of strategic policy design. A single industry code (541330 in the NAICS classification) covers nearly all type of engineering disciplines, including chemical, civil, mechanical, mining, environmental, industrial, and more. Important exceptions are computer systems and software engineering, so this category can be understood as covering all types of physical engineering. This broadly defined classification reflects an important reality, as the world's largest engineering services companies tend to be diversified across a wide range of types of engineering. By diversifying their areas of expertise, they achieve

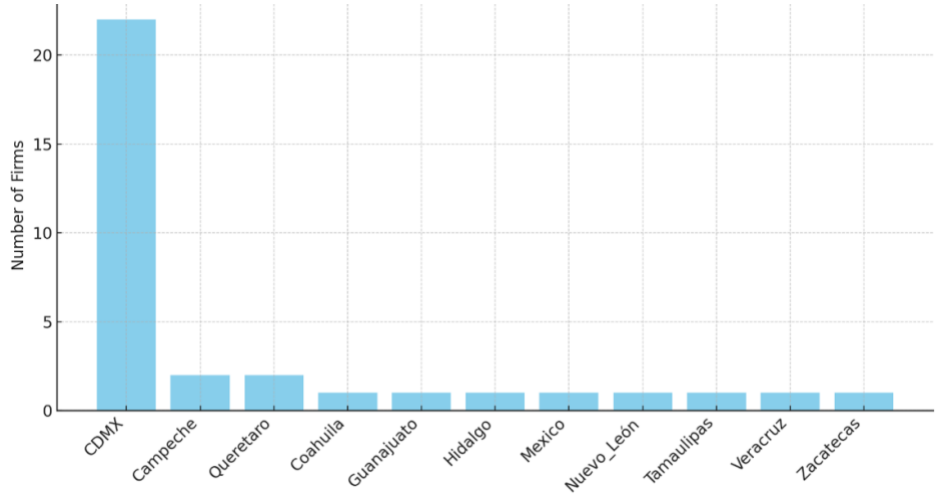
economies of scale in their business management and can serve many of their clients' needs.

The global industry dynamics inform where Hermosillo should target growth strategies. Very large companies — and a wider network of related contractors —play an outsized role in this industry globally. The largest firms in the United States include companies like Jacobs Engineering Group, Aecom, and Tetra Tech, which represent this type of diversified company that provides a wide array of engineering services. The websites of these companies proudly show their locations globally. Tetra Tech lists 550 global locations supporting 28,000 employees. However, none of these locations are in Mexico, based on the company website. When large global engineering companies do have locations in Mexico, they tend to be limited to Mexico City. Therefore, attracting very large companies could prove to be very difficult for Hermosillo. However, strategies for promoting growth could include Hermosillo-based companies becoming better connected to larger networks either as subcontractors or the city attracting medium-sized and smaller companies that initially align with Hermosillo's competitive advantages and local/regional industry needs.

Hermosillo can look to build upon the types of engineering services that already locate in and around the city. Mexican business registry data also shows that large engineering services firms are concentrating heavily in Mexico City (Figure 13). By contrast, the engineering services firms that are in Hermosillo tend to be of smaller size (Figure 14). To develop a strategy for growth of this sector in Hermosillo, it is essential to start by understanding the roles that these companies play and what currently holds back their growth. Among the engineering services firms in Hermosillo, many are focused in civil engineering and mechanical engineering. Despite Sonora's potential in mining, and a reportedly large presence of mining services activities overall,[7] there is a limited presence of businesses involved in mining-related engineering services in the business registry. A few of engineering services companies in Hermosillo directly target a U.S. audience and market with websites in English but most of the companies do not have a functioning website or they have websites exclusively in Spanish. Among the six companies that have over 50 employees, multinational companies appear to have significantly more advanced websites for reaching international markets. Among the smaller companies in the range of 10-50 employees, several local firms do have a more advanced online presence. This is the case for Axis Automation (high-end manufacturing automation) and Oestec (materials, mining, and construction engineering).

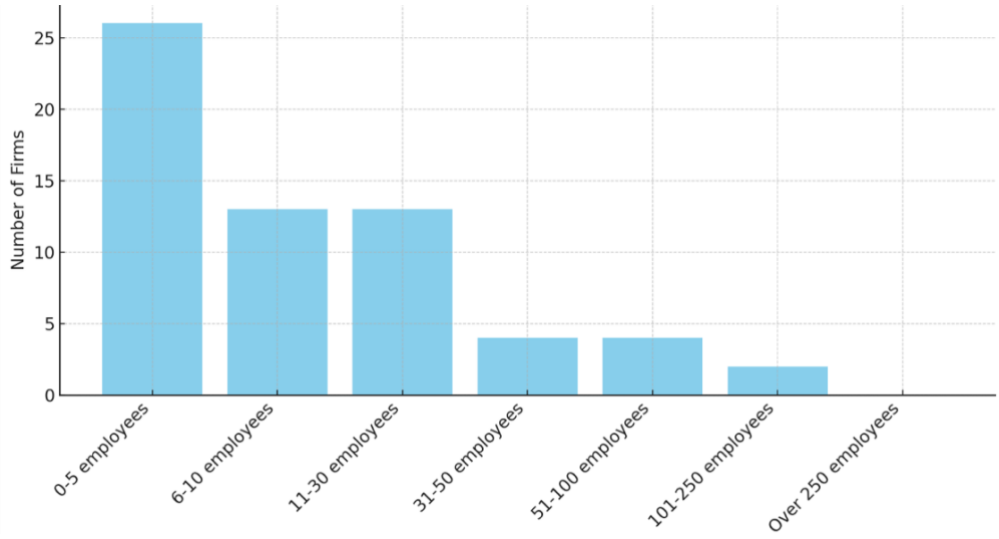
[7] Common mining-related services include various activities in exploration and geotechnical services, environmental services, logistics and transportation support, water management, etc.

Figure 13: Engineering Service Firms with 250+ Employees by Mexican Region



Source: Own calculations using DENUE

Figure 14: Engineering Service Firms by Size in Hermosillo



Source: Own calculations using DENUE

Hermosillo's best strategies likely involve capitalizing on the regional market and leveraging its strong university-level education. Engineering services related to manufacturing processing and materials appear to be a general strength in Hermosillo. High-performing manufacturing firms in Hermosillo often do more than basic, maquila-style manufacturing and contribute intensively to process innovations and adaptions to their machinery and equipment, as described by Fortunato, A. et al. (2024). Growth Lab site visits to factories and interviews suggest that Hermosillo's educated workforce is a strength that is not widely known outside of the city. This competitiveness in engineering services professionals also relates to manufacturing opportunities identified in

complementary Growth Lab analyses focused on nearshoring and green growth. Hermosillo may also be an advantageous base for civil engineering operations to support the wider construction needs of the region and mining-related engineering services, especially if constraints on mining activity in Sonora are lifted. In all these cases, learning from the current experience of businesses in Hermosillo is important, as public-private support strategies should be targeted to overcoming the constraints that they face in growing today as well as attracting new businesses to form a fully realized cluster.

Database and Other Information Services

Database and information services occupy highly strategic positions in Figures 11 and 12, so it's pivotal to understand them in more practical terms. Figure 12 refers to "information services" in its 6th position, which is a wider category that includes both "news agency services" and "database and other information services". The latter is a broad service classification that includes three specific 6-digit NAICS codes across two higher-aggregation 3-digit NAICS codes. These are shown in the table below (links are provided to further information from the NAICS Association website). Among these subclassifications, we devote special attention to the first category (518210), which itself includes a wide range of business activities related to processing and infrastructure for digital data. According to the NAICS Association, these business activities include application hosting, cloud storage services, infrastructure as a service (IaaS), video and technical streaming support services, and web hosting, among others. These types of services are in high demand globally and regionally. Given continued technological innovations in computer processing, consumer and business digital platforms have been continuously increasing in use, and therefore in demand for data storage and infrastructure, over the last decade. More recently, breakthroughs in artificial intelligence (AI) services are fueling even more growth.

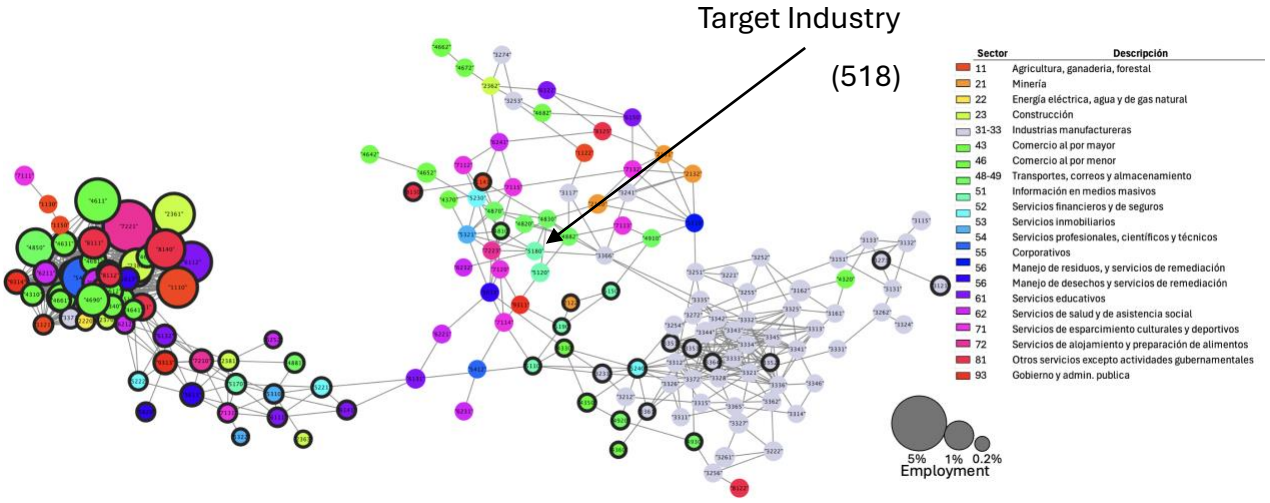
3-digit	6-digit	Industry Name
518	518210	Computing Infrastructure Providers, Data Processing, Web Hosting, and Related
519	519210	Libraries and Archives
	519290	Web Search Portals and All Other Information Services

This first category in the table above (NAICS 518210) can be thought of as all the types of services on the "back-end" that are required for this digital world to function. This is opposed to the third category (NAICS 519290) that includes more "front-end" business activities. While all three categories could be explored further, we focus here on the first category because it may have lower barriers to entry for businesses in Hermosillo. Whereas web search portals and other "front-end" services often require brand recognition (top businesses by annual sales in the U.S. include Meta, Twitter,

Linkedin, and Yelp), back-end services do not (top businesses by annual sales in the U.S. include Dxc Technology, Fiserv, and Automatic Data Processing Inc.). These are not necessarily household names, but demand growth on the back end is needed to support the growing digital consumption associated with smart phones, streaming services, and other applications.

These back-end services create high-wage jobs and represent an attractive area of opportunity within Mexico's industry space. The industry is in the professional and personal services cluster of Mexico's industry space and is relatively connected to clusters of support services for manufacturing, mining, education, hospitals and research (Figure 15). Hermosillo does not yet have a fully developed revealed comparative advantage in this industry[8], as shown in Figure 15. The industry's location in this space is strategically central, and its success would raise Hermosillo's probability of developing competitiveness in nearby industries as well. After all, other industries may use local database and information services, as well as benefit from the new skills introduced to the labor force. The industry is also attractive because it tends to provide relatively high-wage jobs. Labor force data from the United States, which can be thought of as a mature example of this industry, shows that the occupational composition is heavily skewed toward higher wage jobs (Figure 16). Nearly half of jobs in the industry are in occupations that are in the highest wage quintile in the U.S. while a small fraction of jobs corresponds to the lowest-wage quintile.

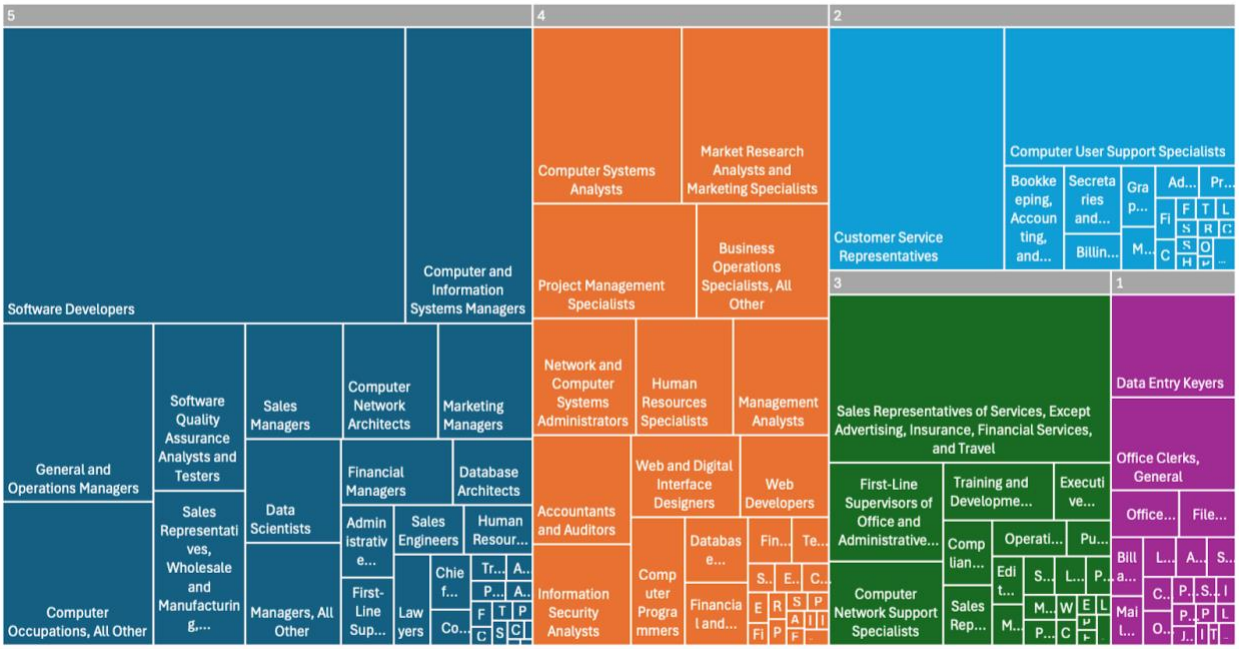
Figure 15: Mexican Industry Space based on Industry Co-Location



Source: Growth Lab based on industry employment from Censo de Población y Vivienda 2020.

[8] This is different to what is shown in Figure 8 under "database and other information services" because that category includes both NAICS code 518 and 519. Figure 15 decomposes both of them showing most of the advantage is in 519.

Figure 16: Occupational Composition by Wage Quintile of "Computing Infrastructure Providers, Data Processing, Web Hosting, and Related" in the U.S.



Source: U.S. Bureau of Labor Statistics. Note: Highest quintile = 5, lowest quintile = 1.

Hermosillo can build on business connections in the southwest United States and leverage its own university ecosystem. There are relatively few companies classified as "computing infrastructure providers, data processing, web hosting, and related services" in Mexico. The global business registry Dun & Bradstreet includes less than 100 companies across all of Mexico, and most of these companies are located in Mexico City or the State of Mexico. The largest company is Uninet, which is a subsidiary of Telemex. Other states with smaller presence include Jalisco, Nuevo León, Querétaro, and Tabasco. Meanwhile, California and Texas have thousands of companies, and Arizona and in New Mexico have hundreds of firms in the space according to the same business registry. Some companies are general purpose while others focus on different types of data system, for example management of medical data, financial data, or traffic data. For some types of data that are less sensitive to cross-border data management, firms may want to outsource to locations like Hermosillo where there is a highly educated workforce, and lower labor costs. Although the service is digital, business relationships still matter, and Hermosillo should have the advantage of close geographic proximity to large U.S. markets and clusters of current business activity. Interestingly, this industry is *not* high in teleworkability. This makes it different than many types of professional services, where a larger proportion of jobs can be done remotely. Therefore, for this opportunity to grow in Hermosillo, the business locations themselves will need to be in Hermosillo.

Additional Observations on Service Opportunities

Strengthening effective business community interactions with Phoenix and other U.S. cities is of special importance. Private businesses in the U.S., as well as elsewhere in Mexico, are not finding and identifying Hermosillo's advantages. This is not something that happens naturally, especially when a city like Hermosillo is relatively remote and independent from other population centers. Industry groups and regional economic development entities in the U.S. and Mexico are showing the same patterns. For example, a 2021 report led by the Bay Area Council Economic Institute conducted together with Mexican research partners, highlights opportunities that often include IT services and engineering services in six regional clusters in Mexico but not Hermosillo.[9] Meanwhile, the most noteworthy business interactions between Phoenix and Hermosillo tend to involve companies from Hermosillo investing in Phoenix rather than the other way around. The advantage of tradeable services is that they can directly serve the growing market of Arizona (like the businesses investing in the Phoenix region) while the business locations, workers, income, and capabilities remain in Hermosillo.

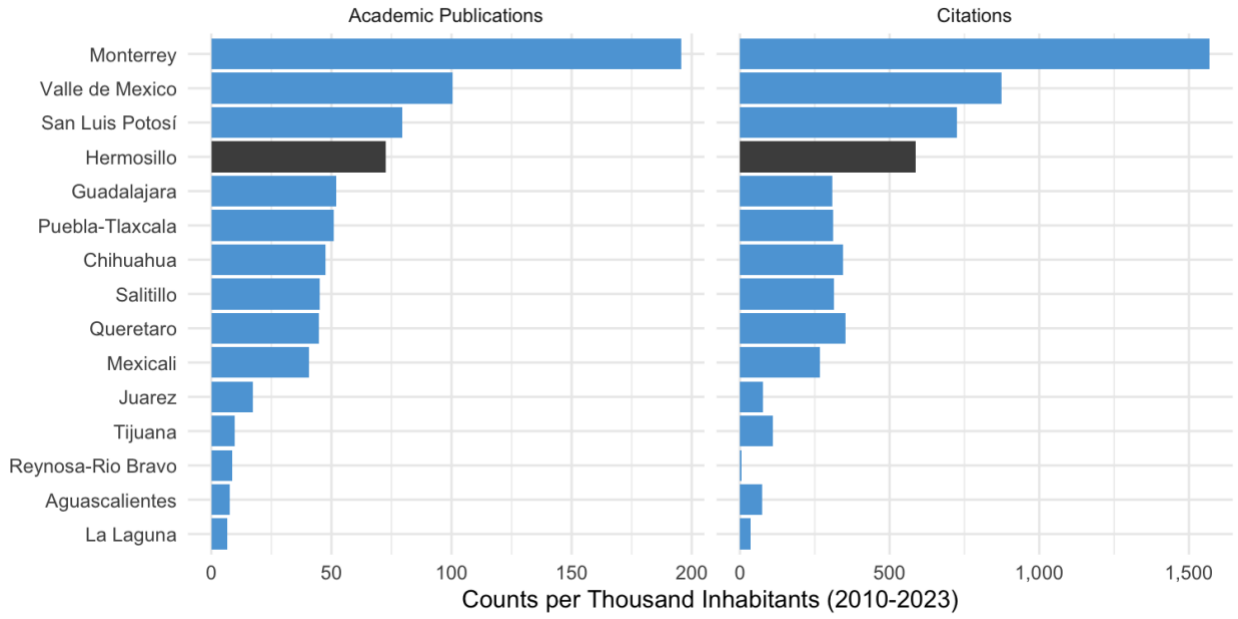
The work of understanding and promoting service opportunities is best done by an organized and well-resourced local group in Hermosillo. Such a group could better explore the two opportunities discussed above and act in the interest of the city and its residents. In addition to the closer look at the two service categories discussed above, we also note a few high-level trends in other promising categories of tradable services.

Education Services: Different from education travel – which involves foreigners studying in Mexico – education services include remote tutoring, specialized cross-border or digitally provided education, and ed-tech, among others. This Mexican service export effectively doubled every year for the past five years, adding USD 197 millions to the country's export basket. Fortunato et al. (2024) established Hermosillo's education ecosystem as one of the city's major assets. Although providing this type of service to foreign markets requires developing new capabilities in virtual and English-language teaching, some of Hermosillo's universities are already taking steps in this direction. To accommodate for excess applicants, the *Instituto Tecnológico de Hermosillo* (ITH) is providing virtual and dual programs. This could be leveraged, for example, to teach the next generation of workers in the Sonora-Arizona microchips industry. Providing lower cost technical education for workers in Arizona could also foster cooperation that improves the course designs in Hermosillo and potentially lead to FDI in the city.

[9] See "Southern Connection: Innovation Clusters in Mexico and the Bridge to Silicon Valley" (https://static1.squarespace.com/static/61b0f3857a9adc5a5722b68f/t/629922a2062d9a2c9d47e026/1654203044557/SouthernConnection-MexicoBayArea-2.pdf)

Other R&D Services: Fortunato et al. (2024) also established that Hermosillo's academic ecosystem is one of the most prolific in Mexico in terms of publications and citations, as shown in Figure 17. Collaborative research between academic institutions and the local private sector remains suboptimal. However, as Hermosillo's institutions attempt to structure policies that foster joint research collaborations, they should be mindful of opportunities beyond the city's borders. R&D service imports from the U.S. have grown nearly USD 10 billion in the past 5 years, and Mexican exports to that market grew USD 268 million in the same period, at an average yearly rate of 23%.

Figure 17: Academic Publications and Citations Per Capita (2010-2023)

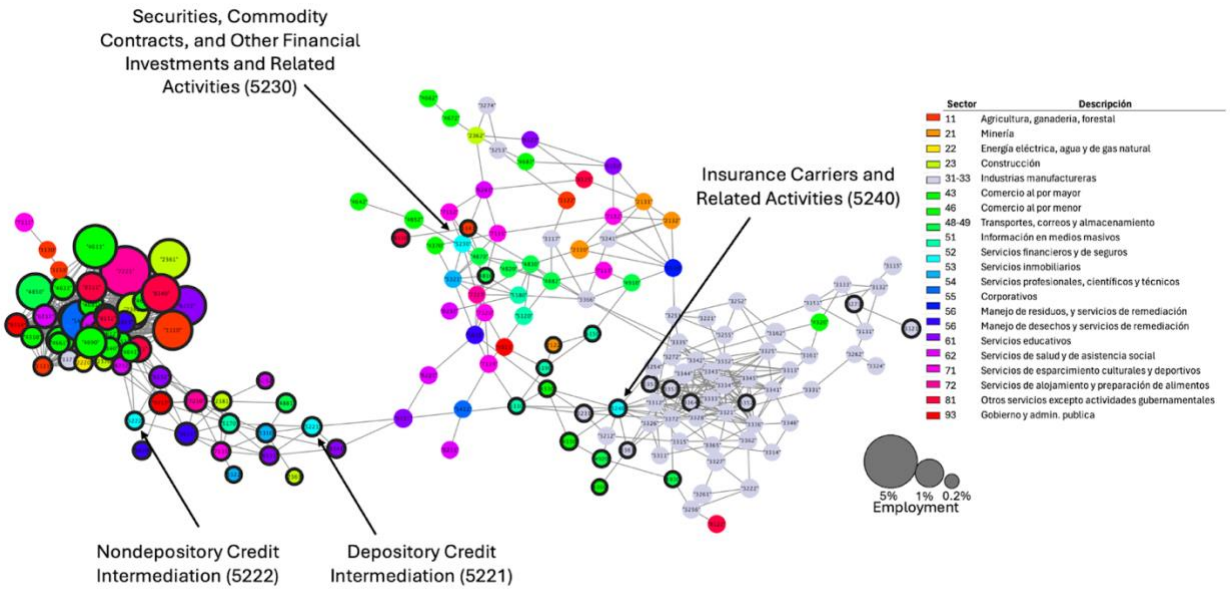


Source: Own calculations based on data from Open Alex, consolidated by Hausmann et al. (2023)

Finance and Insurance: Finance and insurance are a mainstay of the global economy, and the industry is marked by higher-wage opportunities. NAICS classifications usefully divide this large category into distinct areas (see NAICS 522; 523; 524; 525). Although the skills and training are somewhat similar for workers across the broad industry, it is noteworthy that key areas that could be opportunities for Hermosillo occupy very different areas of the industry space (Figure 18). Depository credit intermediation (NAICS 5221) like banks and credit unions and non-depository credit intermediation (NAICS 5222) like credit card services, appear in one part of the space in which Hermosillo already has a well-developed business presence. Meanwhile insurance carriers and related activities (NAICS 5240) is less ubiquitous and thus occupies a different sector of the space. Reinsurance is a relatively concentrated industry at the global scale. Despite being the fourth largest service import for the U.S. and growing at a 76% CAGR in Mexico, it still

only represents USD 67 millions for Mexican exports, and the four largest Mexican reinsurers are in Mexico City. Securities, commodity contracts, and other financial investments and related activities (NAICS 5230) are in another area of the industry space that is well-connected to professional and personal services. Hermosillo does not currently have a revealed comparative advantage here.

Figure 18: Finance and Insurance Industries in Mexico's Industry Space



Source: Growth Lab based on industry employment from Censo de Población y Vivienda 2020.

Audiovisual Services: This industry maps to the 3-digit NAICS code of 512, which includes ten 6-digit industries that relate to different aspects of the film, television, and music industries. This industry overall is very closely related to "database and other information services". In fact, the industries are next to each other in Mexico's industry space (see Figure 15). Among the more specific service activities, "teleproduction and other postproduction services" (NAICS 512191) is likely among the most strategic areas to explore. Like with back-end database and information services, this is an area where skilled labor in Hermosillo can be accessed at a large cost savings versus labor in the United States. This industry has some teleworkable occupations, so it may be accessible to remote workers based in Hermosillo without significant localized capital investment.

Trade-Related Services: Though this industry is lower in terms of overall U.S. import growth, there are indications that it may be especially important for Hermosillo and the region. The relevant NAICS categories are "warehousing and storage" (493) and "support activities for transportation" (488). Mexican data shows that most of the firms in Hermosillo are specifically related to "freight transportation arrangement" (NAICS 488510). This is

an area of rapid growth as well, with 49 out of 66 registered firms in Hermosillo having registered after 2014 and 19 having registered after 2020. As trade expands across the U.S.-Mexico border, such businesses play a critical facilitating role. The more difficult the bureaucratic burdens are on the Mexican side of the border and the more risks involved in transport due to insecurity, the higher the demand will tend to be for these services. For the time being, it appears that firms in Hermosillo are finding ways to help businesses overcome these challenges, and this may unfortunately remain a growing opportunity.

News Agency Services: This industry is well positioned in Figure 12, with the most intensive current presence in Hermosillo and the second largest U.S. imports CAGR. However, Mexico exports to the U.S. in this category only represent around USD 1 million and did not grow in the recent past. In addition, the potential connection between the type of news agency services in which Hermosillo excels and what the U.S. is importing remains unclear. Given that U.S. wages are 14 times larger than Hermosillo's these markets might be significantly segmented, which may preclude opportunities in the space.

5. Concluding Remarks

Hermosillo is well positioned to benefit from the growing internationalization of services if can develop the capabilities to export what it can already competitively provide to its local market. Technological innovations have increased the tradability of services. Hence, international trade in services has grown more than trade in goods in the recent past, and growth has been especially rapid for services that can be digitally provided across borders. Hermosillo could be poised to take advantage of this opportunity because its wages are much lower than those in comparable industries and occupations in the U.S., and because the most important services that can be potentially exported are already developed at the local level in Hermosillo. We identify a set of highly promising exportable options that includes engineering services, database and other information services, business & management consulting, R&D services, education services, and accounting services, among others. Some of these services are experiencing faster growth in demand, which raises the likelihood that new entrants from Hermosillo can find a market for themselves. However, existing firms in Hermosillo firms will need to develop new capabilities as they transition from local providers to international exporters. The challenges for internationalization are bound to be sector-specific, and both firms and policymakers should be proactive in resolving them on an ongoing basis. In addition, policymakers can lay the ground for Hermosillenses to thrive as teleworkers for foreign companies by creating linkages, platforms, and a legislative framework that is amenable towards the practice. Another policy lever is the attraction of larger multinational service providers that can employ talented Hermosillences and connect them to clients.

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