

Special Economic Zones in Panama: A Critical Assessment

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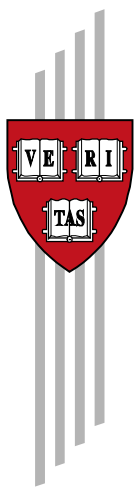
Special Economic Zones in Panama:

A critical assessment

Ricardo Hausmann, Juan Obach, and
Miguel Angel Santos

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EXECUTIVE SUMMARY

Over the last decade, Panama has experienced remarkable economic progress, doubling its income per capita. Panama has excelled in nurturing a competitive service sector in all activities surrounding the Canal, such as logistics, transportation, financial services, communications and trade. In parallel, the Panamanian government has also actively promoted place-based policies to attract foreign firms and spur innovation, through the creation of an array of Special Economic Zones (SEZ). The aim of this paper is to evaluate the economic performance of the most important SEZ in Panama: Colon Free Zone, Panama-Pacific and City of Knowledge.

Colon Free Zone (CFZ) was created in 1948 as an import/re-export zone and today is the second largest SEZ of the world. CFZ is located in the Atlantic entrance of the Canal, employs 30,000 workers and its net exports account for 4% of the GDP. The main economic activity of firms within this zone is retail and wholesale, followed by logistic and transport services. Panama-Pacific (PP), which started operating in 2007, was created as an industrial and residential park with a battery of tax and migratory incentives for firms. Nowadays the zone hosts more than a hundred firms, 40% of them foreign. Worldwide known companies such as 3M, Dell or Caterpillar have already move part of their regional operations to PP. Finally, in a former military base nearby the Canal, City of Knowledge (CK) emerges as a technology park, hosting a set of medium/small size technology firms, the UNDP regional headquarters, and a college campus.

These three zones diverge in their nature and goals, so they should be assessed on their own merits. However, there are common features – such as employment or foreign investment – that can be analyzed in a comparative way. In this paper, we take a twofold approach to measure the benefits derived from SEZ. First, we assess static benefits, namely foreign direct investment (FDI) and employment levels. We also run an econometric exercise to measure the productivity differences between firms within and outside these Zones. But this is a very partial way to appraise SEZ, only taking into account the statistics of what occurs *within* the zone. For a more comprehensive approach, we should also incorporate the impacts of SEZ beyond their boundaries. According to this approach, SEZ can be deemed as successful only if they encourage technology spillovers or knowledge diffusion that enable the local economy to acquire new productive capabilities (Hausmann et al., 2014). Hence, we push forward our analysis to gauge if SEZ are fostering structural transformation within the Panamanian economy by assessing their capacity to attract high-skilled immigrants with new productive capabilities and to generate positive spillovers over local workers.

In terms of FDI attraction, Panama outperforms almost all Latin American countries, yet the role of SEZ in this success story is relatively modest. While foreign capitals have been flowing to the country in an upward trend, the share of total FDI accounted for the SEZ is small, and has decreased steadily since 2007. Moreover, only one out of the 10 largest FDI projects in Panama in the last 12 years is related to a SEZ. Hence, although SEZ have indeed attracted foreign firms – especially PP – they have not been the main driving force behind FDI flowing into Panama.

Although they correspond to only a small fraction of total employment, SEZ represent a source of stable and well-paid jobs to workers. SEZ jobs show lower levels of informality, self-employment and defined-term contracts. Salaries are also higher within SEZ, with PP standing out as the zone with the largest wage premium. In addition, we find that the bulk of the wage gap is explained, not by worker characteristics, but rather for an unobservable component, probably related to firms' productivity. A thorough econometric analysis – allowing to control for a set of firm-level characteristics – confirms the hypothesis that firms within SEZ in Panama are indeed relatively more productive.

At last, we evaluate the knowledge spillovers derived from immigrants. We find that immigrants in Panama are more educated, are more likely to be entrepreneurs, work in industries that are more complex and earn more than natives. We formally test immigrants-to-native spillovers using econometric tools in search for a causal relationship between the share of immigrants and the productivity of Panamanian workers in a particular industry-province space. Our results suggest that there are positive spillovers from immigrants, that tend to increase with the skill level of workers. In this regard, Panamanian SEZ are functioning as cranes that are not only moving brains geographically, but are also acting as international transmitters of know-how, which is ultimately benefiting Panama and its workers. As such, it represents an enormous asset for Panama, as tacit knowledge brought by expats can even expand and diversify Panama's export basket of goods and services (Bahar and Rapoport, 2016). For that to happen, beyond attracting and nurturing foreign firms that import know-how that is not to be found domestically, Panama needs to formulate policies aimed at maximizing spillovers, easing the flow of productive knowledge in and out of the SZE towards the rest of the economy.

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1. INTRODUCTION: BASIC PRINCIPLES OF SPECIAL ECONOMIC ZONES

Special Economic Zones, Free Trade Zones or Export Processing Zones are all terms used interchangeably to identify specific geographic areas in which firms benefit from a business-friendly environment, most often providing some form of tax and labor incentives (Farole, 2011). In this paper, we will refer indistinctly to these zones as Special Economic Zones, yet we need first to establish some distinctions between them, as the nature of their activities differs in significant ways. First, Free Trade Zones or Export Processing Zones are usually referred to places exclusively focused in the import and re-export of tradable goods. Usually these places take the form of entry ports or industrial parks close to borders, aimed at connecting the local economy to world trade. Second, large-scale Special Economic Zones, which started to grow in 1980, combine residential, commercial and industry activities. At last, Science and Technology parks have served as clusters of innovation and technology, which can ultimate upgrade the industrial capacities of the host country (Rodriguez-Pose and Hardy, 2014).

Special Economic Zones (SEZ) are not new, neither in the developing nor in the developed world, and they can be traced back to the XVI and XVII centuries in Gibraltar and Singapore (FIAS, 2008). Nevertheless, the main promotor of SEZ in the post WWII neo-liberal era has been China. Since 1979, more than 2,700 SEZ have been created in China, mainly on its coastal cities, ranging from free trade areas to technological parks (Stigler, 2014). Other countries in South East Asia, such as Malaysia, South Korea, Sri Lanka and the Philippines, have also adopted SEZ as part of their economic policy toolkit.

In the Americas, Panama has been a pioneer in the creation of SEZ. In 1948, it established the Colon Free Zone (CFZ), an exclusive import/re-export area, as a response to the economic decline of the city of Colon after WWII. Today CFZ is the second largest SEZ in the world (only surpassed by Honk-Kong), specializing in the import and re-export of tradable goods throughout the Americas. Later in the 2000s, when the United States handed over the Canal to Panama, they left behind a group of military and civilian areas that today serve as geographic location of two more SEZ; City of Knowledge (CK) and Panama-Pacific (PP). CK, which started operating in the year 2000, is a 120-hectares science and technology park, aimed at building an international platform of knowledge creation and diffusion. It is mainly comprised by technology firms, international organizations, and academic and research institutions. PP, on the other hand, is a landmark example of a large-scale SEZ that combines residential, commercial and industrial activities. It started operating in 2007 in Howard – a former US military airbase – and today spreads throughout a 2,005 hectares.

From the description above, it is evident that the nature of the three Panamanian SEZ analyzed in this paper are quite different. While CFZ is a purely import/re-export zone, PP emerges as a classical example of modern and large-scale multipurpose zone, whilst CK has all the features of an innovation and technology park. All in all, these three zones combined host around 2,000 firms, which employ more than 43,000 workers (2.4% of total employment in Panama). **Table 1** summarizes the tax, labor and migratory benefits for each of the three SEZ analyzed in this study.

One salient feature of SEZ around the world is the upward trend of privately owned and operated zones. While in the 1980s less than 25% of zones worldwide were private, by 2008 this share was 62% (FIAS, 2008). Administration of SEZ under a public-private partnerships (PPP) scheme have also become increasingly popular. SEZ in Panama have followed the same trend, with two SEZ administrated under a PPP scheme (Panama-Pacific and City of Knowledge), and only one (Colon Free Zone) under the administration of the government.

While the specific role of a SEZ may vary from one to another, they are all intended to serve a common purpose: to attract foreign and/or local investment to bolster economic growth over time. Insofar, the literature has identified four main objectives for SEZ (Engman et al., 2007; FIAS, 2008; Farole, 2011):

1. Attract foreign direct investment (FDI).
2. Laboratory for experimentation to achieve a particular policy objective and then scale it.
3. Catalysts of structural transformations and ultimately diversify the local economy.
4. Regional pressure valves to increase employment in disadvantaged areas.

Overall, benefits of SEZ are categorized in two broad groups: static and what we will call here dynamic benefits. Static benefits are flows that occur within a specific timeframe and are relatively easy to measure. Foreign direct investment, employment, and government revenues are all static benefits. Dynamic benefits are typically technology and knowledge spillovers derived from the existence of the SEZs, which take more time in materializing and therefore are not circumscribed to a specific year, but rather have effects that manifest in time. While the literature is plagued with studies that assess the static benefits of SEZ (Warr 1989; Chen 1993; Jayanthakumaran 2003; Mongé-Gonzalez et al., 2005), to our knowledge there are no studies focusing on measuring dynamic benefits.

Most of the criticism to SEZ focus on their operation as enclaves within the local economy, where incentives are exclusively targeted to the flows of firms within the zone and foreign firms (e.g. import/export tax incentives). Hence, SEZ are often categorized as economically sub-optimal policies since

they benefit the few and distort resource allocation (Engman et al., 2007). Panama SEZs are not immune to this criticism. For example, while Colon Free Zone (CFZ) employs around 23,000 workers (21% of the province total employment), the unemployment rate of Colon province is still the higher of the country, reaching an 8.8% in July of 2016.¹ Therefore, to determine if SEZ are a successful policy tool, it is not enough to measure static benefits, as firm-level investment and employment decisions are not fully informative of the total benefits that the Panamanian economy is reaping from its SEZ. Instead, **we take a novel approach by looking at SEZ linkages generated with the local economy.** In particular, SEZ can be deemed as successful policy tools only if they encourage technology spillovers or knowledge diffusion that enable the local economy to acquire new productive capabilities (Hausmann et al., 2014). Under this lens, SEZ are only worthy to the Panamanian government if they act as stepping stones to national strategies of productivity upgrading, industrialization and/or export diversification. It is there, in the most dynamic aspects of SEZ and their interaction with the rest of the economy, where the true potential for igniting a structural transformation lies, and there is where we focus our efforts.

The paper is organized as follows. Section 2 describes the characteristics of the three SEZ analyzed in this study: Colon Free Zone, Panama-Pacific and City of Knowledge. Section 3 lays down an assessment of the static benefits of these zones in terms of foreign direct investment (FDI), job creation, and firms' productivity. In Section 4 we delve into the evaluation of dynamic benefits of SEZ, looking at a particular transmission channel: knowledge spillovers of immigrants attracted by SEZ. Section 5 concludes and outlines a set of policy recommendations to maximize the productive and knowledge spillover that emanate from Special Economic Zones.

¹ Source: INEC, Panama.

Table 1: Benefits of Special Economic Zones (SEZ) in Panama

	Colon Free Zone	Panama-Pacific [†]	City of Knowledge ^{††}
Tax and Fee Incentives			
Exemption of income tax	YES	YES	NO
Exemption of dividend tax	NO	YES	NO
Exemption of Import taxes	YES	YES	YES
Exemption of Export taxes	YES	YES	NO
Exemption of Sales taxes	YES	YES	NO
Exemption of taxes to remittances or transfers abroad	NO	YES	YES
Exemption of taxes to Transfer of Movable Property and the Rendering of Services (ITBMS)	NO	YES	YES
Exemption of commercial license, security and maintenance fees	NO	YES	NO
Exemption of tax to patents	NO	YES	NO
Immigration incentives			
Special Visa for investors	NO	YES	NO
Special Visa for workers	NO	YES	YES
Special Visa for dependents	NO	YES	NO
Tax exemption for imports of domestic belongings up to US\$1,0000	NO	YES	NO
Flexibility to hire more than 10% of immigrants	YES	YES	YES
Labor regime			
Overtime fix rate of 25%	NO	YES	NO
Days-off fix rate of 50%	NO	YES	NO
Flexibility to assign days off	NO	YES	NO
Flexibility to operate on Sundays and official holidays	NO	YES	NO
Higher education institution	NO	YES	YES
Business and investment stability			
Investment Stability Law (54)	NO	YES	NO
Special Custom Regime	NO	YES	NO
Onsite one-stop-shop for permits and procedures	NO	YES	NO

[†] All tax incentives in Panama-Pacific are circumscribed to 12 activities defined by the World Bank in 2005. These activities are: back office operation; multimodal and logistic services; call centers; high-tech products and process manufacturing; offshore services; digital & data transmission; multinational headquarters; film industry; maintenance, repair and overhaul of airplanes; aviation and airport related services; transfer of goods and services to ships and their passengers and distribution centers (import/re-exports).

^{††} Firms that produce, assemble or process high-technology manufactures are exempted from all type of income and capital taxes.

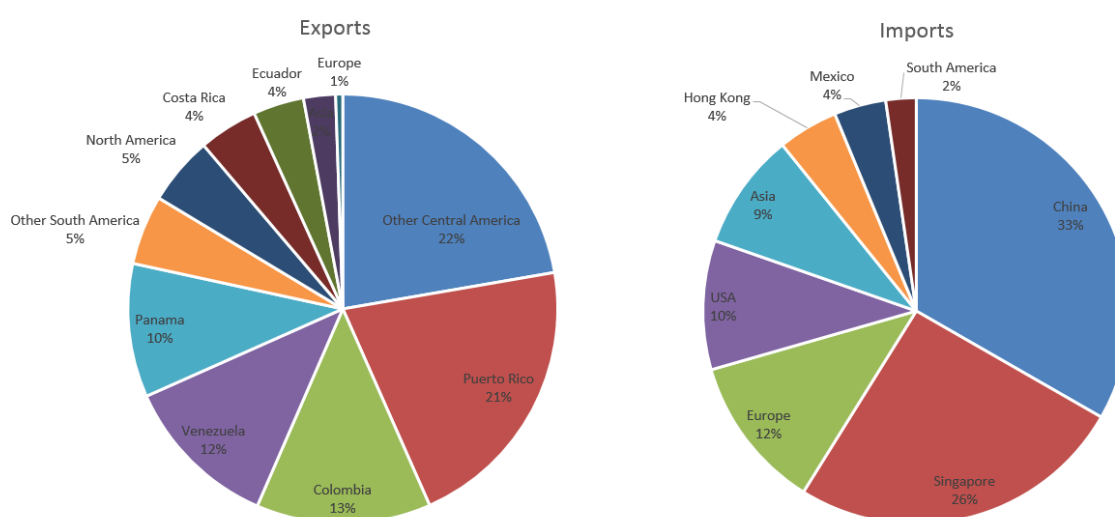
Source: own creation based on current legislation of SEZ in Panama.

2. OVERVIEW OF THE SPECIAL ECONOMIC ZONES IN PANAMA

2.1 COLON FREE ZONE (CFZ)

Established in 1948 in the Caribbean entrance to the canal, the Colon Free Zone is one of the oldest SEZ in the world, the most important of the Americas, and the second largest in the world. CFZ acts as an import/re-export area mainly focused in tradable goods such as fabrics, clothes, shoes, and pharmaceutical products. By 2015, CFZ hosted 2,527 companies, employing 29,786 workers. Firms in CFZ are exempted from all import and export taxes. In addition, they are exempted from the income tax only for international operations and there is no minimum capital investment (**Table 1**). Overall, since its creation ZLC has offered a sizable number of jobs for blue-collar workers in Colon. As we will show later, these jobs represent a source of stable and relatively high income, especially for low-skilled workers.

Figure I: Export and Imports of Colon Free Zone

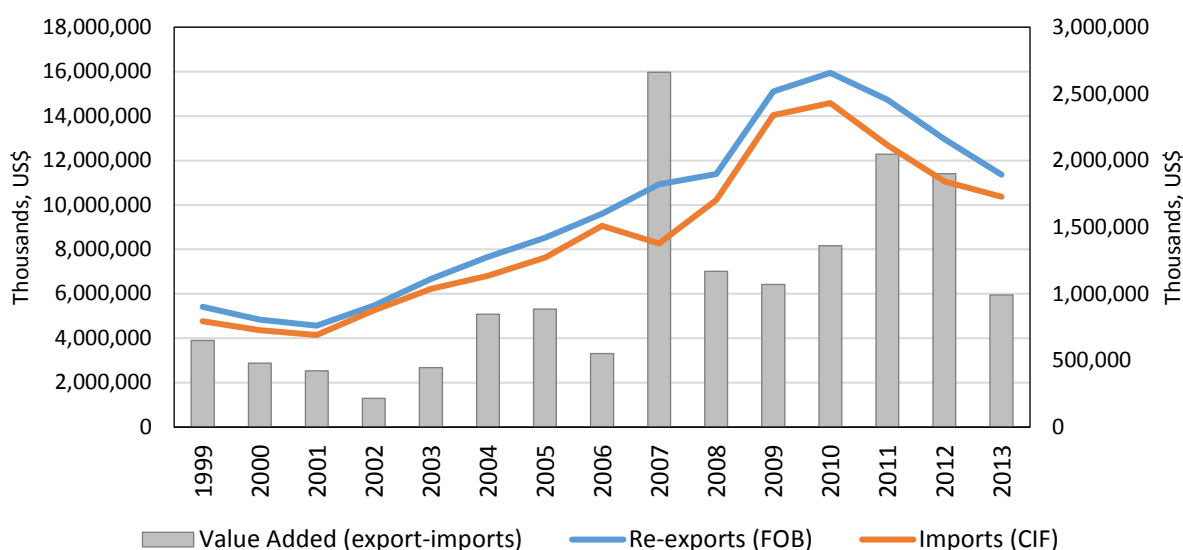


Source: INEC, Panama

In 2015, more than half of the total imports of CFZ came from just four countries: China, Singapore, United States and Hong Kong. Likewise, 50% of the re-exports went to only four countries: Puerto Rico, Colombia, Venezuela and Panama (**Figure I**). In 2012, the trade volume of CFZ reached a peak, with a total of US\$ 15.9 billion in re-exports, and US\$ 14.6 billion of imports. Since then, both re-exports and imports have been decreasing at a steady pace (**Figure II**). In April of 2016, the cumulative exports decreased in 23% compared to April 2015; 20% compared to April 2014. This negative trend can be explained by a slowdown in the regional trade mainly driven by the deteriorated economic situation of Venezuela (third main export destination) and new import-taxes charges on clothes and shoes by Colombia (second largest export

destination).² This slowdown is reflected in the decrease of the value added (exports minus imports) generated by the zone. Although positive throughout the last 20 years, value added in 2013 was only around US\$ 1 billion, the lowest since 2007. Today, tenants of CFZ complain that they have lost competitiveness because tax breaks are not as generous as other Panamanian SEZ, and they are charged with high fixed operation and service fees by the government.³ The fees collected by the government had been highly controversial, since they were implemented on a fixed scheme when the zone was booming. Today, with economic activity declining in CFZ (**Figure II**), these fees represent a high share of tenants' income thereby threatening their profitability.

Figure II: Colon Free Zone re-exports and imports



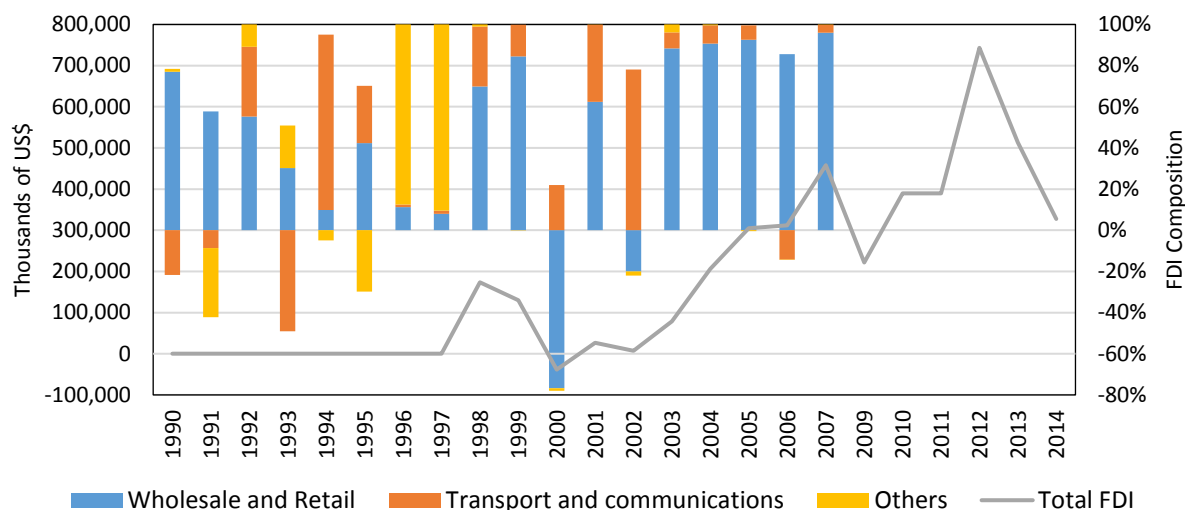
Source: INEC, Panama and WDI

According to the 2012 Economic Census of firms, 4.5% of CFZ firms had foreign capital, compared to a national average of 2.2%. This suggests that CFZ has been successful in attracting FDI, as compared to the rest of the Panamanian economy. From early 2000s to 2013, the net flow of FDI targeted in CFZ increased significantly, totaling more than 700 million in 2012 (**Figure III**). However, in 2014, these flows plummeted down to 2004 levels. Likewise, the lion's share of this FDI has gone to the Wholesale and Retail industry and not to Transport and Logistics activities, core of Panama's competitive advantages.

² Colombia unilaterally imposed an additional 10% tariff on textiles and footwear coming from the Colón Free Zone. In February 2016 Panama demanded arbitration of a World Trade Organization Expert Panel. Case remains unsolved.

³ Interview with *Asociacion Usuarios Colon* (July, 2016).

Figure III: FDI Inflows and Composition in CFZ



Source: INEC, Panama, July 2016

Today, CFZ struggles to remain competitive. Since 2013, hundreds of firms have closed their operations generating massive layoffs. According to CFZ administrators, over the previous three years (2012-2015) there was a net reduction of 3,300 jobs,⁴ and bank loans to CFZ firms decreased by US\$ 200 million.⁵

2.2 PANAMA-PACIFIC (PP)

Panama-Pacific was created in 2007 in the former US military areas of Howard Air Force Base and Fort Kobbe. It operates under Law 41 of 2004, which describes the main goal of the zone as follows:

“... to encourage and ensure the free flow and movement of goods, services and funds so as to attract and promote investments and the generation of jobs and to make the Republic of Panama more competitive within the global economy”

Located in the District of Arraijan⁶ in the west side of the Canal, PP hosts a business and industrial park, several housing projects, shopping malls, a special custom regime, four schools, two training centers, an international airport, and a “one-stop-building” comprised by 18 government agencies to lighten the administrative burden for companies. The government of Panama rented the administration of PP

⁴ http://www.zolicol.gob.pa/imagenes/pdf/compendio_2011_2015.pdf

⁵ Superintendencia de Bancos, Panama

⁶ Anecdotaly, a deformation from the English “a right hand”.

through a 40-years contract to a private developer, London and Regional Properties. The master plan entails 1 million square meters of commercial spaces; 20,000 homes and 40,000 new jobs.

All companies registered within PP that fall under 12 pre-established business activities are exempted from all taxes, both indirect and direct.⁷ However, when products are commercialized within the National Fiscal Territory, direct taxes (income, dividends and money transfer) are applied, with the only exception of high-technology manufactures. In addition, companies can benefit from special immigration standards in which investors, workers and their families are granted special visas. There is also a tax-free, one-time import of any personal and domestic belongings of foreign workers. Finally, the zone offers a special labor regulation with 24/7 operations allowed, an overtime fixed rate of 25% of base salary, and a special ceiling on the proportion of workforce from outside Panama (**Table 1**).

Up to date, 251 companies are registered in PP generating 2,305 direct jobs.⁸ In addition, the zone has successfully attracted foreign capital, which today accounts for 41% of companies and 65% of total investment. Large multinational companies such as Dell, 3M and Caterpillar have installed in PP, attracting a substantive number of expats. In this regard, the special visas offered by PP seem to point in the right direction, as the share of immigrants within PP is almost three times higher than the share of immigrants in the Panama province.⁹ In particular, PP offers two types of visas; one for workers, and other for investors, both for a maximum of five years. However, only under the investor Visa immigrants are eligible to apply for resident visas.¹⁰ A priori, this inability of PP expats to accumulate years for a potential residency permit makes little sense, as it inhibits the likelihood that immigrants move to other firms outside PP or create their own firms, and spread their knowledge outside PP.

⁷ The 12 activities were defined from a study conducted by the International Finance Corporation (IFC) of the World Bank Group in 2005 with the aim of advising the Panama government in the development of PP. These activities are: back office operation; multimodal and logistic services; call centers; high-tech products and process manufacturing; offshore services; digital & data transmission; multinational headquarters; film industry; maintenance, repair and overhaul of airplanes; aviation and airport related services; transfer of goods and services to ships and their passengers and distribution centers (import/re-exports).

⁸ Panama-Pacific Agency, July 2016.

⁹ 2010 Population Census of Panama.

¹⁰ Law 41 of 2004 is only explicit in terms of permanent residence permits for the case of Investor Visas (Article 101).

2.3 CITY OF KNOWLEDGE (CK)

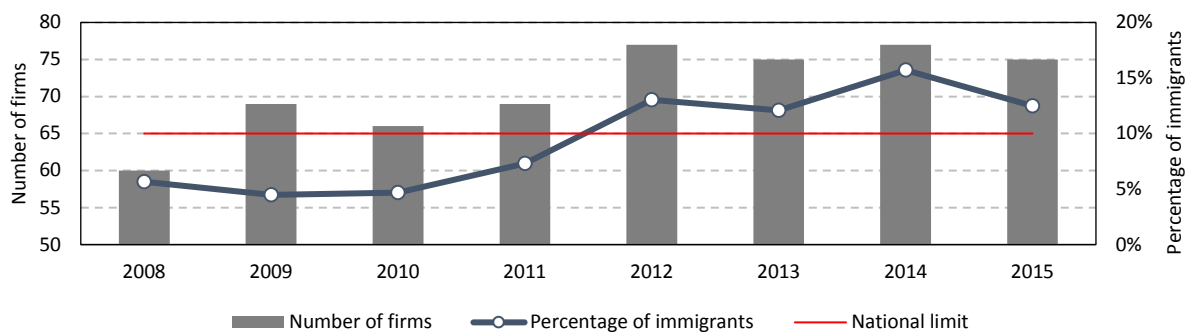
What once was the U.S. Clayton military base, today emerge as a thriving community of firms, research centers, academic institutions and NGOs. Located near the Panama Canal, since the year 2000 City of Knowledge offers an environment aimed at promoting innovation, culture and human development. The infrastructure of this technology park is a mix of old 1920s five story buildings left behind by the US military, and modern constructions. The zone hosts a group of 75 small and medium companies ranging from computer software developers as *Infosgroup* to nano-technology labs as *Nano Dispersion*, to worldwide pharmaceutical leaders such as *GlaxoSmithKline*. In addition, CK hosts the UNDP regional headquarters, a college campus from Florida State University, and two public institutes devoted to innovation and technology: SENACYT and INDICASAT. By 2015, CK generated a total of 1,290 direct jobs.

All companies located in CK must comply with one requirement: constantly innovation. The City of Knowledge Foundation, a private NGO in charge of the administration, has a rigorous firm selection process based exclusively in innovation capacity. Each year, CK receives approximately one hundred applications and has an acceptance rate of 7%. Companies allowed in are given three or four-year contracts depending on the particular case, are screened in terms of innovation and technology and might be requested to leave CK – upon contract expiration – if they do not meet the standards. The setting of these high standards has positively positioned CK as a brand of technological innovation and knowledge diffusion in Panama. Overall, CK has successfully attracted small and medium technology firms and at present displays a 92% occupancy rate.

As the others SEZ of Panama, firms hosted in City of Knowledge benefit from tax discounts and a special migratory regime. Given the nature of technology firms – intensive in capital inputs – the exoneration of import and sales taxes emerges as a key benefit. In addition, firms that commercialize high-technology products or services are fully exempted from any other taxes (**Table 1**).

In terms of migratory benefits, firms in CK can hire as many foreign workers as they want under the City of Knowledge VISA (national limit of 10% does not apply). This benefit is also highly valued by firms. As stated in interviews with tenants, foreign workers bring a particular set of skills that are not found in Panama. Moreover, since 2012 the national limit of 10% has been surpassed systematically, suggesting that high-skilled labor is indeed a binding constraint for these firms that has been surpassed (at a premium) via immigration (**Figure IV**).

Figure IV: Number of firms and percentage of foreign workers in City of Knowledge



Source: City of Knowledge Foundation, July 2016

City of Knowledge contains all the components of a successful triple-helix model, namely government, private sector, and universities and research centers (Etzkowitz and Leydesdorff; 2010; Rodriguez-Pose and Hardy, 2014). However, in reality there are several bottlenecks that are inhibiting a sustainable long-term transfer of knowledge and technology across firms within the CK, and more importantly, from CK to the rest of the country. On the former, within the course of the interviews we carried to tenants of CK it was noteworthy the absence of functional synergies among firms. Moreover, there is a lack of linkages between academic institutions within CK and firms, and the administration does not systematically monitor any indicator of innovation or knowledge transfer. On the latter, there are a number of relevant factors preventing the knowledge created at CK from spilling over to the rest of the economy. First, the Panamanian immigration regime is highly inefficient and expensive. CK Visas have to be renewed annually at a hefty fee that might be quite significant for small and even medium companies where foreign scientists predominate. Furthermore, if foreigners hosted by CK want to work elsewhere in Panama, they have to reapply for a new visa, and bear the costs of the new process. Time spent on the CK does not accrue for Panamanian residence, which ultimately hinders the free flow of immigrants to the domestic economy. Last but not least, most of the activities of CK firms gravitates towards research and development activities rather than commercial and sales activities, hindering the capacity of the zone to add a substantive value added to the Panamanian economy.

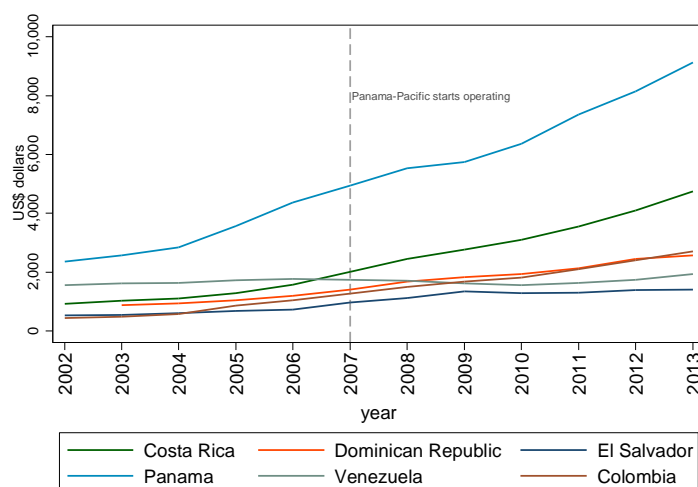
3. STATIC BENEFITS OF SPECIAL ECONOMIC ZONES IN PANAMA

3.1 FOREIGN DIRECT INVESTMENT

In order to assess the FDI impacts of SEZ we would ideally need a valid counterfactual, which is not trivial.¹¹ We looked at several FDI metrics, contrasted Panama's FDI trend with the region, and valued greenfield FDI projects. Our findings suggest that, even if successful in attracting foreign capitals, SEZ have not been the workhorse behind the massive FDI inflows registered over the last ten years.

Since early 2000s Panama experienced a large increase in FDI. From annual FDI levels of US\$ 1 billion at the beginning of the decade, the country went up to 4 or 5 billion per year nowadays. Panama has been successful in attracting foreign investors for various reasons: political and economic stability; trade liberalization; the creation of a business friendly environment with low taxes; and privileged geographic location. **Figure V** shows how Panama outperformed almost all its neighbor countries in FDI. By 2013, the current stock of FDI per person in Panama was US\$8,000, the double of Costa Rica (second neighboring country with largest stock of FDI per person). How much of this gap can be explained by the role of SEZ in the country? As mentioned before, it is hard to know, but the spike of Panama FDI in the year 2004 occurred three years before PP started operating and a year in which CFZ attracted less than US\$500 million in FDI, suggesting that SEZ were not the main driver of capital inflows.

Figure V: Stock of FDI per person in the region

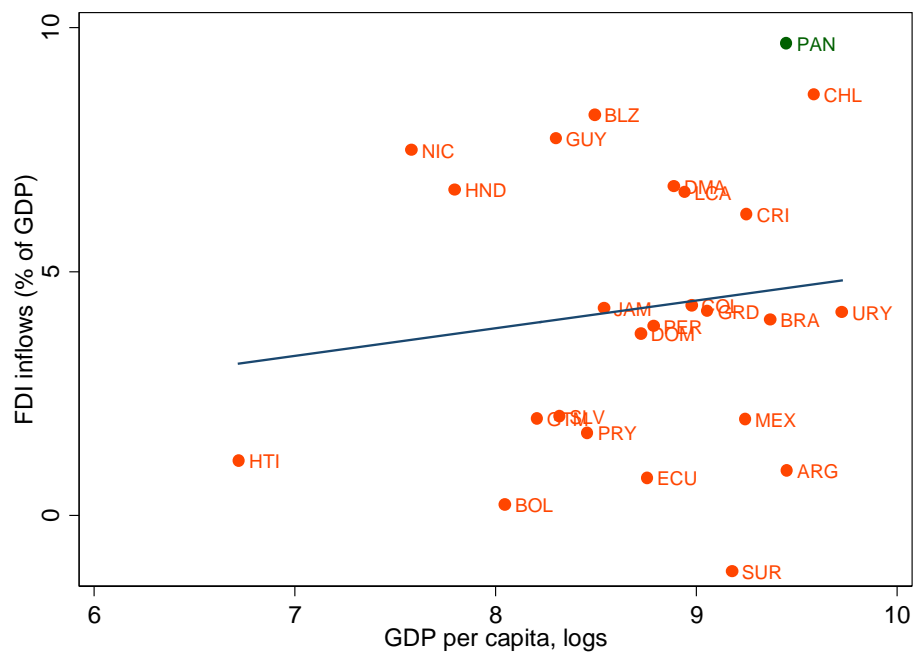


Source: Economist Intelligence Unit, July 2016

¹¹ The counterfactual is the amount of FDI that Panama would have received had it not created none of its Special Economic Zones.

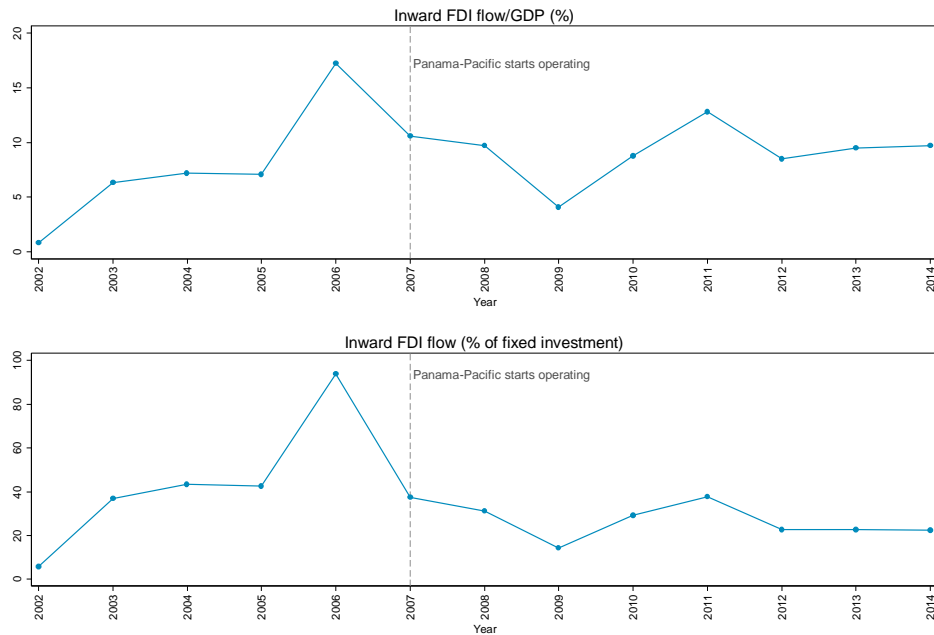
Compared to the rest of Latin American countries, Panama also ranks first in terms of FDI inflows as percentage of GDP (**Figure VI**), confirming that the country has had a successful story of attracting foreign capitals. By 2014, almost 10% of the country’s GDP accounted for foreign direct investment, suggesting that international investors have a strong confidence in the strength of Panama’s economy.

Figure VI: Inward Foreign Direct Investment of LA countries, year 2014



Though Panama has been successful in attracting FDI, this type of investment has neither been the main driver of investment nor GDP growth in the previous decade (**Figure VII**). Moreover, after reaching a maximum in the year 2006, the shares of FDI in investment and GDP in Panama slightly decreased. FDI inflows went from 90% and 40% of total investment in 2006 and 2007, to roughly 20% nowadays. Likewise, today FDI accounts for less than 10% of GDP. These two measures reveal that the relative importance of FDI in the total output of Panama has been stagnant and played a secondary role in the economic boom of the country of the last 10 years.

Figure VII: FDI share of GDP and investment in Panama



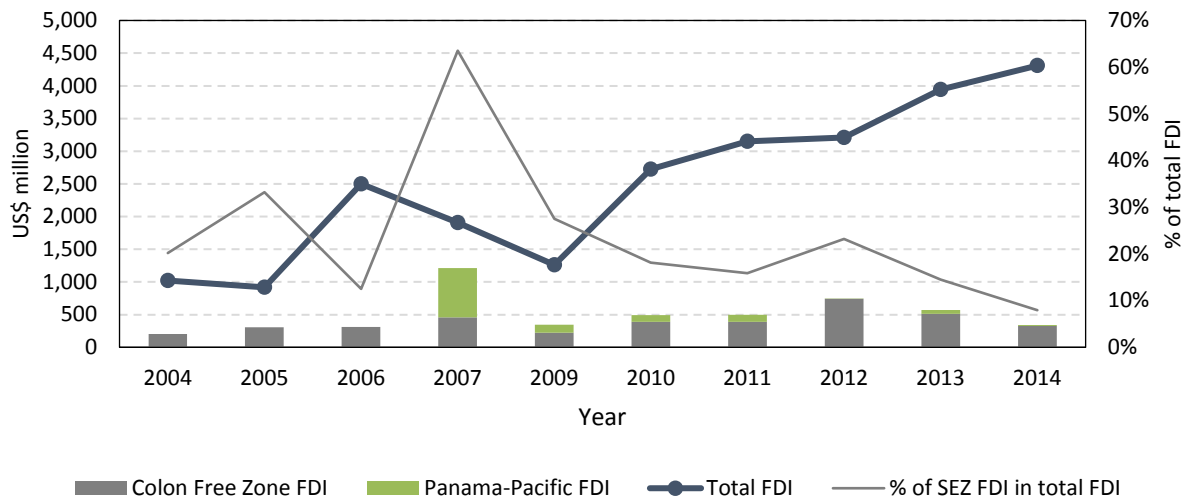
Source: Economist Intelligence Unit, July 2016

Finally, using data from the National Statistical Office (INEC for its Spanish acronym) and the FDI Markets database,¹² we find that the share of FDI directed to SEZ in Panama has been decreasing over time, accounting for only 8% of total FDI in the year 2014 (**Figure VIII**). Since the year 2007, when this share reached a maximum of 64% – mainly due to the US\$700 million investment of the PP developer, London and Regional – the relative importance of SEZ in total FDI has decreased steadily whilst total FDI in Panama increased all along.

We mentioned above that the bulk of FDI in CFZ goes to Wholesale and Retail activities followed by Logistics and Transportation. In PP alone, the US\$700 million investment of the developer – London and Regional Properties – stands out as the largest FDI project, followed by Hewlett-Packard (111 million), BASF (64 million), the Bank of Nova Scotia (62 million) and 3M (52 million).

¹² The FDI Markets database from the Financial Times is the most comprehensive online database of cross-border greenfield investments covering all countries and sectors worldwide. From a total of 359 greenfield FDI projects in Panama between 2003 and 2015 we identified 23 investments related to Panama-Pacific.

Figure VIII: FDI in Colon Free Zone and Panama-Pacific



Source: Own calculations based on data from INEC, Panama, and FDI Markets database

In conclusion, since the year 2000 SEZ in Panama have been successful in attracting foreign capitals, within the context of large capital inflows flying into Latin America. Moreover, as the relative importance of FDI in total investment and GDP has stagnated, we can rule out FDI as the main driver of Panama's impressive growth over the last 10 years. Looking at the share of SEZ on total FDI, we did not find compelling evidence suggesting that without the SEZ the total FDI would have been significantly lower. Moreover, the relative contribution of CFZ and PP in total FDI has been decreasing steadily since 2007, and only one out of the 10 largest FDI projects in Panama in the last 12 years is related to a SEZ (**Figure A- 1**).

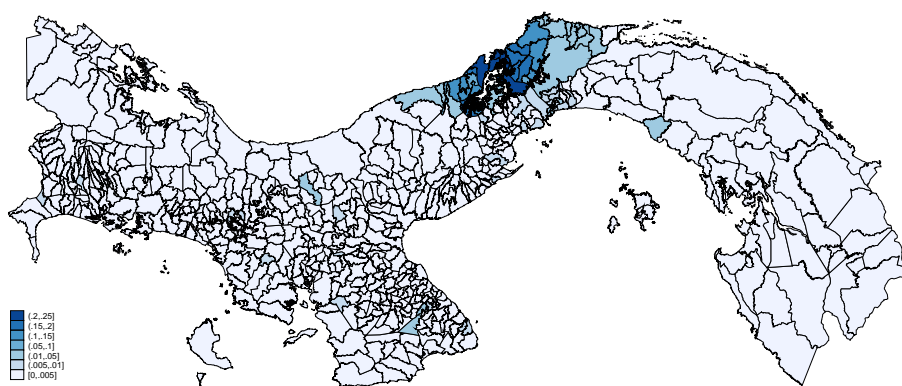
3.2 EMPLOYMENT

The best way to gauge the employment dynamics of SEZ is using data from the Social Security Administrator. However, during the course of this research project we were not able to access data from the *Caja del Seguro Social de Panamá*. We had to limit our analysis, hence, to data from the Population Censuses of 2000 and 2010, which only allowed us to identify workers of firms located in Panama-Pacific and Colon Free Zone, but not from City of Knowledge.

By 2010, CFZ and PP employed a total of 21,773 workers accounting for only 1.7% of total employment in the country.¹³ While in ten years the number of jobs in SEZ almost doubled, the share in total employment has remained the same. If we look at things in a static way, it seems that instead of employment growth in Panama being driven by SEZ, employment in the SEZ was driven by the rest Panama. The only way to assess a different causality would be to look at the spillovers from SEZ, which we do in section 4.

Figure IX reveals that CFZ is the most important employer of the Panamanian SEZ, concentrating more than 70% of total SEZ jobs. Despite the 30,000 jobs that CFZ currently generates, Colon happens to be the province with the highest unemployment rate. This disturbing contrast casts doubts on CFZ ability to bolster a path of inclusive employment growth over time, and provides some ground to the common criticism to SEZ as closed enclaves. However, as shown later in this section, CFZ offers an array of jobs targeted to low-skilled workers which are better paid and more stable than jobs outside the zone.

Figure IX: Share of total Workers in Special Economic Zones, by *corregimiento*

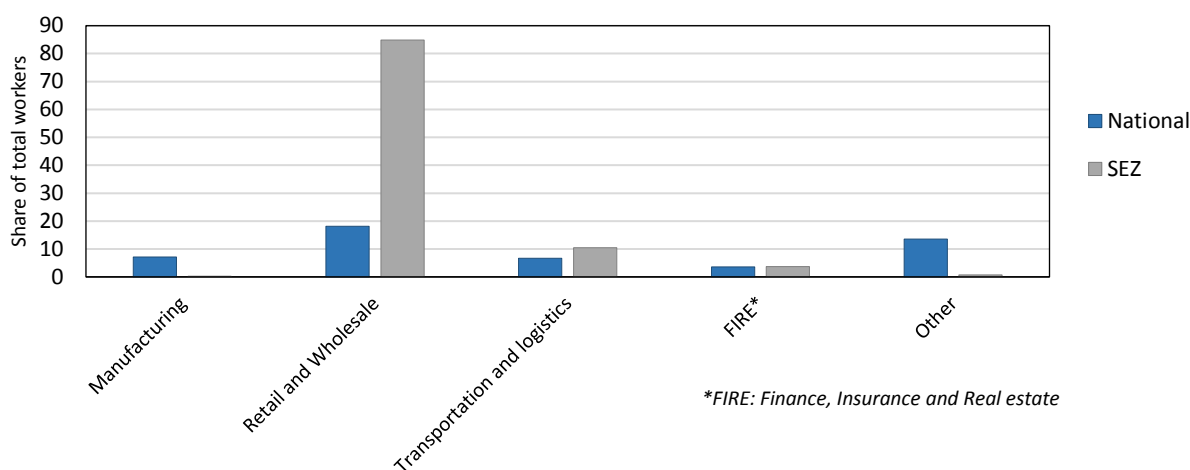


Source: Own calculations based on Population Census 2010

¹³ We use data from the 2010 Population Census to identify workers of CFZ and PP Special Economic Zones, based on industry classification and location. Panama uses the CIIU Rev4 with minor adaptations. Particularly, it identifies industries exclusively related to Free Zones activities.

In terms of industries, 80% of total employment within SEZ is concentrated in Wholesale and Retail, compared to a national average of 2%. In addition, the share of workers within the Transportation and Logistics sector in SEZ mirrors the national average. Conversely, sectors that require more complex skills and productive *know how*, such as manufacturing, are highly underrepresented within SEZ (**Figure X**). The overrepresentation of industries with low level of complexity (wholesale and retail) and the underrepresentation of those that require complex skills is significant. It suggests that if SEZ want to become key players in the process of upgrading and diversifying the Panamanian economy, they must shift gears toward activities demanding more complex skills. The relative high share of employment in Transportation and Logistics is a good signal, as this industry combines the natural competitive advantage of Panama due to the Canal and, at the same time, requires a set of infrastructure and related services that should help Panama board more complex industries in the future. The Panamanian government has already notice tis, as the 2015-2019 Strategic Government Plan identified Transportation and Logistics as the sector with higher potential to increase the productivity of the Panamanian economy.¹⁴

Figure X: Workers of SEZ vs total national, by industry



Source: Own calculations based on Population Census 2010

¹⁴<http://www.mef.gob.pa/es/Documents/PEG%20PLAN%20ESTRATEGICO%20DE%20GOBIERNO%202015-2019.pdf>

Table 2 characterizes the quality of jobs for firms within and outside the zones, for the province of Colon and Panama, respectively. First, firms within SEZ benefit from lower levels of informality, self-employment and defined term contracts. Second, there are enormous differences between CFZ and PP jobs in terms of type of occupations, both when compared between each other, and with other firms within the same provinces. In CFZ, one every three workers is non-qualified, lower than the is one every four observed elsewhere in the Colon province. Conversely, in PP the non-qualified occupations only account for 9% of total jobs, a share three times smaller than in ZLC and two times smaller than other firms in Panama. If we take a closer look at upper-end occupations, the share of managers and professionals within PP accounts for 30% of the total employment of the zone, 9 percentage points higher than other firms in Panama province and 16 percentage points higher than firms within CFZ.

Table 2: Quality of jobs in SEZ

	Outside SEZ	Within SEZ
Colon province		
Total Workers	74,648	16,356
Wage (US\$)	490	522
Defined term contract (%)	15.9	12.3
Informality (%)	12.8	4.1
Self-employment (%)	27.9	1.9
Managers/professionals (%)	12.2	12.8
Non-qualified workers (%)	23.0	31.8
Panama province		
Total Workers	744,576	4,889
Wage (US\$)	740	1,251
Defined term contract (%)	18.32	13.40
Informality (%)	8.66	2.87
Self-employment (%)	19.68	7.36
Managers/professionals (%)	19.96	28.53
Non-qualified workers (%)	18.93	8.63

Source: Population Census 2010

The divergence in type of occupations affects directly wages in CFZ that are, on average, more than two times smaller than in PP and only 7% higher than wages elsewhere in Colon. Panel A in **Table 3** shows wages in the Colon province for firms within and outside CFZ. It is remarkable that wages of occupations that require relative high skills - such as mid-level technicians, managers and professionals – are not higher within the CFZ relative to elsewhere in Colon (for mid-level technician and clerical they are significantly

lower).¹⁵ Therefore, the (positive) gap of wages between firms within ZFC and other Colon firms is mainly driven by a wage premium in service and sales and non-qualified workers (machine operators actually make less within the CFZ).

Likewise, Panel B in **Table 3** shows that wages within PP are, on average, US\$ 511 higher than wages outside the zone. This means that PP has a wage premium of 69% compared to other firms in the Panama province, and more than 2 times compared to CFZ firms. In this zone, all types occupations present significantly higher wages relative to other firms in Panama, with the exception of wages of machine operators, who do differ significantly from the rest of Panama.

Table 3: Wages within and outside SEZ (intra-provincial differences)

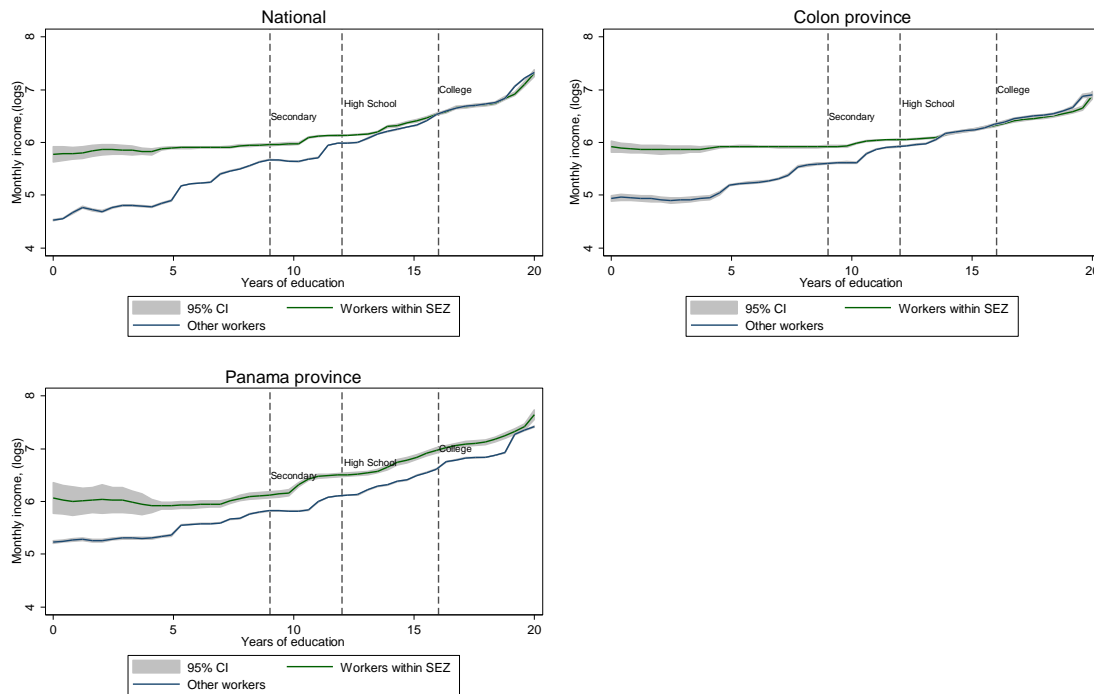
	Within SEZ (US\$)	Outside SEZ (US\$)	Difference	P-value
Panel A: Colon Free Zone	522.16	489.56	32.6	0.00
Managerial and professional	917.6	883.7	33.9	0.11
Mid-level and clerical	526.8	617.8	-91.0	0.00
Services and sales	548.3	389.4	158.9	0.00
Machine operators	443.5	612.1	-168.6	0.00
Non-qualified, others	381.0	292.7	88.3	0.00
Panel B: Panama-Pacific	1,250.82	739.97	510.8	0.00
Managerial and professional	2,016.1	1,495.6	520.5	0.00
Mid-level and clerical	1,072.6	808.5	264.2	0.00
Services and sales	1,159.4	497.6	661.8	0.00
Machine operators	561.8	571.4	-9.5	0.86
Non-qualified, others	480.2	364.3	115.9	0.00

Note: All workers (self-employed and employed) considered. Total workers within SEZ are 21,733, with 16,356 working in Colon Free Zone and 4,889 in Panama-Pacific. Source: Population Census 2010

Figure XI depicts the level of wages by years of education for both, CFZ and PP workers. The same features reported above are observed: a wage premium in CFZ focused on low-skilled workers and a much higher wage premium in PP, which is spread more evenly across the educational distribution of workers. Both of these wage gaps suggest that something else than education must account for such a difference.

¹⁵ The wages of managerial and professional occupations within Colon Free Zone may be underestimated. We identify CFZ works as those who live within Colon province and declare to work with a Free Trade Zone. However, the share of managers and professionals that work in Colon but live in Panama province is larger compared to other type of occupations (**Figure A-2**)

Figure XI: Polynomial fit of income and years of education of SEZ workers



Source: own calculations based on Population Census 2010

Source: Panama Population Census 2010

Why wages in PP are significantly higher than wages outside the zone? Why this gap is not so big when we analyze CFZ? Can these differences be explained by workers' attributes (such as education or experience) or is due to specific features of SEZ that are driving firm's productivity? To estimate more precisely the drivers of the wage gap of workers within and outside these SEZ we use a twofold Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca 1973). In very simple terms, this decomposition allows to discern what share of the wage gap is explained by a certain set of characteristics of workers ("quantity effect") and how much is explained by things that are not measured ("the unexplained part"). We use years of schooling, work experience, gender, a dummy for college diploma and indigenous condition as worker's characteristics. We make this decomposition for each of the two analyzed SEZ (Colon Free Zone and Panama-Pacific), comparing the intra-province wage gap of workers in firms within the SEZ with workers in firms outside the SEZ. **Table 4** summarizes our findings.

Table 4: Oaxaca-Blinder decomposition

	Colon Free Zone (CFZ)			Panama-Pacific (PP)		
	overall	explained	unexplained	overall	explained	unexplained
Wage difference (logs)	-0.305*** (0.00554)			-0.510*** (0.0127)		
explained	-0.0512*** (0.00377)			-0.217*** (0.00736)		
unexplained	-0.254*** (0.00505)			-0.293*** (0.0105)		
schooling		-0.0947*** (0.00382)	0.692*** (0.0247)		-0.168*** (0.00622)	-0.272*** (0.0664)
experience		0.0360*** (0.00183)	0.0640*** (0.0122)		0.00415** (0.00211)	-0.157*** (0.0291)
college diploma		-0.00237*** (0.000400)	-0.0107*** (0.00399)		-0.0246*** (0.00150)	0.0818*** (0.0160)
female		0.00981*** (0.00154)	-0.0860*** (0.00413)		-0.0257*** (0.00224)	-0.0163** (0.00703)
indigenous		5.72e-05 (5.95e-05)	0.00351*** (0.000825)		-0.00268*** (0.000336)	-0.000620 (0.00108)
Constant			-0.916*** (0.0270)			0.0713 (0.0634)
Observations	85,334	85,334	85,334	710,061	710,061	710,061

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The unexplained part of intra-provincial wage gap in both zones is very similar, accounting for 0.25 log points in the case of CFZ (column 1) and 0.29 log points for PP (column 4). In other words, 83% of the wage gap between CFZ and the rest of Colon province cannot be explained by workers' characteristics; 56% in the case of PP. These results suggest that in both SEZ the lion's share of the wage gap cannot be explained by factors associated to workers, so there respond to firms' characteristics.

In conclusion, jobs created by SEZ in Panama represent a very small fraction of total employment in the country and are mostly generated by Colon Free Zone (CFZ). Likewise, the quality of jobs within these zones is higher than jobs generated outside them. Particularly, SEZ jobs show lower levels of informality, self-employment and defined-term contracts. However, the types of occupations differ significantly across SEZ. While the bulk of the 16,000 jobs generated by CFZ in 2010 belonged to dockhand, warehouse employees, security guards, clerks and other non-qualified occupations, the 4,000 jobs in PP were more business-oriented. This divergence has a direct effect on the wage gap of the zones against firms located outside them. While salaries in CFZ are only 7% higher than other Colon firms, in PP this gap skyrockets to

69% with respect to Panama City. When we analyze these wage gaps in terms of observable worker's characteristics, we find that in CFZ the bulk of the gap is explained by a wage premium of low-skilled occupations. To the contrary, the wage gap for Panama-Pacific is persistent across all levels of education. Overall, in both SEZ observable characteristics of workers account for less than 50% of the intra-provincial wage gap, leaving the bulk of the gap to *unobservable* features. In the next section we will try to shed some light on this *unobservable* by analyzing differences in productivity of firms in and outside the SEZ.

3.3 PRODUCTIVITY OF FIRMS

Are firms located in SEZ more productive than firms located outside their perimeter? In this section we delve in search of an answer using simple measures of productivity drawn from the 2012 Economic Census of firms. Our results reveal that firms within ZLC, on average, are more productive than other firms of Colon province, even after controlling for firm size and industry. Firms within PP also show higher productivity measures, but they are not statistically different from those of firms located in other parts of Panama province.¹⁶ These results are consonant with the findings of our Oaxaca-Blinder decomposition in the previous section, in which we found that most of the wage gap between workers within and outside SEZ is explained by unobservable characteristics of firms. So, why firms within SEZ are more productive than other firms? Agglomeration effects are usually the main explanation for productivity and welfare gains of these type of location-based policies (Ellison and Glaeser 1997; Greenstone et al., 2010; Kline and Moretti, 2013). These agglomeration forces may include large infrastructure developments, such as the Multimodal Logistics Center of CFZ, which integrates seaports, railroads and an airport. However, we cannot rule out the possibility of sorting, in which more productive firms tend to agglomerate in the same geographical region (Behrens and Robert-Nicoud, 2014).

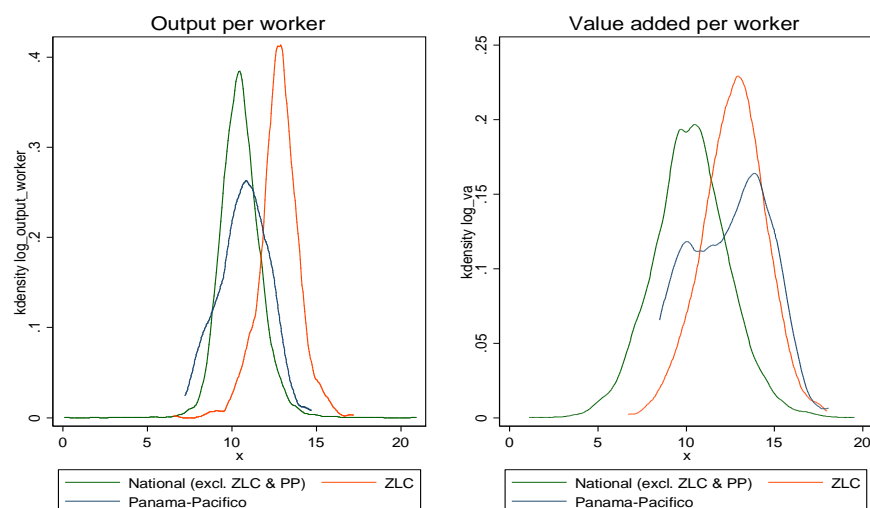
Figure XII shows the distribution of Panamanian firms in terms of two productivity measures: output per worker and value added per worker. According to the data, by 2012 there were 930 firms located in CFZ and 77 firms in PP,¹⁷ from a total national of 19,211 firms. Not surprisingly, firms in CFZ have higher output than those of PP and the rest of the country, as this is the largest import-export zone of the Americas. However, using value added we find that the distribution of PP firms shifts to the right relative to the

¹⁶ It is worth noting that the lack of statistical significance may be exclusively due to a problem of small sample size.

¹⁷ The 77 firms in PP were identified through geographic location on the firms on the Economic Census, and as such represents an approximation. At the time of writing, PP hosts 251 firms.

other two groups.¹⁸ A priori, in terms of value added per worker firms in both SEZ seem to be more productive than the rest of Panamanian firms. To draw more substantive conclusions though, we need to make intra-province comparisons and control for size of firms, as we are ultimately trying to find a control group that tells us what would have happen with these same firms in the province in the absence of a SEZ.

Figure XII: Distribution of Panamanian firm's productivity



Source: National Census of firms, 2012

Table 5 shows the results of several OLS regressions and matching estimates where the outcomes are the two aforementioned productivity measures and our variable of interest is a dummy that takes the value of one if the firm is located within a SEZ and zero otherwise.¹⁹ For Colon province we find that firms within CFZ are almost twice as productive as firms elsewhere in the province, in terms of output per worker (column 1) and 1.4 times in terms of value added per worker (column 4). Even if we control for firm size and openness to world trade, we still find that ZLC firms are 90% more productive than other Colon firms (columns 2 and 5). These results hold for matching estimates as well. These findings suggest that CFZ is generating a positive value added to the local economy of Colon. Not only have these firms represented a source of well-paid salaries to low-skilled workers (as shown in the previous section) but they also have made the local economy more productive. Although this conclusion may be at odds with the high

¹⁸ Value added is measured as total incomes minus total expenses divided by the total number of firm's workers.

¹⁹ For the matching estimates we use the nearest-neighbor matching approach. The number of matchings specified was one. Finally, we estimate the average treatment effect on the treated (TOT).

unemployment rate of Colon, it implies that unemployment in Colon would be much higher if the CFZ would not exist.

The regression coefficients for firms located within Panama-Pacific are also positive but lower in magnitude and significance relative to CFZ (columns 7 to 12 of **Table 5**). Firms in PP are 16% more productive than other firms in Panama in terms of output per worker (column 8) and 29% in terms of value added per worker (column 11). However, these results lack of statistical significance, which is probably driven by the small sample size. In the Economic Census of 2012, we were only able to identify 62 firms located in PP, which affects the statistical power of the test. In other words, we cannot rule out the possibility that firms within PP are indeed more productive than the other firms of Panama province.

Table 5: OLS and Matching estimates for firm's productivity in Colon Free Zone and Panama-Pacific

	Panel A: Colon Free Zone (CFZ)						Panel B: Panama-Pacific (PP)					
	Output per worker (logs)			Value Added per worker (logs)			Output per worker (logs)			Value Added per worker (logs)		
	OLS	OLS	Matching	OLS	OLS	Matching	OLS	OLS	Matching	OLS	OLS	Matching
Special Economic Zone	1.982***	0.878***	1.64***	1.390***	0.853***	1.209***	0.197	0.168	0.044	0.294*	0.290*	0.259
	(0.0720)	(0.204)	(0.104)	(0.0783)	(0.191)	(0.153)	(0.145)	(0.148)	(0.1376)	(0.172)	(0.171)	(0.1795)
Workers (logs)		0.0314			-0.0244			0.0584***			0.0415***	
		(0.0275)			(0.0388)			(0.0114)			(0.0110)	
% exports in sales		-0.0835			0.132			0.450***			0.326***	
		(0.219)			(0.246)			(0.0538)			(0.0601)	
% imports in expenses		1.513***			0.598***			0.952***			0.541***	
		(0.183)			(0.219)			(0.0582)			(0.0627)	
Constant	10.76***	10.69***		8.892***	8.908***		11.27***	10.79***		9.301***	9.000***	
	(0.0614)	(0.0670)		(0.0588)	(0.0781)		(0.0214)	(0.0368)		(0.0215)	(0.0358)	
Observations	1,091	1,091		751	751		4,959	4,959		4,429	4,429	
R-squared	0.400	0.472		0.253	0.269		0.208	0.294		0.061	0.109	
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: The sample for Panel A considers only firms within the Wholesale and Retail industries in Colon province, with 827 located within ZLC and 287 outside. The sample for Panel B only considers firms in Panama province for the following industries: Wholesale and Retail; Construction; Education; Hotels and Restaurants; Manufacturing; and Logistics and Transport. Specifically, 62 firms within PP and 5,000 outside this zone. Both Panels compare firms within SEZ with firms outside SEZ but in the same province. Matching estimates control for the covariates workers, % exports in sales and % of imports in expenses with an exact match in the industry cell.

4. DYNAMIC BENEFITS: THE CASE OF IMMIGRANTS KNOWLEDGE SPILLOVERS

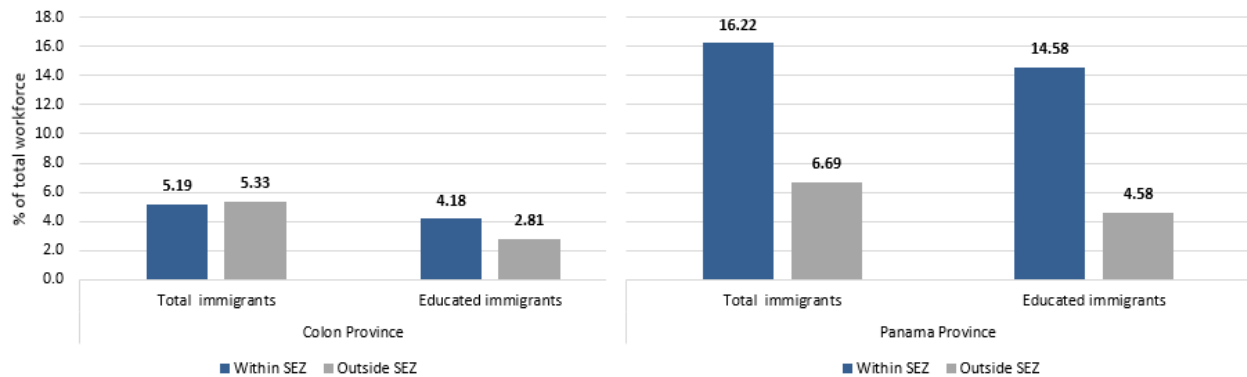
So far, the overall goals of Panama's SEZ in terms of static benefits have been successfully achieved. Today, PP, CFZ and CK host around 2,900 firms, which together employ around 40,000 workers. So far, we have showed that: (i) workers within the zones benefit from better paid and more stable jobs, (ii) wage premium is highly concentrated in low-skilled occupations mostly CFZ, and (iii) firms within PP and CFZ tend to be more productive than other firms located outside. However, while private returns to firms from installing in these SEZ may be positive, social returns may not. In other words, SEZ may be beneficial for firms but not for Panama. Hence, as we mentioned earlier, simple measures of investment and job creation are not enough. In this section we shift gears towards the measurement dynamic benefits of SEZ, as represented by knowledge and technological spillovers. In particular, we highlight the importance of SEZ in the attraction of immigrants, and how immigrants may transfer productive knowledge to the local economy.²⁰ Overall, we find strong evidence that supports the hypothesis that immigrants, and in particular those attracted by SEZ, are generating positive spillovers in the labor market, increasing the productivity of Panamanian workers. We find larger effects for educated workers and industries that require a higher level of productive know-how or complexity.

The successful effort of Panama in attracting foreign firms and workers has doubled the country's immigrant stock in the decade spanning between censuses (2000-2010). 70% of immigrants have settled in the province of Panama, a sign that the economic benefits are highly concentrated in the capital. This immigrant province-divergence is also salient in the SEZ. While only 5.2% of CFZ workforce is foreign born, PP triples this share up to 16.2% (**Figure XIII**). SEZ immigrants do not only differ across provinces, but also within provinces. Firms within CFZ employ more educated immigrants than other firms on Colon. However, both groups employ the same share of foreigners.²¹ In Panama province the differences are more striking. Firms within PP are twice as likely to employ any type of immigrants and almost three times more likely to hire educated immigrants.

²⁰ Not only the flexible migratory regime that SEZ offer has contributed to this massive migrant inflow, but also the enactment of the "Headquarters Law" in 2007 has played a major role. Designed to attract regional headquarters of large multinational companies (200 million in assets or more), the "Headquarters Law" offers similar tax benefits to those of SEZ for ten types of back-office activities. In addition, this law offers special permanent and temporary visas for foreign personnel at a management or executive level (expats), and to their dependents.

²¹ We define educated immigrants as immigrants who have at least a high-school diploma.

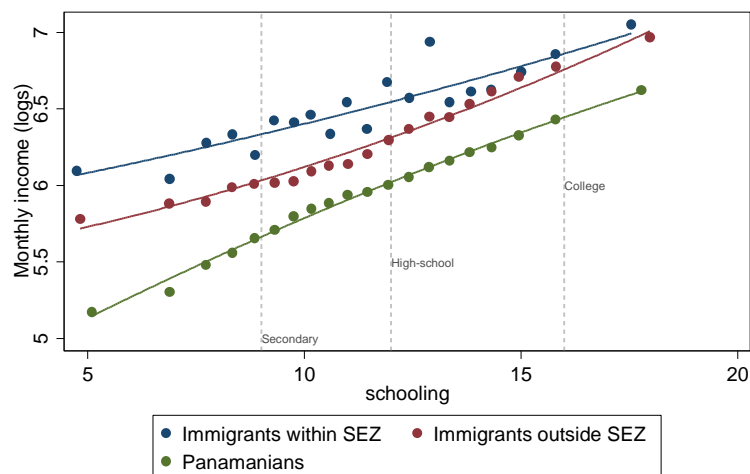
Figure XIII: Share of immigrants in SEZ



Source: 2010 Population Census

We compare the salaries of local workers with those of the immigrants. Once we control for education, work experience, gender, race, occupation and industry, a significant wage gap shows up in favor of the latter. Moreover, immigrants that work within SEZ have a much larger wage premium than immigrants outside SEZ (**Figure XIV**). These findings suggest that immigrants – especially those attracted to the SEZ – must have a set of unobservable characteristics that make them more productive. We also find that this wage gap is larger in industries that require more *know-how* such as manufacturing and in high-skilled managerial and professional occupations (**Figure A- 3** and **Figure A- 4**)

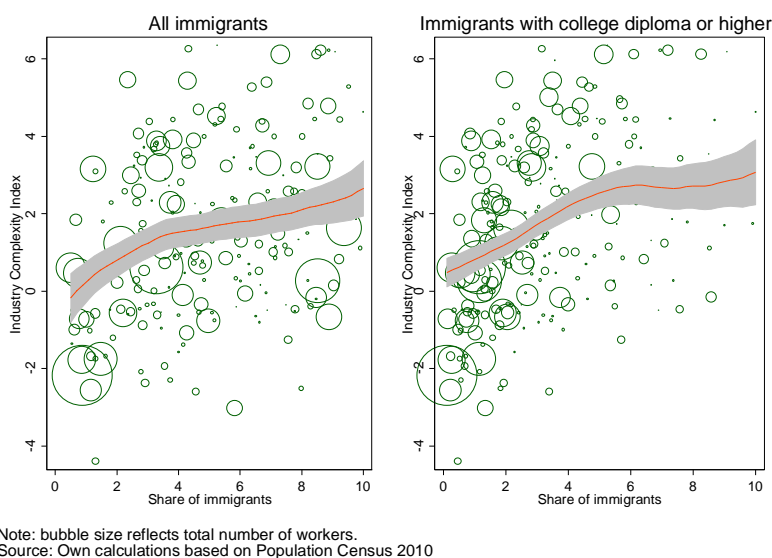
Figure XIV: Income of Immigrants vs Panamanians, by years of schooling



Relation of income and schooling controlling for experience, gender, race, occupation and industry. Lines represent quadratic fit after variables have been residualized.
Source: Population Census 2010

Not only immigrants earn more than Panamanians workers; they also work in industries that are more complex. Using complexity measures at the industry level we were able to identify which Panamanians industries require a more complex set of productive capacities (Hausmann et al., 2014) and rank them according to their average product complexity index (PCI). **Figure XV** depicts a positive and strong correlation between the share of immigrants and the complexity index of that industry, suggesting that most of the positions filled by immigrants require a particular set of complex and more advanced skills.

Figure XV: Relation between PCI and share of immigrants



Overall, all these findings reflect a shortage in the local supply of labor for specific knowledge-intensive occupations, a transversal complain among managers of all firms interviewed over the course of this investigation. Immigrants are filling these positions and receiving a wage premium for it. According to data from the 2010 Population census, 13% of management occupations are filled by immigrants and ten types of engineer carriers have a share of 14% or higher of immigrants (**Figure A- 5** and **Figure A- 6**).

Are immigrants – whether attracted by Special Economic Zones or other policy tools such as the “Headquarters Law” – generating positive spillovers in the local economy? Our hypothesis is that immigrants bring with them a set of particular skills that local workers usually lack, and these skills may diffuse over the local economy, both in terms of productivity gains or creation of new firms. Insofar, there are only a few attempts to measure this type of spillovers and results have been mainly positive (Poole 2013, Combes et al., 2015; Kerr and Kerr, 2016; Bahar and Rapoport, 2016).

The best way to measure immigrant's spillovers is to look at the job trajectory of immigrants in the host country, in order to analyze the type of industries and firms they moved into, the performance of their peers, and whether they are more likely to become entrepreneurs than local workers, among others. The most suited data to run this analysis is data from the Social Security Administrator that tracks all the employment spells of workers. However, as mentioned previously, during this project the Panamanian authorities in custody of this data (*Caja de Seguro Social de Panamá*) were highly reticent to grant us access. Hence, we were only able to run our analysis with data from the Population Census of 2010.

If immigrants bring a set of skills and those skills are diffused over local workers, the productivity of local workers should increase, thereby increasing their salaries. We formally test these immigrant-to-native spillovers using econometric tools in search for a causal relationship between the share of immigrants and the productivity of Panamanian workers. In particular, we study the wages of Panamanian workers (proxy for their productivity) as function of the share of immigrants for the specific province and industry in which they work. If our hypothesis is correct, we should find a positive and significant correlation between these two variables. However, significant and positive correlations of native workers' salaries with the share of immigrants (OLS models) do not necessarily point out to a casual relation, as immigrants may just be choosing industries and provinces where salaries are already high. In an effort to mitigate potential endogeneity, we use the enactment of the "Headquarters Law" in 2007 as an instrumental variable (IV) for the share of immigrants, as this law contains a set of migratory and tax incentives for multinational companies to install regional headquarters in Panama.

All of the OLS and IV results support the hypothesis that immigrants are increasing local worker's productivity. In each of the nine models presented in **Table 6**, the coefficient for the share of immigrants is positive and significant. Furthermore, as the immigrant's educational level increases, the spillovers to native workers are higher. According to the specification of our IV model in Column 4, an increase of one percentage point in the share of immigrants has an impact of 2.5% in the salaries of local workers.²²

²² As the IV estimator is Local Average Treatment Effect (LATE), estimates are related only to those individuals affected by the instrument. In this case, as the "Headquarters Law" instrument tends to attract high-skill immigrants in managerial and professional occupations, estimates are larger than OLS, as these workers may produce larger spillovers. IV estimates can also be higher than OLS due to the elimination of measurement error (attenuation bias), so in small samples should differ significantly from the target parameter (Angrist and Pischke, 2009).

Table 6: OLS and IV results for immigrant spillovers in Panama

Spillovers of immigrants by industry-province. Dependent variable: $\ln(\text{income})$ of native workers

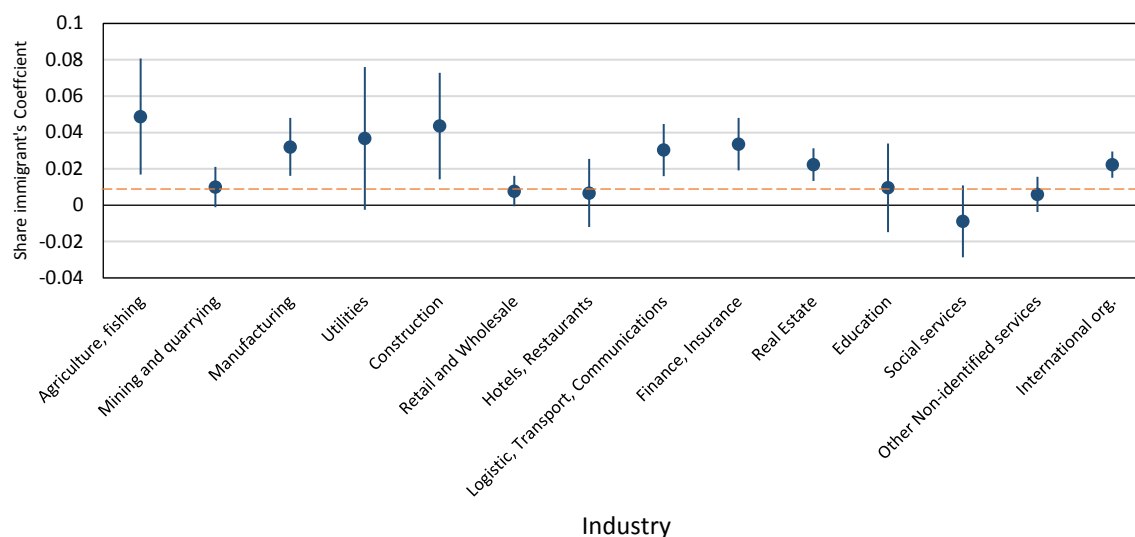
	All immigrants			Workers with high school diploma or less			Workers with at least college diploma		
	OLS	OLS	IV	OLS	OLS	IV	OLS	OLS	IV
share_immigrant	0.0138*** (0.00287)	0.0149*** (0.00294)	0.0255*** (0.00358)	0.0245*** (0.00261)	0.0261*** (0.00254)	0.0393*** (0.00241)	0.0384*** (0.00483)	0.0346*** (0.00343)	0.0232*** (0.00293)
Observations	1,036,183	1,036,183		544,801	544,801		272,407	272,407	
R-squared	0.481	0.498		0.344	0.371		0.316	0.360	
Occupation FE	YES	YES	YES	YES	YES	YES	YES	YES	
Industry FE	NO	1-digit	1-digit	NO	1-digit	1-digit	NO	1-digit	1-digit
Cluster	Ind-Prov	Ind-Prov	Robust	Ind-Prov	Ind-Prov	Robust	Ind-Prov	Ind-Prov	Robust
F-stat First Stage			2,209.2			4,197.2			3,501.3

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

All models control for schooling, work experience, gender, race and dummy for living in an indigenous comarca. HH services and Public Administration industries do not included

If we disentangle the impacts of the share of immigrants in local worker's productivity by industry, the larger effects are found Agriculture, Manufacturing, Construction, Logistics and Transport, and Finance (Figure XVI).²³

Figure XVI: Heterogeneous effects of immigrants' spillovers, by industry



Source: Own calculations based on Population Census 2010

Finally, we also find that immigrants are more likely than Panamanian to become entrepreneurs, another sign of potential spillovers (Figure A- 7). Entrepreneurs hire workers, invest in capital and technology and, overall, contribute to the economy of a country in various ways. Specifically, after controlling for several covariates, the probability of becoming an entrepreneur increases in 4.8 percentage points when a worker is immigrant. With a national average of 1.3% of entrepreneurs among workers, the share of entrepreneurs among immigrants is more than 6 times higher than among local workers.

Our findings suggest that there are positive and significant spillovers from immigrants to local workers and these spillovers tend to be higher among most educated workers and in industries with higher complexity. As shown above, SEZ had played a catalyst role in this transmission by promoting the

²³ The large impact observed in agriculture is most likely a consequence of the contrast between low-productivity or subsistence agriculture employing a large share of Panamanians (17%), and a few multinational firms doing modern agriculture using top notch technology.

attraction of foreign brains into Panama. Here, PP stands out as a landmark example generating a large inflow of educated migrants that contrast with the average of firms elsewhere in Panama.

In conclusion, Panamanian SEZ are functioning as cranes that are not only moving brains geographically, but are acting as international transmitters of know-how. The Panamanian economy and its workers are the ultimate beneficiaries of this process. The enhanced stock of knowledge and skills is a significant asset for Panama, as tacit knowledge brought by expats can even expand and diversify the basket of product and services that Panama exports (Bahar and Rapoport, 2016).

Our findings become more relevant as we ran, within the course of our investigation, into a set of legal bottlenecks hindering the free flow of immigrants out of the SEZ. First, visas granted by immigrants in CK are to be given for only one year, are expensive (US\$ 2,000-US\$ 3,000), and do not add up years to apply for a residency permit in Panama. Second, in both PP and CK, when immigrants end a contractual relationship with their employers, their visas are immediately revoked with no chance to transition to other jobs inside or outside the SEZ. Finally, spread throughout several laws and decrees, Panama has a list of 27 occupations that are “only for Panamanians”, i.e. restricted to foreign born workers.²⁴ Moreover, since April of 2015 the Immigration Office of Panama, by request of the Panamanian Society of Engineers and Architects, is not accepting immigrants with any type of engineering degree. All these bottlenecks are minimizing the potential positive spillovers derived from the knowledge and skills of immigrants. In the next section we summarize these constraints and propose policy guidelines to overcome them.

²⁴ There is a list of 27 occupations, stated by different laws, restricted to immigrants. Among these occupations are Nurses (Law 1 of 1954); Dentists (Law 22 of 1956); Agriculture Sciences (Law 22 of 1961); Architects (Law 15 of 1959); Doctors (Decree 196 of 1970); Economists (Law 7 of 1981); Lawyers (Law 9 of 1984); Chemists (Law 45 of 2001); Educators in the areas of history, geography and civic education; and all types of Engineers.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

Have the SEZ been a successful policy intervention in Panama? Looking at static benefits, such as investment and employment, the answer is affirmative. SEZ have successfully attracted foreign investment and human capital into Panama. They have provided stable, well-paid jobs for Panamanians. The evidence we have analyzed also indicates that firms within these zones tend to be relatively more productive, suggesting that SEZ benefit from agglomeration forces such as transport cost savings, common pool of high-skill workers, and shared infrastructure (Glaeser, 2010). And yet, there are still a series of constraints that are preventing SEZ from truly disseminating structural transformation. Restrictions to foreign workers in terms of hindrance of free flow across firms, hefty fees for visa renewals, restricted occupations, or inability to accumulate years for permanent residence, must be addressed by the authorities if they ultimately want to leverage on SEZ to foster development throughout the country.

Colon Free Zone stands out as one of the pillars of the Panamanian economy, representing around 4% of total GDP. More importantly, it represents an invaluable source of stable and well-paid jobs for low skill workers in a province with one of the weakest labor market of the country. However, the current lethargic performance of the zone calls for a more profound policy response.²⁵ First, the fixed scheme of fees collection from government should be revised and modified for a profit-sharing model with upper and lower limits. Second, tax benefits should be enhanced to resemble more advantageous schemes such as the ones offered by Panama-Pacific. Firms in CFZ should also benefit from the Investment Stability Law (Law 54 of 1998). Third, the zone lacks migratory benefits, which is thwarting its ability to attract foreign high-skilled workers. The creation of Colon visas under a regulation similar to PP or “Headquarters Law” may help attracting skilled immigrants. Finally, the authorities should evaluate the implementation of mechanisms to attract more FDI targeted in Transportation and Logistics, as this sector should be one of the spearheads of the future growth of Panama (Hausmann, Morales, and Santos, 2016).

Panama-Pacifico has already in place an attractive set of tax, labor and migratory benefits. So far, the large number of firms installed in the former Howard base (around 250) insinuates these benefits have been successful in terms of generating private returns. However, the government of Panama should take a

²⁵ In 2016, Congress enacted a reform bill to reactive Colon Free Zone economy. However, there is a broad consensus that this reform is enough to recover the competitiveness of CFZ. The reform bill establishes that Panamanians can make purchases up to \$2,000 per year without paying sales taxes, with no limits for tourists. It also adds fiscal benefits for infrastructure investments.

closer look at the activities generated by these firms and assess whether they are enabling the level of skills and know-how of the local economy. First, the exemption of taxes for firms that want to sell high-tech manufactures or multimodal and logistic services in Panamanian territory is in the right track. Authorities should evaluate expanding this instrument to more industries with the capacity of adding more complex capabilities to the economy.²⁶ More broadly, authorities should evaluate if the 12 pre-established sectors defined by the World Bank ten years ago are still relevant to the growth strategy of the country. Second, large investments in infrastructure related to business services – in particular the one-stop building and the onsite customs office – represent a significant source of efficiency for firms within Panama-Pacific. The fact that these benefits are highly valued by firms inside PP, and a source of complain on the economy outside it (Hausmann, Espinoza, and Santos, 2016), seems to be pointing out to red tape is a significant binding constraint in Panama and deserves further attention. Finally, the set of migratory benefits of PP should be revised: (i) the time length of worker VISAS (3 years) should be matched with the one of investors VISAS (5 years), (ii) if an immigrant ends a contractual relation with a firm in PP, her visa should not be immediately revoked, but allow her a time timespan to look for other jobs, (iii) time accrued within a PP special visa could be counted and accumulated for residency purposes, and (iv) we find no compelling reasons not to grant the same visa benefits to firms that have less than 10 employees.

City of Knowledge has been successful in attracting innovative and high-tech firms and position itself as the main technology hub in Panama. However, the zone has a collection of frictions that are deterring technology and knowledge spillovers to the local economy, making CK an isolated enclave rather than a driver of innovation and technology for the rest of Panama. We can categorize these frictions in two broad groups: productive activities and labor flows.

Firms within CK are focusing their activities towards research and development. Moving on to commercialization and sales of these products is not encouraged, and there is a limbo for a foreign firm that stops innovating and wants to move out of the CK to carry commercial operations. This is inhibiting firms' capacity to generate positive returns from their activities, ultimately hindering their ability to aggregate new, more complex products to the economy. Furthermore, we found little evidence of functional synergies among firms within CK, a fact that thwarts the ability of cross-fertilization across firms

²⁶ This mechanism -stated in article 60 of Law 41 of 2004- should help PP firms to move towards the production of more complex goods, which will ultimately help fostering a productive transformation of the local economy. Companies such as 3M, Vans or Flavor Infusion had taken advantage of this benefit, moving from business services activities to manufacture.

and their ability to learn from each other in terms of productive processes or product commercialization.²⁷ The admission process of firms can also be improved. The administration of CK has a screening process that is paperwork intensive, based on old-fashioned business plans rather than asking for prototypes or patents. In this regard, the lack of metrics such as patents creation or productivity gains of firms should be addressed with urgency. Finally, professional careers imparted by the on-site college campus of Florida State University (FSU) are misaligned with the human capital needs of firms within the zone.

In terms of labor flows, the visa system for foreign workers in CK do not respond to a logic of maximizing the expats' knowledge. First, the legislation establishes that workers' visas are to be given only for one year. That creates an acute problem for small technology firms, where the innovation processes usually require longer to succeed. Second, there is a financial cost of \$2,000-\$3,000 to renew these visas, mostly related to legal services, which imposes a significant financial burden to small and medium firms. At last, CK visas do not allow immigrants to accumulate years of residency, nor are dependents allowed to have special visas. Ideally, CK should transition to a more flexible, modern visa scheme, similar to the one of Panama-Pacific.

A common problem across the administrations of these three SEZ is a lack of firm-level data to measure performance. For example, knowledge and innovation diffusion is at the core of City of Knowledge mission, however the administrators do not record data related to patents generation or even on research and development expenditures of firms. Likewise, although the law that created Panama-Pacific establishes that the main goal of this area is to increase the competitiveness of the economy, Panama-Pacific Agency does not register systematic data neither of firm's productivity nor workers' performance. If the government of Panama wants to situate its SEZ at the center of its development strategy, more efforts need to be done in terms of evaluating desired outcomes, so that policy corrections can be introduced timely.

Hosting around 3,500 firms and generating more than 30,000 jobs, the three Special Economic Zones analyzed in this paper have been relevant actors in Panama's story of success. So far, these place-based policies have been effective in attracting both local and foreign firms. However, what the government should ultimately care about are social, not private returns. Therefore, it should take a closer look at the

²⁷ There have been some attempts but of small scale and short duration. The example of CAPATEC –a consortium of computer services companies– points in the right direction.

type of products and activities generated by firms within these zones and particularly, to the formal links between these firms and the rest of the economy. In this paper we devoted special attention to a particular link; i.e. the spillovers generated by high-skill immigrants attracted by these zones. If the government of Panama wants to uplift the role of SEZ in the development strategy of the country for the coming years, several constraints and frictions need to be released in this front.

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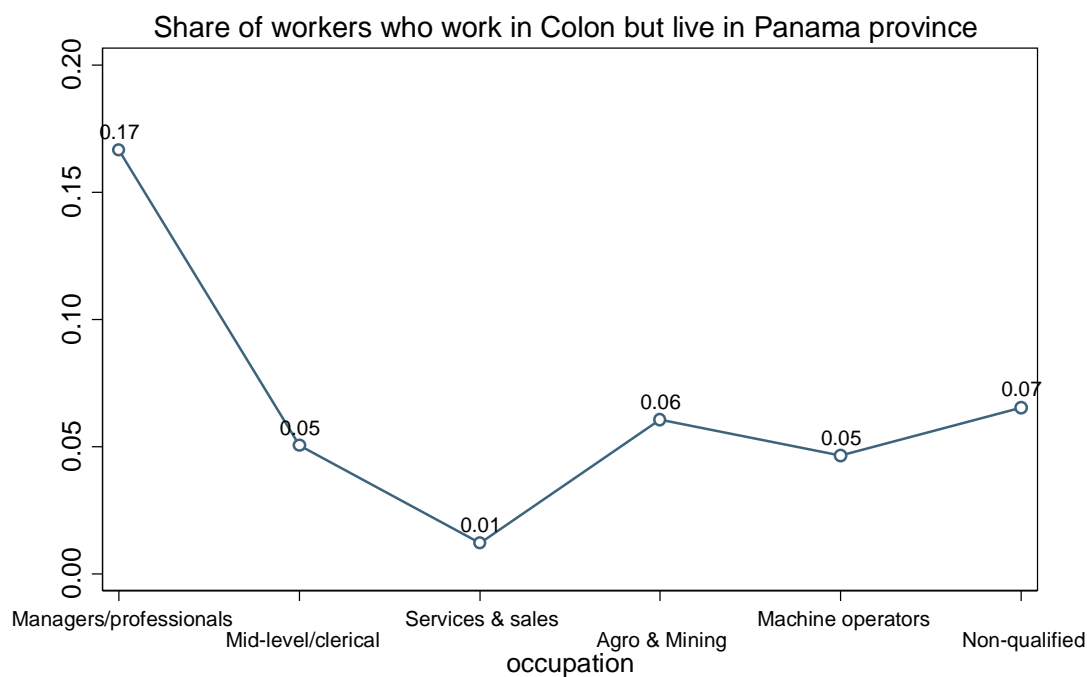
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Figure A- 1: Ten largest FDI projects in Panama

company	year	capex	jobs	subsector
First Quantum Minerals	2014	6400	3000	Copper, nickel, lead, & zinc min
SkyPower	2015	1000	179	Solar electric power
Wind 7	2008	700	125	Wind electric power
London & Regional Properties	2007	700	3000	Real estate services
Qatar Petrochemical Company (QAP)	2007	653.1	146	Petroleum refineries
Du-Temp	2007	653.1	146	Petroleum refineries
Union Eolica Espanola	2013	440	79	Wind electric power
InterEnergy Holdings	2014	427	76	Wind electric power
Wind 7	2008	400	72	Wind electric power
Trump	2009	400	2835	Accommodation

Source: FDI Markets database, Financial Times

Figure A- 2



Source: Labor Market Survey, August 2015

Figure A- 3: Immigrants wage gap, by industry

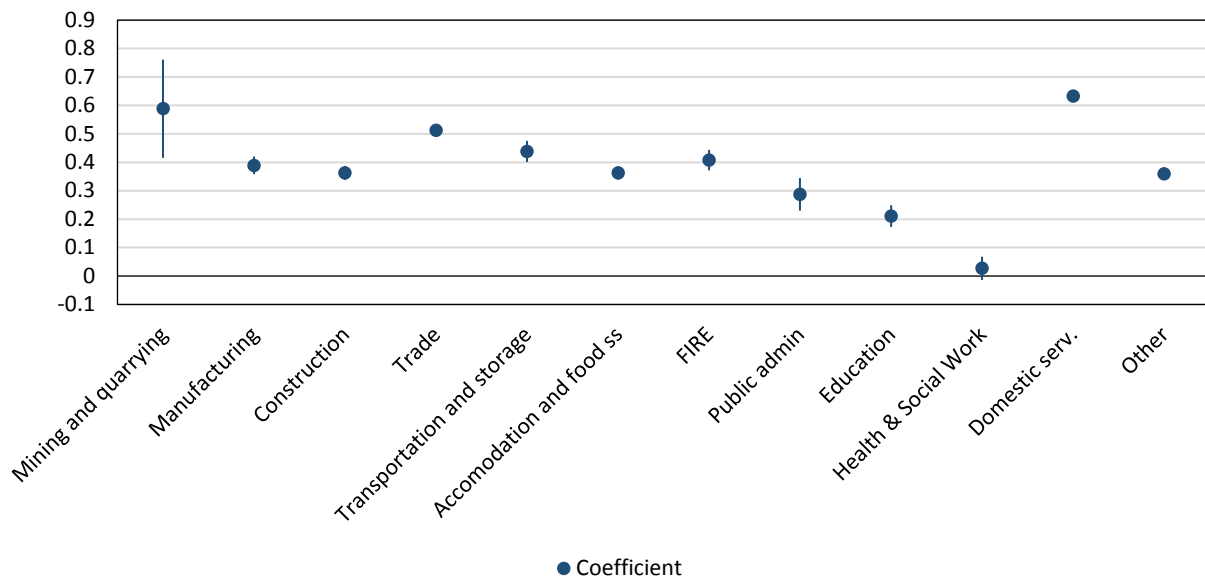


Figure A- 4: Immigrants wage gap, by occupation

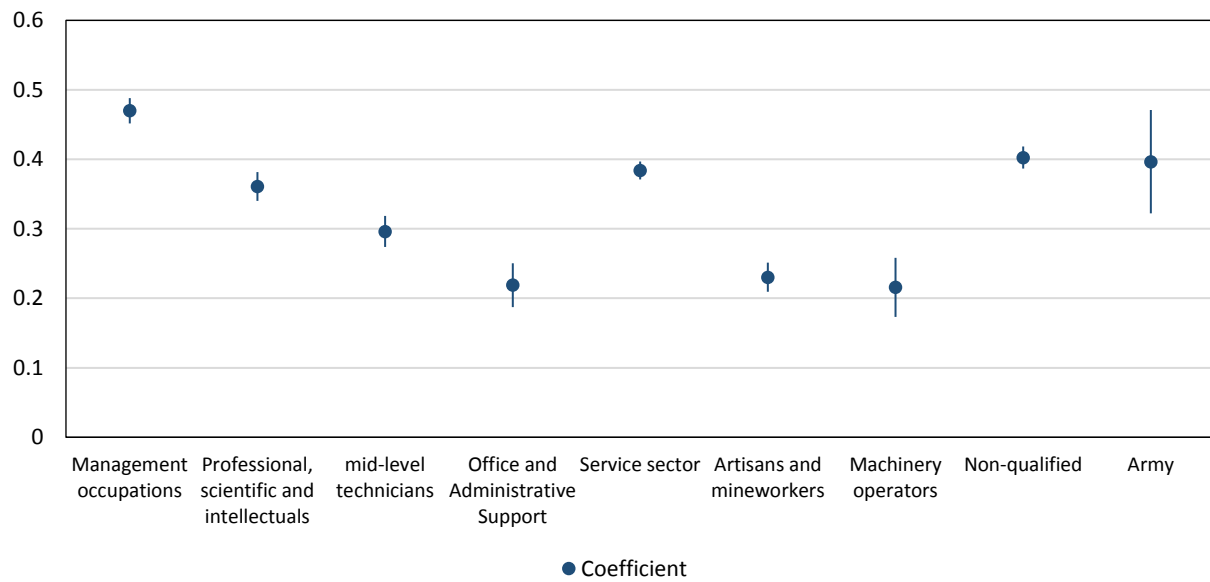


Figure A- 5: Managerial occupations (4-digits level) with highest share of immigrants

occup_name	tot_workers	share_immigrant
Gerente de empresa de producción de muebles	25	64%
Director regional o provincial de empresa	27	63%
Gerente de empresa de producción de cemento	17	59%
Gerente general de empresa de cuidados personales	7	57%
Gerente de empresa de productos de metal	15	53%
Director general de empresa de transporte	17	53%
Director de empresa de telecomunicaciones	29	52%
Director de empresa de comercio exterior (importación y/o exportación)	33	52%
Presidente de empresa	201	46%
Gerente general de comercio mayorista o minorista	203	45%
Gerente de empresa de comercio exterior (importación y/o exportación)	284	45%
Director de empresa constructora	82	44%
Gerente de comercio mayorista o minorista	862	31%
Gerente de hotel	341	30%
Gerente regional o provincial de empresa	252	28%
Gerente de centro comercial	178	28%
Gerente de empresa de telecomunicaciones	234	27%
Gerente de empresa constructora	645	26%

Source: Population Census 2010

Figure A- 6: Professional occupations (4-digits level) with highest share of immigrants

occup_name	tot_workers	share_immigrant
Ingeniero de minas	19	47%
Asesor de inversiones	186	39%
Ingeniero en imprenta	11	36%
Geólogo	57	35%
Diseñador de prendas de vestir (excepto calzado)	106	28%
Ingeniero químico	55	27%
Consultor legal	89	27%
Ingeniero civil en construcción de carreteras y calles	49	27%
Ingeniero civil en dragado	19	26%
Consultor de negocios	685	26%
Ingeniero mecánico	265	24%
Consultor de sistemas informáticos	381	22%
Ingeniero hidráulico	38	21%
Asesor administrativo	305	20%
Ingeniero mecánico en aeronáutica	61	20%
Ingeniero en telecomunicaciones	383	15%
Ingeniero civil	2632	14%

Source: Population Census 2010

Figure A- 7: Probability of immigrants of becoming entrepreneur

Dependent variable is dummy for <i>patron</i>												
All immigrants					High school diploma or higher				College diploma or higher			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
immigrant	0.0570*** (0.00106)	0.0504*** (0.00103)	0.0468*** (0.00102)	0.0476*** (0.00102)	0.0459*** (0.00119)	0.0384*** (0.00117)	0.0357*** (0.00117)	0.0364*** (0.00118)	0.0366*** (0.00146)	0.0278*** (0.00145)	0.0259*** (0.00145)	0.0264*** (0.00145)
Observations	1,164,601	1,164,601	1,164,599	1,164,599	1,164,601	1,164,601	1,164,599	1,164,599	1,164,601	1,164,601	1,164,599	1,164,599
R-squared	0.016	0.026	0.037	0.038	0.009	0.021	0.033	0.034	0.006	0.018	0.030	0.032
Occupation FE	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	4-digits	4-digits	NO	NO	4-digits	4-digits	NO	NO	4-digits	4-digits
Province FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

All models control for schooling, work experience, gender and race. HH services and Public Administration industries do not included.

Executive Summary

Over the last decade, Panama has experienced remarkable economic progress, doubling its income per capita. Panama has excelled in nurturing a competitive service sector in all activities surrounding the Canal, such as logistics, transportation, financial services, communications and trade. In parallel, the Panamanian government has also actively promoted place-based policies to attract foreign firms and spur innovation, through the creation of an array of Special Economic Zones (SEZ). The aim of this paper is to evaluate the economic performance of the most important SEZ in Panama: Colon Free Zone, Panama-Pacific and City of Knowledge.

Colon Free Zone (CFZ) was created in 1948 as an import/re-export zone and today is the second largest SEZ of the world. CFZ is located in the Atlantic entrance of the Canal, employs 30,000 workers and its net exports account for 4% of the GDP. The main economic activity of firms within this zone is retail and wholesale, followed by logistic and transport services. Panama-Pacific (PP), which started operating in 2007, was created as an industrial and residential park with a battery of tax and migratory incentives for firms. Nowadays the zone hosts more than a hundred firms, 40% of them foreign. Worldwide known companies such as 3M, Dell or Caterpillar have already move part of their regional operations to PP. Finally, in a former military base nearby the Canal, City of Knowledge (CK) emerges as a technology park, hosting a set of medium/small size technology firms, the UNDP regional headquarters, and a college campus.

These three zones diverge in their nature and goals, so they should be assessed on their own merits. However, there are common features – such as employment or foreign investment – that can be analyzed in a comparative way. In this paper, we take a twofold approach to measure the benefits derived from SEZ. First, we assess static benefits, namely foreign direct investment (FDI) and employment levels. We also run an econometric exercise to measure the productivity differences between firms within and outside these Zones. But this is a very partial way to appraise SEZ, only taking into account the statistics of what occurs *within* the zone. For a more comprehensive approach, we should also incorporate the impacts of SEZ beyond their boundaries. According to this approach, SEZ can be deemed as successful only if they encourage technology spillovers or knowledge diffusion that enable the local economy to acquire new productive capabilities (Hausmann et al., 2014). Hence, we push forward our analysis to gauge if SEZ are fostering structural transformation within the Panamanian economy by assessing their capacity to attract high-

skilled immigrants with new productive capabilities and to generate positive spillovers over local workers.

In terms of FID attraction, Panama outperforms almost all Latin American countries, yet the role of SEZ in this success story is relatively modest. While foreign capitals have been flowing to the country in an upward trend, the share of total FDI accounted for the SEZ is small, and has decreased steadily since 2007. Moreover, only one out of the 10 largest FDI projects in Panama in the last 12 years is related to a SEZ. Hence, although SEZ have indeed attracted foreign firms – especially PP – they have not been the main driving force behind FDI flowing into Panama.

Although they correspond to only a small fraction of total employment, SEZ represent a source of stable and well-paid jobs to workers. SEZ jobs show lower levels of informality, self-employment and defined-term contracts. Salaries are also higher within SEZ, with PP standing out as the zone with the largest wage premium. In addition, we find that the bulk of the wage gap is explained, not by worker characteristics, but rather for an unobservable component, probably related to firms' productivity. A thorough econometric analysis – allowing to control for a set of firm-level characteristics – confirms the hypothesis that firms within SEZ in Panama are indeed relatively more productive.

At last, we evaluate the knowledge spillovers derived from immigrants. We find that immigrants in Panama are more educated, are more likely to be entrepreneurs, work in industries that are more complex and earn more than natives. We formally test immigrants-to-native spillovers using econometric tools in search for a causal relationship between the share of immigrants and the productivity of Panamanian workers in a particular industry-province space. Our results suggest that there are positive spillovers from immigrants, that tend to increase with the skill level of workers. In this regard, Panamanian SEZ are functioning as cranes that are not only moving brains geographically, but are also acting as international transmitters of know-how, which is ultimately benefiting Panama and its workers. As such, it represents an enormous asset for Panama, as tacit knowledge brought by expats can even expand and diversify Panama's export basket of goods and services (Bahar and Rapoport, 2016). For that to happen, beyond attracting and nurturing foreign firms that import know-how that is not to be found domestically, Panama needs to formulate policies aimed at maximizing spillovers, easing the flow of productive knowledge in and out of the SZE towards the rest of the economy.

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1. Introduction: Basic principles of Special Economic Zones

Special Economic Zones, Free Trade Zones or Export Processing Zones are all terms used interchangeably to identify specific geographic areas in which firms benefit from a business-friendly environment, most often providing some form of tax and labor incentives (Farole, 2011). In this paper, we will refer indistinctly to these zones as Special Economic Zones, yet we need first to establish some distinctions between them, as the nature of their activities differs in significant ways. First, Free Trade Zones or Export Processing Zones are usually referred to places exclusively focused in the import and re-export of tradable goods. Usually these places take the form of entry ports or industrial parks close to borders, aimed at connecting the local economy to world trade. Second, large-scale Special Economic Zones, which started to grow in 1980, combine residential, commercial and industry activities. At last, Science and Technology parks have served as clusters of innovation and technology, which can ultimate upgrade the industrial capacities of the host country (Rodriguez-Pose and Hardy, 2014).

Special Economic Zones (SEZ) are not new, neither in the developing nor in the developed world, and they can be traced back to the XVI and XVII centuries in Gibraltar and Singapore (FIAS, 2008). Nevertheless, the main promotor of SEZ in the post WWII neo-liberal era has been China. Since 1979, more than 2,700 SEZ have been created in China, mainly on its coastal cities, ranging from free trade areas to technological parks (Stigler, 2014). Other countries in South East Asia, such as Malaysia, South Korea, Sri Lanka and the Philippines, have also adopted SEZ as part of their economic policy toolkit.

In the Americas, Panama has been a pioneer in the creation of SEZ. In 1948, it established the Colon Free Zone (CFZ), an exclusive import/re-export area, as a response to the economic decline of the city of Colon after WWII. Today CFZ is the second largest SEZ in the world (only surpassed by Honk-Kong), specializing in the import and re-export of tradable goods throughout the Americas. Later in the 2000s, when the United States handed over the Canal to Panama, they left behind a group of military and civilian areas that today serve as geographic location of two more SEZ; City of Knowledge (CK) and Panama-Pacific (PP). CK, which started operating in the year 2000, is a 120-hectares science and technology park, aimed at building an international platform of knowledge creation and diffusion. It is mainly comprised by technology firms, international organizations, and academic and research institutions. PP, on the other hand, is a landmark example of a large-scale SEZ that combines residential, commercial and industrial activities. It started

operating in 2007 in Howard – a former US military airbase – and today spreads throughout 2,005 hectares.

From the description above, it is evident that the nature of the three Panamanian SEZ analyzed in this paper are quite different. While CFZ is a purely import/re-export zone, PP emerges as a classical example of modern and large-scale multipurpose zone, whilst CK has all the features of an innovation and technology park. All in all, these three zones combined host around 2,000 firms, which employ more than 43,000 workers (2.4% of total employment in Panama). **Table 1** summarizes the tax, labor and migratory benefits for each of the three SEZ analyzed in this study.

One salient feature of SEZ around the world is the upward trend of privately owned and operated zones. While in the 1980s less than 25% of zones worldwide were private, by 2008 this share was 62% (FIAS, 2008). Administration of SEZ under a public-private partnerships (PPP) scheme have also become increasingly popular. SEZ in Panama have followed the same trend, with two SEZ administrated under a PPP scheme (Panama-Pacific and City of Knowledge), and only one (Colon Free Zone) under the administration of the government.

While the specific role of a SEZ may vary from one to another, they are all intended to serve a common purpose: to attract foreign and/or local investment to bolster economic growth over time. Insofar, the literature has identified four main objectives for SEZ (Engman et al., 2007; FIAS, 2008; Farole, 2011):

1. Attract foreign direct investment (FDI).
2. Laboratory for experimentation to achieve a policy objective and then scale it.
3. Catalysts of structural transformations and ultimately diversify the local economy.
4. Regional pressure valves to increase employment in disadvantaged areas.

Overall, benefits of SEZ are categorized in two broad groups: static and what we will call here dynamic benefits. Static benefits are flows that occur within a specific timeframe and are relatively easy to measure. Foreign direct investment, employment, and government revenues are all static benefits. Dynamic benefits are typically technology and knowledge spillovers derived from the existence of the SEZs, which take more time in materializing and therefore are not circumscribed to a specific year, but rather have effects that manifest in time. While the literature is plagued with studies that assess the static benefits of SEZ (Warr 1989; Chen 1993; Jayanthakumaran 2003;

Mongé-Gonzalez et al., 2005), to our knowledge there are no studies focusing on measuring dynamic benefits.

Most of the criticism to SEZ focus on their operation as enclaves within the local economy, where incentives are exclusively targeted to the flows of firms within the zone and foreign firms (e.g. import/export tax incentives). Hence, SEZ are often categorized as economically sub-optimal policies since they benefit the few and distort resource allocation (Engman et al., 2007). Panama SEZs are not immune to this criticism. For example, while Colon Free Zone (CFZ) employs around 23,000 workers (21% of the province total employment), the unemployment rate of Colon province is still the higher of the country, reaching an 8.8% in July of 2016.¹ Therefore, to determine if SEZ are a successful policy tool, it is not enough to measure static benefits, as firm-level investment and employment decisions are not fully informative of the total benefits that the Panamanian economy is reaping from its SEZ. Instead, **we take a novel approach by looking at SEZ linkages generated with the local economy.** In particular, SEZ can be deemed as successful policy tools only if they encourage technology spillovers or knowledge diffusion that enable the local economy to acquire new productive capabilities (Hausmann et al., 2014). Under this lens, SEZ are only worthy to the Panamanian government if they act as stepping stones to national strategies of productivity upgrading, industrialization and/or export diversification. It is there, in the most dynamic aspects of SEZ and their interaction with the rest of the economy, where the true potential for igniting a structural transformation lies, and there is where we focus our efforts.

The paper is organized as follows. Section 2 describes the characteristics of the three SEZ analyzed in this study: Colon Free Zone, Panama-Pacific and City of Knowledge. Section 3 lays down an assessment of the static benefits of these zones in terms of foreign direct investment (FDI), job creation, and firms' productivity. In Section 4 we delve into the evaluation of dynamic benefits of SEZ, looking at a specific transmission channel: knowledge spillovers of immigrants attracted by SEZ. Section 5 concludes and outlines a set of policy recommendations to maximize the productive and knowledge spillover that emanate from Special Economic Zones.

¹ Source: INEC, Panama.

Table 1: Benefits of Special Economic Zones (SEZ) in Panama

	Colon Free Zone	Panama-Pacific†	City of Knowledge††
Tax and Fee Incentives			
Exemption of income tax	YES	YES	NO
Exemption of dividend tax	NO	YES	NO
Exemption of Import taxes	YES	YES	YES
Exemption of Export taxes	YES	YES	NO
Exemption of Sales taxes	YES	YES	NO
Exemption of taxes to remittances or transfers abroad	NO	YES	YES
Exemption of taxes to Transfer of Movable Property and the Rendering of Services (ITBMS)	NO	YES	YES
Exemption of commercial license, security and maintenance fees	NO	YES	NO
Exemption of tax to patents	NO	YES	NO
Immigration incentives			
Special Visa for investors	NO	YES	NO
Special Visa for workers	NO	YES	YES
Special Visa for dependents	NO	YES	NO
Tax exemption for imports of domestic belongings up to US\$1,0000	NO	YES	NO
Flexibility to hire more than 10% of immigrants	YES	YES	YES
Labor regime			
Overtime fix rate of 25%	NO	YES	NO
Days-off fix rate of 50%	NO	YES	NO
Flexibility to assign days off	NO	YES	NO
Flexibility to operate on Sundays and official holidays	NO	YES	NO
Higher education institution	NO	YES	YES
Business and investment stability			
Investment Stability Law (54)	NO	YES	NO
Special Custom Regime	NO	YES	NO
Onsite one-stop-shop for permits and procedures	NO	YES	NO

† All tax incentives in Panama-Pacific are circumscribed to 12 activities defined by the World Bank in 2005. These activities are: back office operation; multimodal and logistic services; call centers; high-tech products and process manufacturing; offshore services; digital & data transmission; multinational headquarters; film industry; maintenance, repair and overhaul of airplanes; aviation and airport related services; transfer of goods and services to ships and their passengers and distribution centers (import/re-exports).

†† Firms that produce, assemble or process high-technology manufactures are exempted from all type of income and capital taxes.

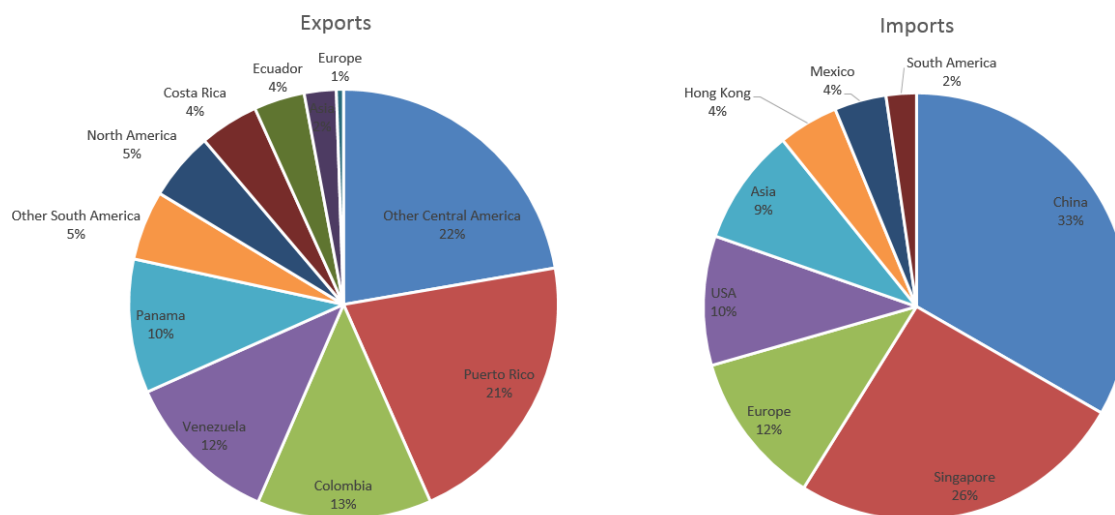
Source: own creation based on current legislation of SEZ in Panama.

2. Overview of the Special Economic Zones in Panama

2.1 Colon Free Zone (CFZ)

Established in 1948 in the Caribbean entrance to the canal, the Colon Free Zone is one of the oldest SEZ in the world, the most important of the Americas, and the second largest in the world. CFZ acts as an import/re-export area mainly focused in tradable goods such as fabrics, clothes, shoes, and pharmaceutical products. By 2015, CFZ hosted 2,527 companies, employing 29,786 workers. Firms in CFZ are exempted from all import and export taxes. In addition, they are exempted from the income tax only for international operations and there is no minimum capital investment (**Table 1**). Overall, since its creation ZLC has offered a sizable number of jobs for blue-collar workers in Colon. As we will show later, these jobs represent a source of stable and relatively high income, especially for low-skilled workers.

Figure 1: Export and Imports of Colon Free Zone

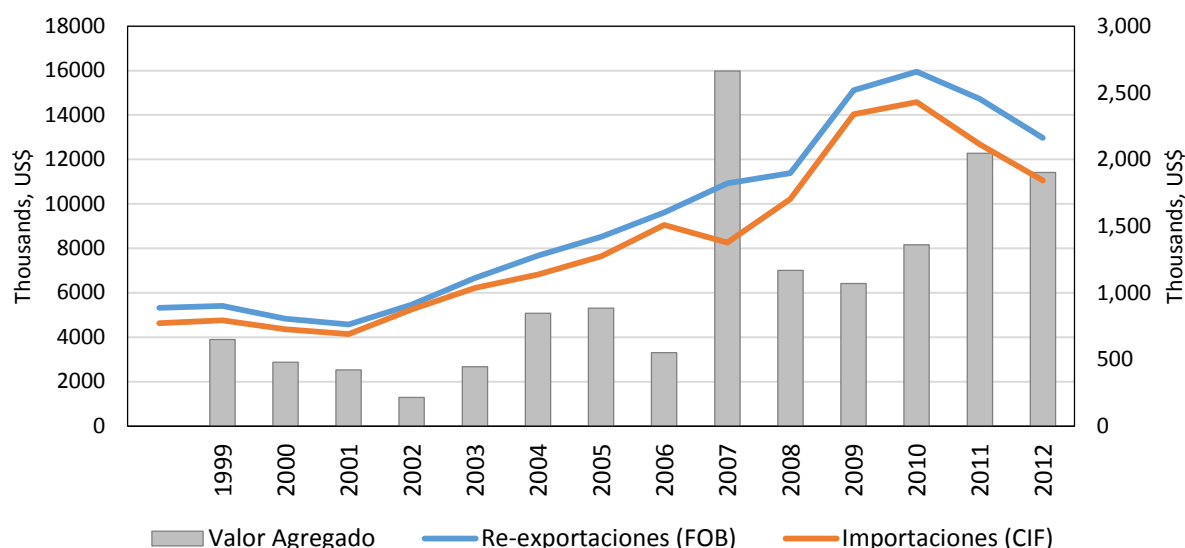


Source: INEC, Panama

In 2015, more than half of the total imports of CFZ came from just four countries: China, Singapore, United States and Hong Kong. Likewise, 50% of the re-exports went to only four countries: Puerto Rico, Colombia, Venezuela and Panama (**Figure 1**). In 2012, the trade volume of CFZ reached a peak, with a total of US\$ 15.9 billion in re-exports, and US\$ 14.6 billion of imports. Since then, both re-exports and imports have been decreasing at a steady pace (**Figure 2**). In April of 2016, the cumulative exports decreased in 23% compared to April 2015; 20% compared to April 2014. This negative trend can be explained by a slowdown in the regional trade mainly driven by the

deteriorated economic situation of Venezuela (third main export destination) and new import-taxes charges on clothes and shoes by Colombia (second largest export destination).² This slowdown is reflected in the decrease of the value added (exports minus imports) generated by the zone. Although positive throughout the last 20 years, value added in 2013 was only around US\$ 1 billion, the lowest since 2007. Today, tenants of CFZ complain that they have lost competitiveness because tax breaks are not as generous as other Panamanian SEZ, and they are charged with high fixed operation and service fees by the government.³ The fees collected by the government had been highly controversial, since they were implemented on a fixed scheme when the zone was booming. Today, with economic activity declining in CFZ (**Figure 2**), these fees represent a high share of tenants' income thereby threatening their profitability.

Figure 2: Colon Free Zone re-exports and imports



Source: INEC, Panama and WDI

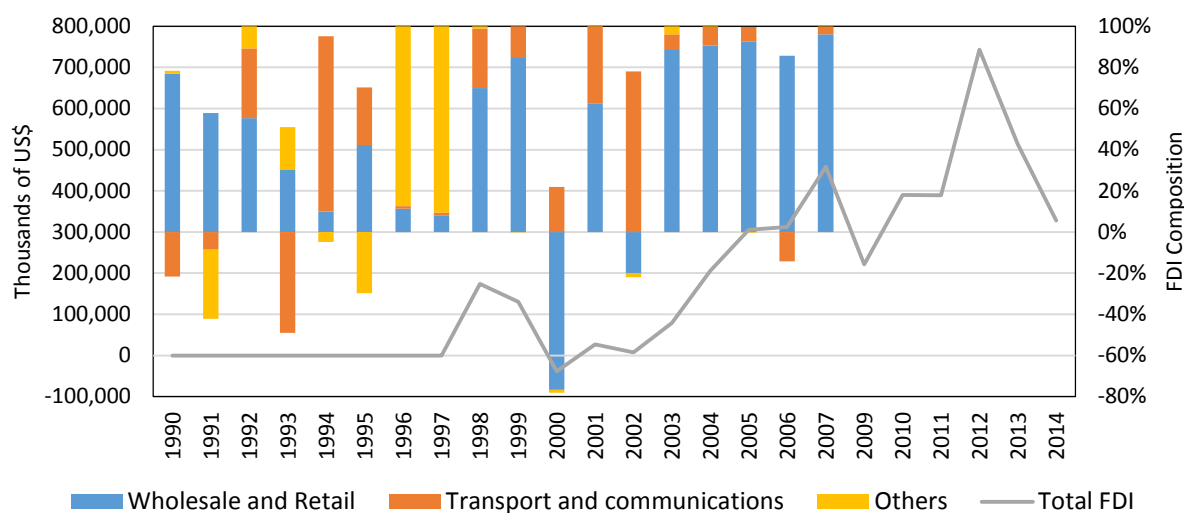
According to the 2012 Economic Census of firms, 4.5% of CFZ firms had foreign capital, compared to a national average of 2.2%. This suggests that CFZ has been successful in attracting FDI, as compared to the rest of the Panamanian economy. From early 2000s to 2013, the net flow of FDI targeted in CFZ increased significantly, totaling more than 700 million in 2012 (**Figure 3**).

² Colombia unilaterally imposed an additional 10% tariff on textiles and footwear coming from the Colón Free Zone. In February 2016 Panama demanded arbitration of a World Trade Organization Expert Panel. Case remains unsolved.

³ Interview with *Asociación Usuarios Colon* (July, 2016).

However, in 2014, these flows plummeted down to 2004 levels. Likewise, the lion's share of this FDI has gone to the Wholesale and Retail industry and not to Transport and Logistics activities, core of Panama's competitive advantages.

Figure 3: FDI Inflows and Composition in CFZ



Source: INEC, Panama, July 2016

Today, CFZ struggles to remain competitive. Since 2013, hundreds of firms have closed their operations generating massive layoffs. According to CFZ administrators, over the previous three years (2012-2015) there was a net reduction of 3,300 jobs,⁴ and bank loans to CFZ firms decreased by US\$ 200 million.⁵

2.2 Panama-Pacific (PP)

Panama-Pacific was created in 2007 in the former US military areas of Howard Air Force Base and Fort Kobbe. It operates under Law 41 of 2004, which describes the main goal of the zone as follows:

“... to encourage and ensure the free flow and movement of goods, services and funds so as to attract and promote investments and the generation of jobs and to make the Republic of Panama more competitive within the global economy”

⁴ http://www.zolicol.gob.pa/imagenes/pdf/compendio_2011_2015.pdf

⁵ Superintendencia de Bancos, Panama

Located in the District of Arraijan⁶ in the west side of the Canal, PP hosts a business and industrial park, several housing projects, shopping malls, a special custom regime, four schools, two training centers, an international airport, and a “one-stop-building” comprised by 18 government agencies to lighten the administrative burden for companies. The government of Panama rented the administration of PP through a 40-years contract to a private developer, London and Regional Properties. The master plan entails 1 million square meters of commercial spaces; 20,000 homes and 40,000 new jobs.

All companies registered within PP that fall under 12 pre-established business activities are exempted from all taxes, both indirect and direct.⁷ However, when products are commercialized within the National Fiscal Territory, direct taxes (income, dividends and money transfer) are applied, with the only exception of high-technology manufactures. In addition, companies can benefit from special immigration standards in which investors, workers and their families are granted special visas. There is also a tax-free, one-time import of any personal and domestic belongings of foreign workers. Finally, the zone offers a special labor regulation with 24/7 operations allowed, an overtime fixed rate of 25% of base salary, and a special ceiling on the proportion of workforce from outside Panama (**Table 1**).

Up to date, 251 companies are registered in PP generating 2,305 direct jobs.⁸ In addition, the zone has successfully attracted foreign capital, which today accounts for 41% of companies and 65% of total investment. Large multinational companies such as Dell, 3M and Caterpillar have installed in PP, attracting a substantive number of expats. In this regard, the special visas offered by PP seem to point in the right direction, as the share of immigrants within PP is almost three times higher than the share of immigrants in the Panama province.⁹ In particular, PP offers two types of visas; one for workers, and other for investors, both for a maximum of five years. However, only under the

⁶ Anecdotaly, a deformation from the English “a right hand”.

⁷ The 12 activities were defined from a study conducted by the International Finance Corporation (IFC) of the World Bank Group in 2005 with the aim of advising the Panama government in the development of PP. These activities are: back office operation; multimodal and logistic services; call centers; high-tech products and process manufacturing; offshore services; digital & data transmission; multinational headquarters; film industry; maintenance, repair and overhaul of airplanes; aviation and airport related services; transfer of goods and services to ships and their passengers and distribution centers (import/re-exports).

⁸ Panama-Pacific Agency, July 2016.

⁹ 2010 Population Census of Panama.

investor Visa immigrants are eligible to apply for resident visas.¹⁰ A priori, this inability of PP expats to accumulate years for a potential residency permit makes little sense, as it inhibits the likelihood that immigrants move to other firms outside PP or create their own firms, and spread their knowledge outside PP.

2.3 City of Knowledge (CK)

What once was the U.S. Clayton military base, today emerge as a thriving community of firms, research centers, academic institutions and NGOs. Located near the Panama Canal, since the year 2000 City of Knowledge offers an environment aimed at promoting innovation, culture and human development. The infrastructure of this technology park is a mix of old 1920s five story buildings left behind by the US military, and modern constructions. The zone hosts a group of 75 small and medium companies ranging from computer software developers as *Infosgroup* to nano-technology labs as *Nano Dispersion*, to worldwide pharmaceutical leaders such as *GlaxoSmithKline*. In addition, CK hosts the UNDP regional headquarters, a college campus from Florida State University, and two public institutes devoted to innovation and technology: SENACYT and INDICASAT. By 2015, the firms located at CK had 1,290 employees.¹¹

All companies located in CK must comply with one requirement: constant innovation. The CK Foundation, a private NGO in charge of administration, has a rigorous firm selection process based exclusively in innovation capacity. Each year, CK receives approximately one hundred applications with an acceptance rate of 7%. Companies allowed in are given three or four-year contracts depending on the case, are screened in terms of innovation and technology and might be requested to leave CK – upon contract expiration – if they do not meet the standards. The setting of these high standards has positively positioned CK as a brand of technological innovation and knowledge diffusion in Panama. Overall, CK has successfully attracted small and medium technology firms and at present displays a 92% occupancy rate.

As the others SEZ of Panama, firms hosted in City of Knowledge benefit from tax discounts and a special migratory regime. Given the nature of technology firms – intensive in capital inputs – the

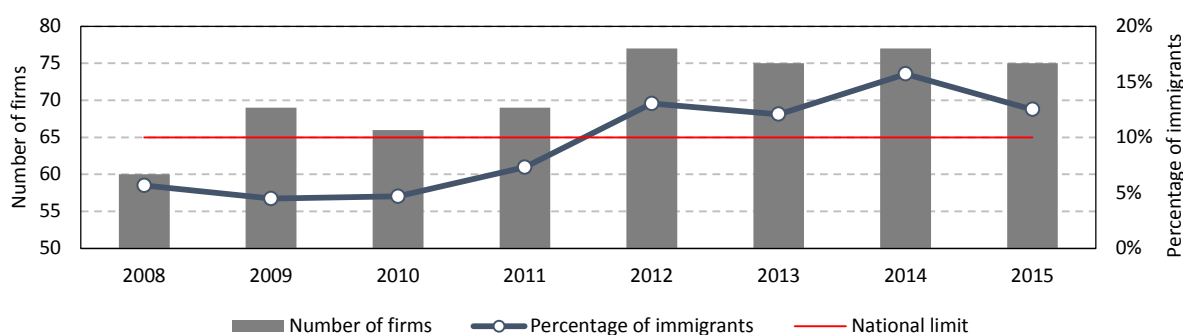
¹⁰ Law 41 of 2004 is only explicit in terms of permanent residence permits for the case of Investor Visas (Article 101).

¹¹ Total employment at CK is significantly higher, as it includes non-governmental organizations, academic institutions and government offices. Our 1,290 figure only includes jobs at productive firms.

exoneration of import and sales taxes emerges as a key benefit. In addition, firms that commercialize high-technology products or services are fully exempted from any other taxes (**Table 1**).

In terms of migratory benefits, firms in CK can hire as many foreign workers as they want under the City of Knowledge VISA (national limit of 10% does not apply). This benefit is also highly valued by firms. As stated in interviews with tenants, foreign workers bring a set of skills that are not found in Panama. Moreover, since 2012 the national limit of 10% has been surpassed systematically, suggesting that high-skilled labor is indeed a binding constraint for these firms that has been surpassed (at a premium) via immigration (**Figure 4**).

Figure 4: Number of firms and percentage of foreign workers in City of Knowledge



Source: City of Knowledge Foundation, July 2016

City of Knowledge contains all the components of a successful triple-helix model, namely government, private sector, and universities and research centers (Etzkowitz and Leydesdorff; 2010; Rodriguez-Pose and Hardy, 2014). However, there are several bottlenecks that are inhibiting a sustainable long-term transfer of knowledge and technology across firms within the CK, and more importantly, from CK to the rest of the country. On the former, within the course of the interviews we carried to tenants of CK it was noteworthy the absence of functional synergies among firms. Moreover, there is a lack of linkages between academic institutions within CK and firms, and the administration does not systematically monitor any indicator of innovation or knowledge transfer. On the latter, there are a number of relevant factors preventing the knowledge created at CK from spilling over to the rest of the economy. First, the Panamanian immigration regime is highly inefficient and expensive. CK Visas have to be renewed annually at a hefty fee that might be quite significant for small and even medium companies where foreign scientists predominate. Furthermore, if foreigners hosted by CK want to work elsewhere in Panama, they must reapply for a new visa, and

bear the costs of the new process. Time spent on the CK does not accrue for Panamanian residence, which ultimately hinders the free flow of immigrants to the domestic economy. Finally, most of the activities of CK firms gravitates towards research and development activities rather than commercial and sales activities, hindering the capacity of the zone to add a substantive value added to the Panamanian economy.

3. Static Benefits of Special Economic Zones in Panama

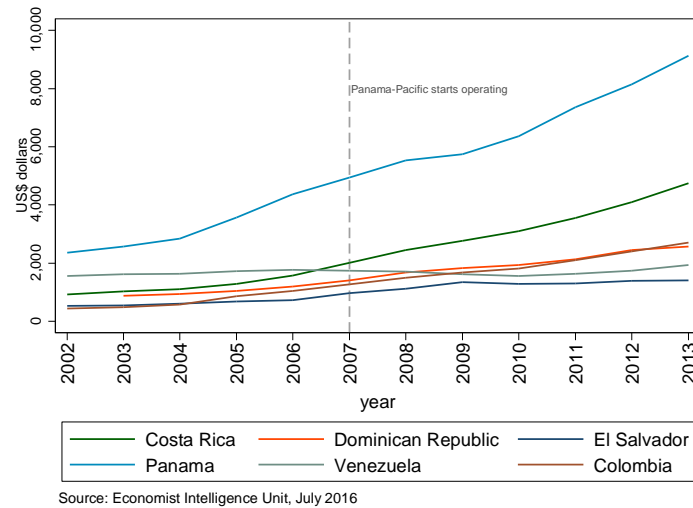
3.1 Foreign direct investment

To assess the FDI impacts of SEZ we would ideally need a valid counterfactual, which is not trivial.¹² We looked at several FDI metrics, contrasted Panama's FDI trend with the region, and valuated greenfield FDI projects. Our findings suggest that, even if successful in attracting foreign capitals, SEZ have not been the workhorse behind the massive FDI inflows registered over the last ten years.

Since early 2000s Panama experienced a large increase in FDI. From annual FDI levels of US\$ 1 billion at the beginning of the decade, the country went up to 4 or 5 billion per year nowadays. Panama has been successful in attracting foreign investors for various reasons: political and economic stability; security; trade liberalization; the creation of a business-friendly environment with low taxes; and privileged geographic location. **Figure 5** shows how Panama outperformed almost all its neighbor countries in FDI. By 2013, the current stock of FDI per person in Panama was US\$8,000, the double of Costa Rica (second neighboring country with largest stock of FDI per person). How much of this gap can be explained by the role of SEZ in the country? As mentioned before, it is hard to know, but the spike of Panama FDI in the year 2004 occurred three years before PP started operating and a year in which CFZ attracted less than US\$500 million in FDI, suggesting that SEZ were not the main driver of capital inflows.

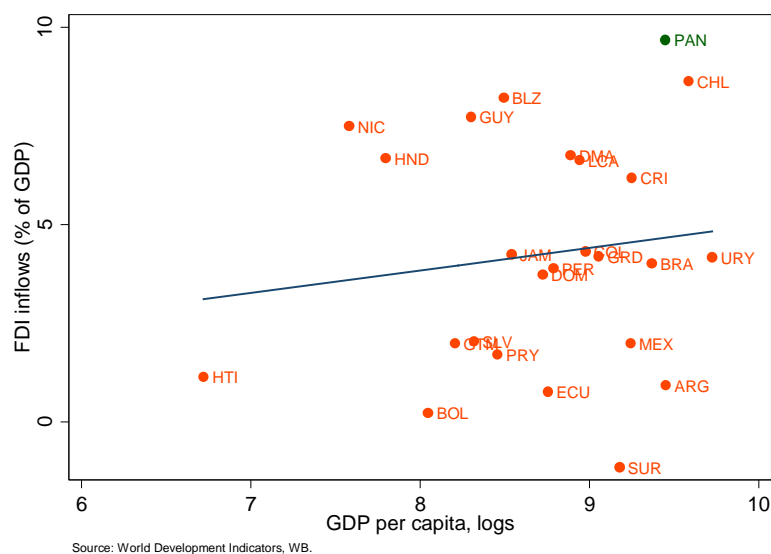
Figure 5: Stock of FDI per person in the region

¹² The counterfactual is the amount of FDI that Panama would have received had it not created none of its Special Economic Zones.



Compared to the rest of Latin American countries, Panama also ranks first in terms of FDI inflows as percentage of GDP (**Figure 6**), confirming that the country has had a successful story of attracting foreign capitals. By 2014, almost 10% of the country's GDP accounted for foreign direct investment, suggesting that international investors have a strong confidence in the strength of Panama's economy.

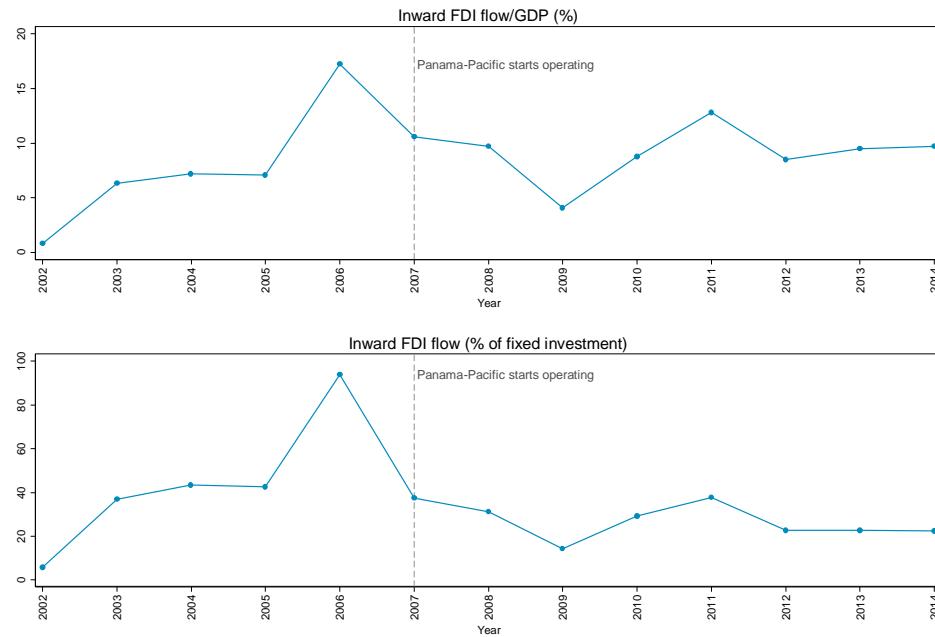
Figure 6: Inward Foreign Direct Investment of LA countries, year 2014



Though Panama has been successful in attracting FDI, this type of investment has neither been the main driver of investment nor GDP growth in the previous decade (**Figure 7**). Moreover, after reaching a maximum in the year 2006, the shares of FDI in investment and GDP in Panama slightly

decreased. FDI inflows went from 90% and 40% of total investment in 2006 and 2007, to roughly 20% nowadays. Likewise, today FDI accounts for less than 10% of GDP. These two measures reveal that the relative importance of FDI in the total output of Panama has been stagnant and played a secondary role in the economic boom of the country of the last 10 years.

Figure 7: FDI share of GDP and investment in Panama



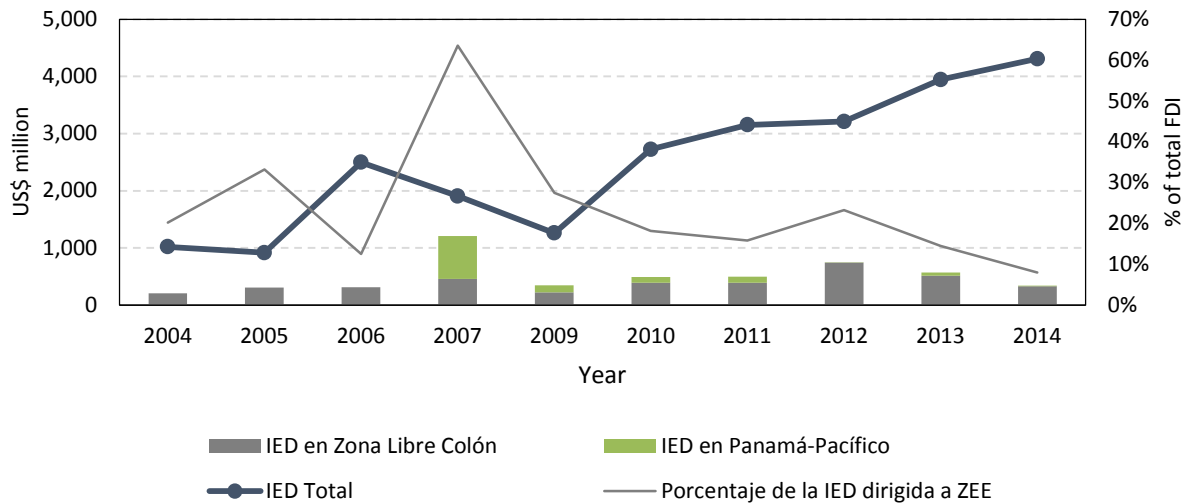
Source: Economist Intelligence Unit, July 2016

Finally, using data from the National Statistical Office (INEC for its Spanish acronym) and the FDI Markets database,¹³ we find that the share of FDI directed to SEZ in Panama accounted for only 8% of total FDI in the year 2014 (**Figure 8**). Moreover, in the last decade the share of FDI directed to SEZ has not surpassed the 40% of total FDI but only in the year 2007, which corresponds to a US\$700 million investment of the PP developer, London and Regional Properties. It is worth noticing that this investment will fully materialize during the timespan of the contract between the PP developer and the Panamanian government, which lasts until the year 2047.

We mentioned above that the bulk of FDI in CFZ goes to Wholesale and Retail activities followed by Logistics and Transportation. Besides the compromise of the developer to invest US\$700 million over 40 years, Panama-Pacific has already benefited from investments of several foreign companies, namely Hewlett-Packard (111 million), BASF (64 million), the Bank of Nova Scotia (62 million) and 3M (52 million).

¹³ The FDI Markets database from the Financial Times is the most comprehensive online database of cross-border greenfield investments covering all countries and sectors worldwide. From a total of 359 greenfield FDI projects in Panama between 2003 and 2015 we identified 23 investments related to Panama-Pacific.

Figure 8: FDI in Colon Free Zone and Panama-Pacific



Source: Own calculations based on data from INEC, Panama, and FDI Markets database

In conclusion, since the year 2000 SEZ in Panama have been successful in attracting foreign capitals, within the context of large capital inflows flying into Latin America. Moreover, as the relative importance of FDI in total investment and GDP has stagnated, we can rule out FDI as the main driver of Panama's impressive growth over the last 10 years. Looking at the share of SEZ on total FDI, we did not find compelling evidence suggesting that without the SEZ the total FDI would have been significantly lower. Moreover, the relative contribution of CFZ and PP in total FDI has been decreasing steadily since 2007, and only one out of the 10 largest FDI projects in Panama in the last 12 years is related to a SEZ (**Figure A- 1**).

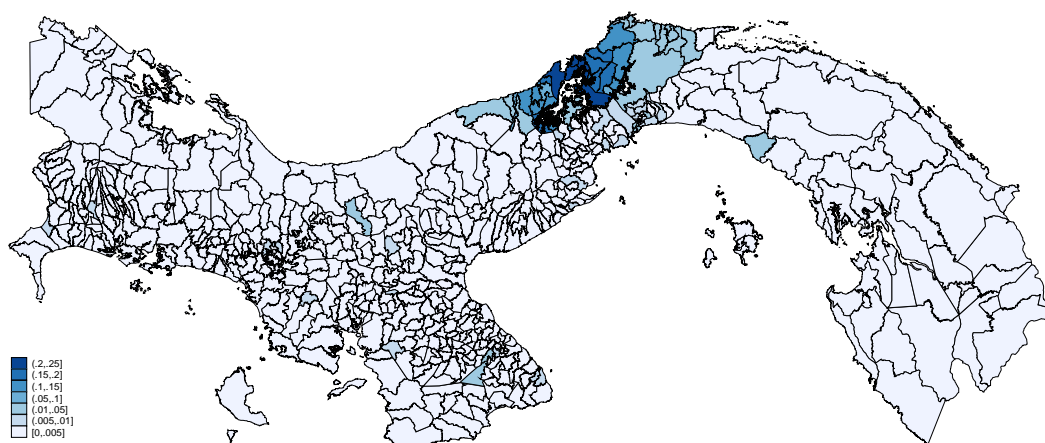
3.2 Employment

The best way to gauge the employment dynamics of SEZ is using data from the Social Security Administrator. However, during the course of this research project we were not able to access data from the *Caja del Seguro Social de Panamá*. We had to limit our analysis, hence, to data from the Population Censuses of 2000 and 2010, which only allowed us to identify workers of firms located in Panama-Pacific and Colon Free Zone, but not from City of Knowledge.

By 2010, CFZ and PP employed a total of 21,773 workers accounting for only 1.7% of total employment in the country.¹⁴ While in ten years the number of jobs in SEZ almost doubled, the share in total employment has remained the same. If we look at things in a static way, it seems that instead of employment growth in Panama being driven by SEZ, employment in the SEZ was driven by the rest of Panama. The only way to assess a different causality would be to look at the spillovers from SEZ, which we do in section 4.

Figure 9 reveals that CFZ is the most important employer of the Panamanian SEZ, concentrating more than 70% of total SEZ jobs. Despite the 30,000 jobs that CFZ currently generates, Colon happens to be the province with the highest unemployment rate. This disturbing contrast casts doubts on CFZ's ability to bolster a path of inclusive employment growth over time, and provides some ground to the common criticism to SEZ as closed enclaves. However, as shown later in this section, CFZ offers an array of jobs targeted to low-skilled workers which are better paid and more stable than jobs outside the zone.

Figure 9: Share of total Workers in Special Economic Zones, by *corregimiento*



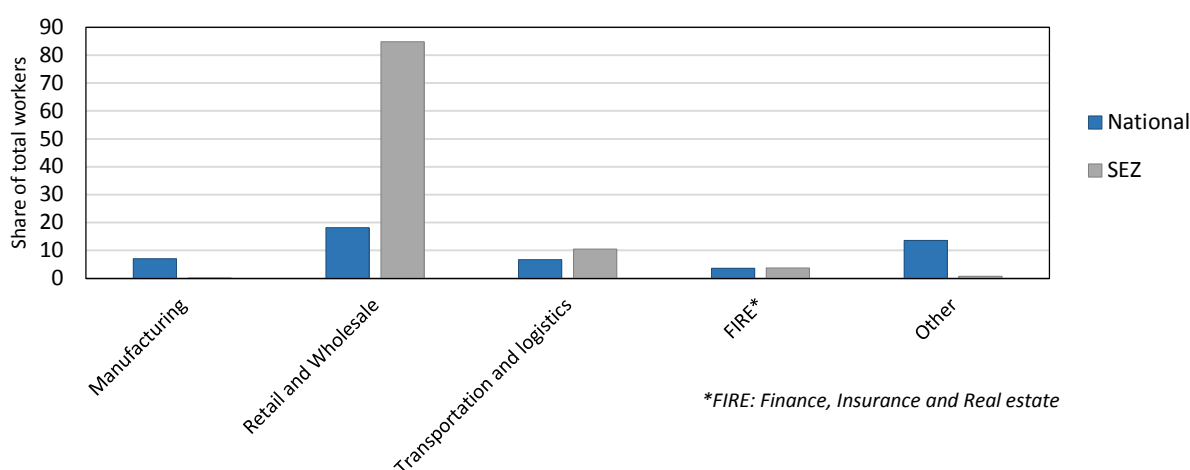
Source: Own calculations based on Population Census 2010

In terms of industries, 80% of total employment within SEZ is concentrated in Wholesale and Retail, compared to a national average of 2%. In addition, the share of workers within the Transportation and Logistics sector in SEZ mirrors the national average. Conversely, sectors that require more complex skills and productive *know how*, such as manufacturing, are highly

¹⁴ We use data from the 2010 Population Census to identify workers of CFZ and PP Special Economic Zones, based on industry classification and location. Panama uses the CIIU Rev4 with minor adaptations. Particularly, it identifies industries exclusively related to Free Zones activities.

underrepresented within SEZ (**Figure 10**). The overrepresentation of industries with low level of complexity (wholesale and retail) and the underrepresentation of those that require complex skills is significant. It suggests that if SEZ want to become key players in the process of upgrading and diversifying the Panamanian economy, they must shift gears toward activities demanding more complex skills. The relative high share of employment in Transportation and Logistics is a good signal, as this industry combines the natural competitive advantage of Panama due to the Canal and, at the same time, requires a set of infrastructure and related services that should help Panama board more complex industries in the future. The Panamanian government has already notice this, as the 2015-2019 Strategic Government Plan identified Transportation and Logistics as the sector with higher potential to increase the productivity of the Panamanian economy.¹⁵ However, at the time of writing this report there was no formal execution strategy of this plan.

Figure 10: Workers of SEZ vs total national, by industry



Source: Own calculations based on Population Census 2010

Table 2 characterizes the quality of jobs for firms within and outside the zones, for the province of Colon and Panama, respectively. First, firms within SEZ benefit from lower levels of informality, self-employment and defined term contracts. Second, there are enormous differences between CFZ and PP jobs in terms of type of occupations, both when compared between each other, and with other firms within the same provinces. In CFZ, one every three workers is non-qualified, lower than

¹⁵ <http://www.mef.gob.pa/es/Documents/PEG%20PLAN%20ESTRATEGICO%20DE%20GOBIERNO%202015-2019.pdf>

the is one every four observed elsewhere in the Colon province. Conversely, in PP the non-qualified occupations only account for 9% of total jobs, a share three times smaller than in ZLC and two times smaller than other firms in Panama. If we take a closer look at upper-end occupations, the share of managers and professionals within PP accounts for 30% of the total employment of the zone, 9 percentage points higher than other firms in Panama province and 16 percentage points higher than firms within CFZ.

Table 2: Quality of jobs in SEZ

	Outside SEZ	Within SEZ
Colon province		
Total Workers	74,648	16,356
Wage (US\$)	490	522
Defined term contract (%)	15.9	12.3
Informality (%)	12.8	4.1
Self-employment (%)	27.9	1.9
Managers/professionals (%)	12.2	12.8
Non-qualified workers (%)	23.0	31.8
Panama province		
Total Workers	744,576	4,889
Wage (US\$)	740	1,251
Defined term contract (%)	18.32	13.40
Informality (%)	8.66	2.87
Self-employment (%)	19.68	7.36
Managers/professionals (%)	19.96	28.53
Non-qualified workers (%)	18.93	8.63

Source: Population Census 2010

The divergence in type of occupations affects directly wages in CFZ that are, on average, more than two times smaller than in PP and only 7% higher than wages elsewhere in Colon. Panel A in **Table 3** shows wages in the Colon province for firms within and outside CFZ. It is remarkable that wages of occupations that require relative high skills - such as mid-level technicians, managers and professionals – are not higher within the CFZ relative to elsewhere in Colon (for mid-level technician and clerical they are significantly lower).¹⁶ Therefore, the (positive) gap of wages between

¹⁶ The wages of managerial and professional occupations within Colon Free Zone may be underestimated. We identify CFZ works as those who live within Colon province and declare to work with a Free Trade Zone. However, the share of managers and professionals that work in Colon but live in Panama province is larger compared to other type of occupations (**Figure A-2**)

firms within ZFC and other Colon firms is mainly driven by a wage premium in service and sales and non-qualified workers (machine operators actually make less within the CFZ).

Likewise, Panel B in **Table 3** shows that wages within PP are, on average, US\$ 511 higher than wages outside the zone. This means that PP has a wage premium of 69% compared to other firms in the Panama province, and more than 2 times compared to CFZ firms. In this zone, all types occupations present significantly higher wages relative to other firms in Panama, with the exception of wages of machine operators, who do differ significantly from the rest of Panama.

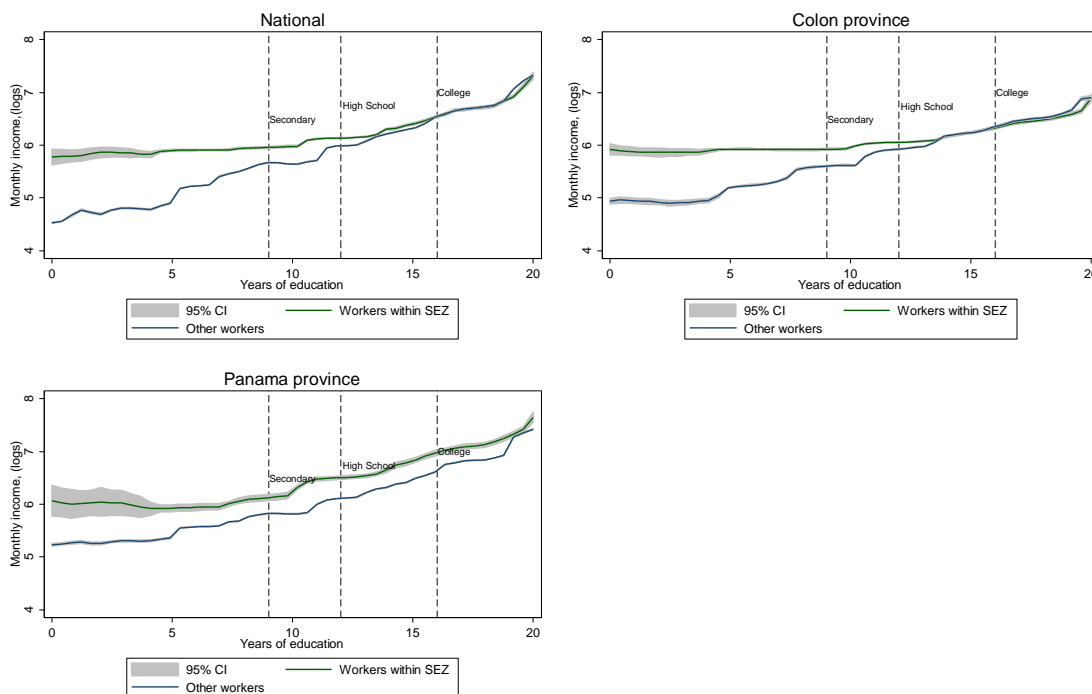
Table 3: Wages within and outside SEZ (intra-provincial differences)

	Within SEZ (US\$)	Outside SEZ (US\$)	Difference	P-value
Panel A: Colon Free Zone	522.16	489.56	32.6	0.00
Managerial and professional	917.6	883.7	33.9	0.11
Mid-level and clerical	526.8	617.8	-91.0	0.00
Services and sales	548.3	389.4	158.9	0.00
Machine operators	443.5	612.1	-168.6	0.00
Non-qualified, others	381.0	292.7	88.3	0.00
Panel B: Panama-Pacific	1,250.82	739.97	510.8	0.00
Managerial and professional	2,016.1	1,495.6	520.5	0.00
Mid-level and clerical	1,072.6	808.5	264.2	0.00
Services and sales	1,159.4	497.6	661.8	0.00
Machine operators	561.8	571.4	-9.5	0.86
Non-qualified, others	480.2	364.3	115.9	0.00

Note: All workers (self-employed and employed) considered. Total workers within SEZ are 21,733, with 16,356 working in Colon Free Zone and 4,889 in Panama-Pacific. Source: Population Census 2010

Figure 11 depicts the level of wages by years of education for both, CFZ and PP workers. The same features reported above are observed: a wage premium in CFZ focused on low-skilled workers and a much higher wage premium in PP, which is spread more evenly across the educational distribution of workers. Both of these wage gaps suggest that something else than education must account for such a difference.

Figure 11: Polynomial fit of income and years of education of SEZ workers



Source: own calculations based on Population Census 2010

Source: Panama Population Census 2010

Why wages in PP are significantly higher than wages outside the zone? Why this gap is not so big when we analyze CFZ? Can these differences be explained by workers' attributes (such as education or experience) or is due to specific features of SEZ that are driving firm's productivity? To estimate more precisely the drivers of the wage gap of workers within and outside these SEZ we use a twofold Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca 1973). In very simple terms, this decomposition allows to discern what share of the wage gap is explained by a certain set of characteristics of workers ("quantity effect") and how much is explained by things that are not measured ("the unexplained part"). We use years of schooling, work experience, gender, a dummy for college diploma and indigenous condition as worker's characteristics. We make this decomposition for each of the two analyzed SEZ (Colon Free Zone and Panama-Pacific), comparing the intra-province wage gap of workers in firms within the SEZ with workers in firms outside the SEZ. **Table 4** summarizes our findings.

Table 4: Oaxaca-Blinder decomposition

	Colon Free Zone (CFZ)			Panama-Pacific (PP)		
	overall	explained	unexplained	overall	explained	unexplained
Wage difference (logs)	-0.305*** (0.00554)			-0.510*** (0.0127)		
explained	-0.0512*** (0.00377)			-0.217*** (0.00736)		
unexplained	-0.254*** (0.00505)			-0.293*** (0.0105)		
schooling		-0.0947*** (0.00382)	0.692*** (0.0247)		-0.168*** (0.00622)	-0.272*** (0.0664)
experience		0.0360*** (0.00183)	0.0640*** (0.0122)		0.00415** (0.00211)	-0.157*** (0.0291)
college diploma		-0.00237*** (0.000400)	-0.0107*** (0.00399)		-0.0246*** (0.00150)	0.0818*** (0.0160)
female		0.00981*** (0.00154)	-0.0860*** (0.00413)		-0.0257*** (0.00224)	-0.0163** (0.00703)
indigenous		5.72e-05 (5.95e-05)	0.00351*** (0.000825)		-0.00268*** (0.000336)	-0.000620 (0.00108)
Constant			-0.916*** (0.0270)			0.0713 (0.0634)
Observations	85,334	85,334	85,334	710,061	710,061	710,061

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The unexplained part of intra-provincial wage gap in both zones is very similar, accounting for 0.25 log points in the case of CFZ (column 1) and 0.29 log points for PP (column 4). In other words, 83% of the wage gap between CFZ and the rest of Colon province cannot be explained by workers' characteristics; 56% in the case of PP. These results suggest that in both SEZ the lion's share of the wage gap cannot be explained by factors associated to workers, so there respond to firms' characteristics.

In conclusion, jobs created by SEZ in Panama represent a very small fraction of total employment in the country and are mostly generated by Colon Free Zone (CFZ). Likewise, the quality of jobs within these zones is higher than jobs generated outside them. Particularly, SEZ jobs show lower levels of informality, self-employment and defined-term contracts. However, the types of occupations differ significantly across SEZ. While the bulk of the 16,000 jobs generated by CFZ in 2010 belonged to dockhand, warehouse employees, security guards, clerks and other non-qualified occupations, the 4,000 jobs in PP were more business-oriented. This divergence has a direct effect on the wage gap of the zones against firms located outside them. While salaries in CFZ are only 7%

higher than other Colon firms, in PP this gap skyrockets to 69% with respect to Panama City. When we analyze these wage gaps in terms of observable worker's characteristics, we find that in CFZ the bulk of the gap is explained by a wage premium of low-skilled occupations. To the contrary, the wage gap for Panama-Pacific is persistent across all levels of education. Overall, in both SEZ observable characteristics of workers account for less than 50% of the intra-provincial wage gap, leaving the bulk of the gap to *unobservable* features. In the next section we will try to shed some light on this *unobservable* by analyzing differences in productivity of firms in and outside the SEZ.

3.3 Productivity of firms

Are firms located in SEZ more productive than firms located outside their perimeter? In this section we delve in search of an answer using simple measures of productivity drawn from the 2012 Economic Census of firms. Our results reveal that firms within ZLC, on average, are more productive than other firms of Colon province, even after controlling for firm size and industry. Firms within PP also show higher productivity measures, but they are not statistically different from those of firms located in other parts of Panama province.¹⁷ These results are consonant with the findings of our Oaxaca-Blinder decomposition in the previous section, in which we found that most of the wage gap between workers within and outside SEZ is explained by unobservable characteristics of firms. So, why firms within SEZ are more productive than other firms? Agglomeration effects are usually the main explanation for productivity and welfare gains of these type of location-based policies (Ellison and Glaeser 1997; Greenstone et al., 2010; Kline and Moretti, 2013). These agglomeration forces may include large infrastructure developments, such as the Multimodal Logistics Center of CFZ, which integrates seaports, railroads and an airport. However, we cannot rule out the possibility of sorting, in which more productive firms tend to agglomerate in the same geographical region (Behrens and Robert-Nicoud, 2014).

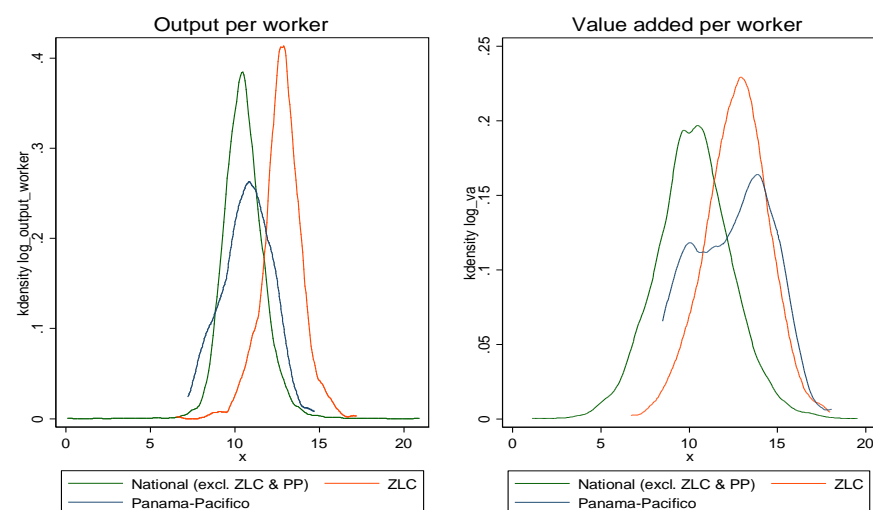
Figure 12 shows the distribution of Panamanian firms in terms of two productivity measures: output per worker and value added per worker. According to the data, by 2012 there were 930 firms located in CFZ and 77 firms in PP,¹⁸ from a total national of 19,211 firms. Not surprisingly, firms in CFZ have higher output than those of PP and the rest of the country, as this is the largest import-

¹⁷ It is worth noting that the lack of statistical significance may be exclusively due to a problem of small sample size.

¹⁸ The 77 firms in PP were identified through geographic location on the firms on the Economic Census, and as such represents an approximation. At the time of writing, PP hosts 251 firms.

export zone of the Americas. However, using value added we find that the distribution of PP firms shifts to the right relative to the other two groups.¹⁹ A priori, in terms of value added per worker firms in both SEZ seem to be more productive than the rest of Panamanian firms. To draw more substantive conclusions though, we need to make intra-province comparisons and control for size of firms, as we are ultimately trying to find a control group that tells us what would have happen with these same firms in the province in the absence of a SEZ.

Figure 12: Distribution of Panamanian firm's productivity



Source: National Census of firms, 2012

Table 5 shows the results of several OLS regressions and matching estimates where the outcomes are the two productivity measures and our variable of interest is a dummy that takes the value of one if the firm is located within a SEZ and zero otherwise.²⁰ For Colon province we find that firms within CFZ are almost twice as productive as firms elsewhere in the province, in terms of output per worker (column 1) and 1.4 times in terms of value added per worker (column 4). Even if we control for firm size and openness to world trade, we still find that ZLC firms are 90% more productive than other Colon firms (columns 2 and 5). These results hold for matching estimates as well. These findings suggest that CFZ is generating a positive value added to the local economy of Colon. Not

¹⁹ Value added is measured as total incomes minus total expenses divided by the total number of firm's workers.

²⁰ For the matching estimates we use the nearest-neighbor matching approach. The number of matchings specified was one. Finally, we estimate the average treatment effect on the treated (TOT).

only have these firms represented a source of well-paid salaries to low-skilled workers (as shown in the previous section) but they also have made the local economy more productive. Although this conclusion may be at odds with the high unemployment rate of Colon, it implies that unemployment in Colon would be much higher if the CFZ would not exist.

The regression coefficients for firms located within Panama-Pacific are also positive but lower in magnitude and significance relative to CFZ (columns 7 to 12 of **Table 5**). Firms in PP are 16% more productive than other firms in Panama in terms of output per worker (column 8) and 29% in terms of value added per worker (column 11). However, these results lack of statistical significance, which is probably driven by the small sample size. In the Economic Census of 2012, we were only able to identify 62 firms located in PP, which affects the statistical power of the test. In other words, we cannot rule out the possibility that firms within PP are indeed more productive than the other firms of Panama province.

Table 5: OLS and Matching estimates for firm's productivity in Colon Free Zone and Panama-Pacific

	Panel A: Colon Free Zone (CFZ)						Panel B: Panama-Pacific (PP)					
	Output per worker (logs)			Value Added per worker (logs)			Output per worker (logs)			Value Added per worker (logs)		
	OLS	OLS	Matching	OLS	OLS	Matching	OLS	OLS	Matching	OLS	OLS	Matching
Special Economic Zone	1.982*** (0.0720)	0.878*** (0.204)	1.64*** (0.104)	1.390*** (0.0783)	0.853*** (0.191)	1.209*** (0.153)	0.197 (0.145)	0.168 (0.148)	0.044 (0.1376)	0.294* (0.172)	0.290* (0.171)	0.259 (0.1795)
Workers (logs)		0.0314 (0.0275)			-0.0244 (0.0388)			0.0584*** (0.0114)			0.0415*** (0.0110)	
% exports in sales		-0.0835 (0.219)			0.132 (0.246)			0.450*** (0.0538)			0.326*** (0.0601)	
% imports in expenses		1.513*** (0.183)			0.598*** (0.219)			0.952*** (0.0582)			0.541*** (0.0627)	
Constant	10.76*** (0.0614)	10.69*** (0.0670)		8.892*** (0.0588)	8.908*** (0.0781)		11.27*** (0.0214)	10.79*** (0.0368)		9.301*** (0.0215)	9.000*** (0.0358)	
Observations	1,091	1,091		751	751		4,959	4,959		4,429	4,429	
R-squared	0.400	0.472		0.253	0.269		0.208	0.294		0.061	0.109	
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: The sample for Panel A considers only firms within the Wholesale and Retail industries in Colon province, with 827 located within ZLC and 287 outside. The sample for Panel B only considers firms in Panama province for the following industries: Wholesale and Retail; Construction; Education; Hotels and Restaurants; Manufacturing; and Logistics and Transport. Specifically, 62 firms within PP and 5,000 outside this zone. Both Panels compare firms within SEZ with firms outside SEZ but in the same province. Matching estimates control for the covariates workers, % exports in sales and % of imports in expenses with an exact match in the industry cell.

4. Dynamic benefits: the case of immigrants knowledge spillovers

So far, the overall goals of Panama's SEZ in terms of static benefits have been successfully achieved. Today, PP, CFZ and CK host around 2,900 firms, which together employ around 40,000 workers. We already showed that: (i) workers within the zones benefit from better paid and more stable jobs, (ii) wage premium is highly concentrated in low-skilled occupations mostly CFZ, and (iii) firms within PP and CFZ tend to be more productive than other firms located outside. However, while private returns to firms from installing in these SEZ may be positive, social returns may not. In other words, SEZ may be beneficial for firms but not for Panama. Hence, as we mentioned earlier, simple measures of investment and job creation are not enough. In this section we shift gears towards the measurement of the dynamic benefits of SEZ, as represented by knowledge and technological spillovers. We highlight the importance of SEZ in the attraction of immigrants, and how immigrants may transfer productive knowledge to the local economy.²¹ Overall, we find strong evidence that supports the hypothesis that immigrants, and in particular those attracted by SEZ, are generating positive spillovers in the labor market, increasing the productivity of Panamanian workers.

The success in attracting foreign know-how and easing the transfer of knowledge to domestic workers has been a crucial part of the history of Panama. First, the country's thriving banking sector benefited from a large inflow of foreign executives brought by multinational banks, who in turn bolstered the growth of a competitive domestic banking sector. Second, there is the construction and administration of the Canal, carried by U.S. authorities and handed over to an efficient and transparent domestic administration. That has also been the case of ports and logistics services, not to mention the development of Copa Airlines, which relied on foreign pilots, who then went on to train their Panamanian counterparts to accommodate its steadfast growth.

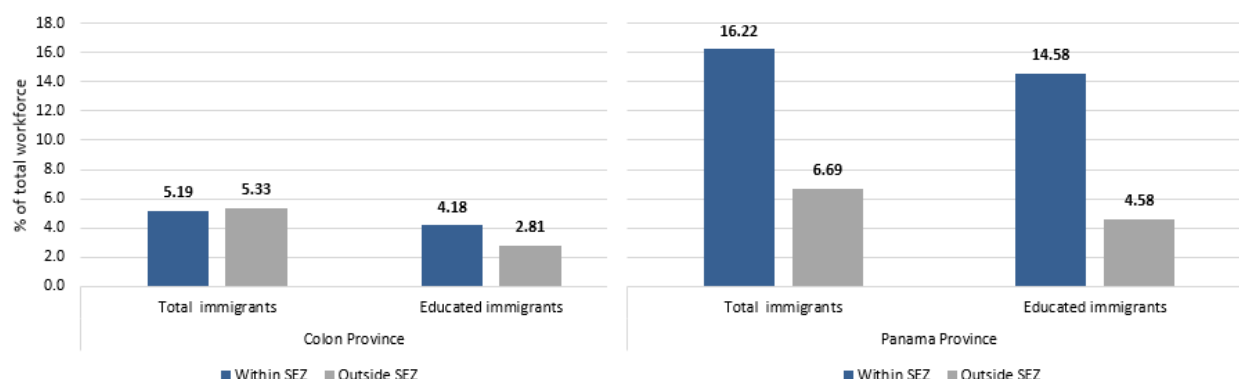
5. Description of immigrants in Panama

In the last 15 years, Panama has attracted a significant number of foreign firms and workers, with the SEZ and the SEM law playing an important role. The stock of immigrants doubled between

²¹ Not only the flexible migratory regime that SEZ offer has contributed to this massive migrant inflow, but also the enactment of the "Headquarters Law" in 2007 has played a major role. Designed to attract regional headquarters of large multinational companies (200 million in assets or more), the "Headquarters Law" offers similar tax benefits to those of SEZ for ten types of back-office activities. In addition, this law offers special permanent and temporary visas for foreign personnel at a management or executive level (expats), and to their dependents.

2000 and 2010. By 2010, 70% of immigrants have settled in the province of Panama, a sign that the economic benefits are highly concentrated around the capital. This immigrant province-divergence is also present in the SEZ. While only 5.2% of CFZ workforce is foreign born, PP triples this share up to 16.2% (**Figure 13**). SEZ immigrants do not only differ across provinces, but also within provinces. Firms within CFZ employ more educated immigrants than other firms on Colon.²² In Panama province the differences are even more striking, with firms within PP employing educated immigrants at a rate three times higher than in the rest of the province.

Figure 13: Share of immigrants in SEZ

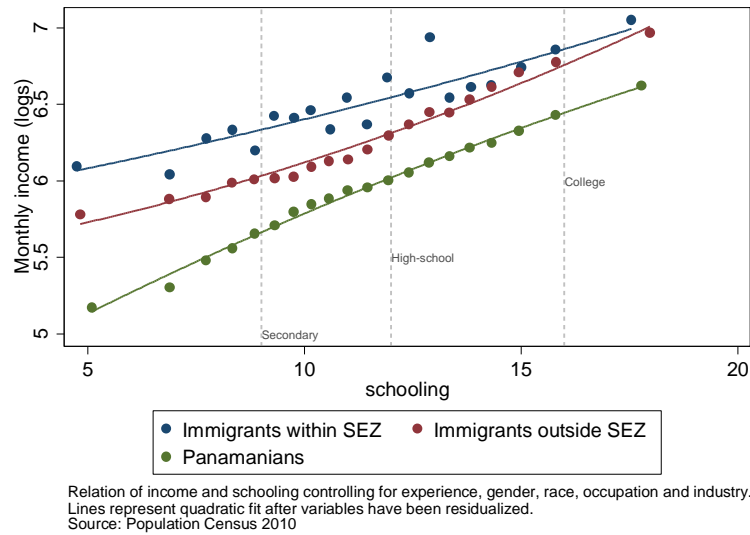


Source: 2010 Population Census

We compare the salaries of local workers with those of the immigrants. Once we control for education, work experience, gender, race, occupation and industry, a significant wage gap shows up in favor of the latter. Moreover, immigrants that work within SEZ have even a larger wage premium than immigrants outside SEZ (**Figure 14**). These findings suggest that immigrants – especially those attracted to the SEZ – must have a set of unobservable characteristics that make them more productive. We also find that this wage gap is larger in industries that require more *know-how* such as transport and in high-skilled managerial and professional occupations (Figure A- 3).

²² We define educated immigrants as immigrants who have at least a high-school diploma.

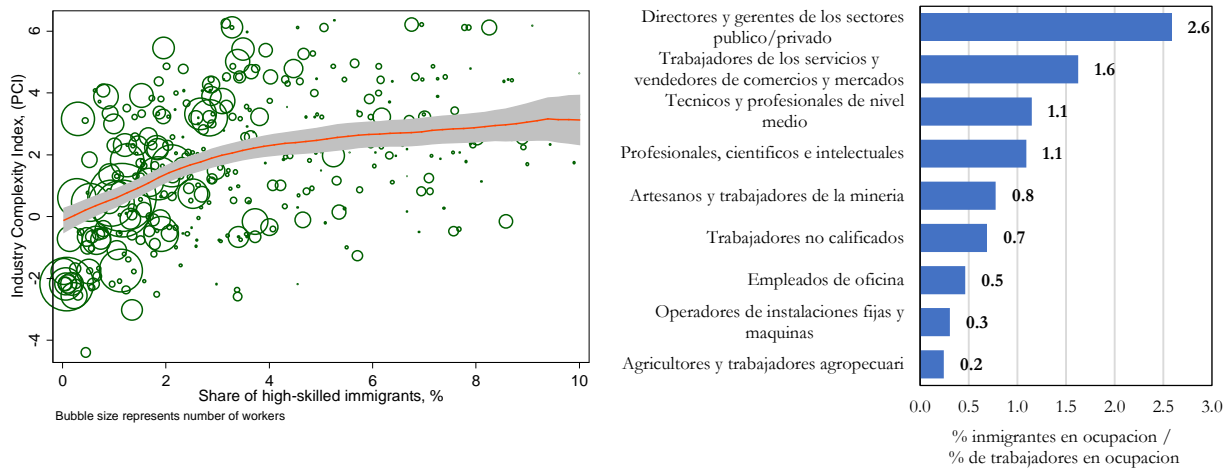
Figure 14: Income of Immigrants vs Panamanians, by years of schooling



Not only immigrants earn more than Panamanians workers; they are over represented in occupations that require a set of high skills and work in industries that are more complex (**Figure 15**).²³ Overall, these findings reflect a shortage in the local supply of labor for specific knowledge-intensive occupations, a transversal complain among managers of all firms interviewed over the course of this investigation. Immigrants are filling these positions and receiving a wage premium for it. According to data from the 2010 Population census, 13% of management occupations are filled by immigrants and ten types of engineer carriers have a share of 14% or higher of immigrants (**Figure A- 4** and **Figure A- 5**).

²³ Using complexity measures at the industry level we were able to identify which Panamanians industries require a more complex set of productive capacities and rank them according to their average product complexity index (PCI). For more details, see Hausmann et al. (2014) and Hausmann et al. (2016b).

Figure 15: Relation between PCI and share of immigrants



Source: own calculation based on Population Census, 2010

6. Measuring the diffusion of know-how

Are immigrants – whether attracted by Special Economic Zones or other policy tools such as the “Headquarters Law” – generating positive spillovers in the local economy? Our hypothesis is that immigrants bring with them a set of particular skills that local workers usually lack, and these skills may diffuse over the local economy, both in terms of productivity gains or creation of new firms. Insofar, there are only a few attempts to measure this type of spillovers and results have been mainly positive (Poole 2013, Combes et al., 2015; Kerr and Kerr, 2016; Bahar and Rapoport, 2016).

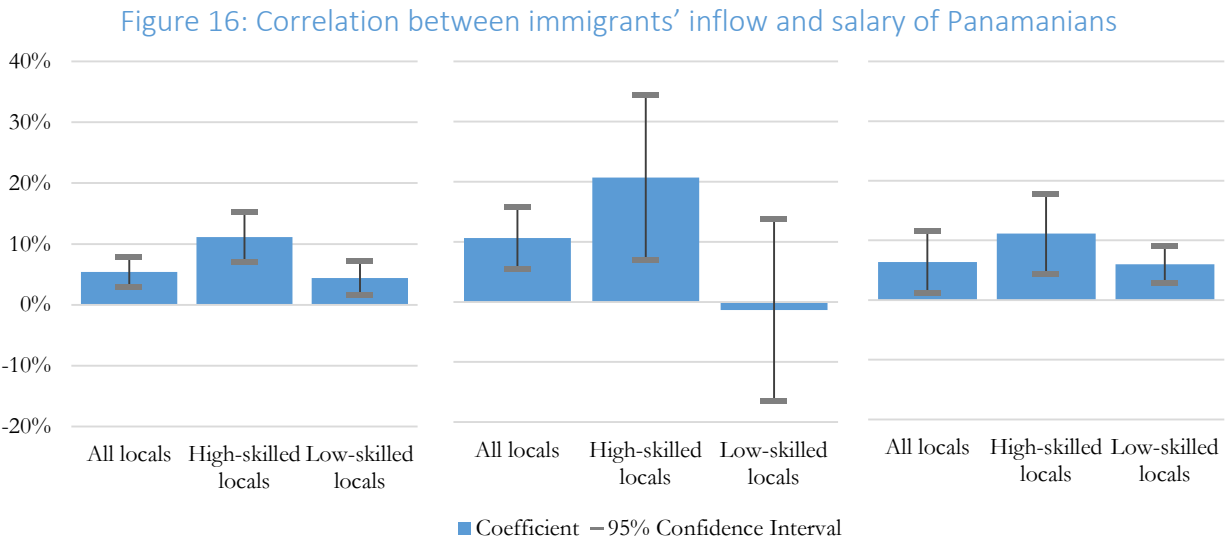
The best way to measure immigrant’s spillovers is to look at the job trajectory of immigrants in the host country, with data from the Social Security Administrator. However, as mentioned previously, during this project the Panamanian authorities in custody of this data (*Caja de Seguro Social de Panamá*) were highly reticent to grant us access. Hence, we were only able to run our analysis with data from the Population Census of 2000 and 2010.

If immigrants bring a set of productive skills, and if those skills are spread among local workers, their productivity can be increased, thereby increasing their wages. Following an extensive literature that seeks to measure the economic effects of immigrants on local workers (Borjas 2003, Card 2009; Ottaviano and Peri 2012; Basso and Peri, 2015; Card and Peri, 2016) we study the wages of Panamanian workers as a function of immigrant participation. In particular, we analyze the interaction of these two variables in a space defined by the industry and geographic location of the

workers, since it is in this space that we believe that there is more likely to be an effective diffusion of productive knowledge.

If our hypothesis about the diffusion of know-how is correct, we should find a positive and significant correlation between the wage of local workers and the inflow of immigrants. However, simple correlations do not necessarily reflect a causal relationship, since immigrants may simply be choosing industries and provinces where wages are already high. To mitigate this problem, we use a series of fixed effects at the level of industry and geographical location. We also extend our analysis by identifying those immigrants who work in industries where their countries of origin are competitive. In other words, if Panama receives a strong influx of Frenchmen with experience in the French wine industry, it is likely that over time Panamanians will acquire this tacit knowledge and become better at producing wines (Bahar and Rapoport, 2016).

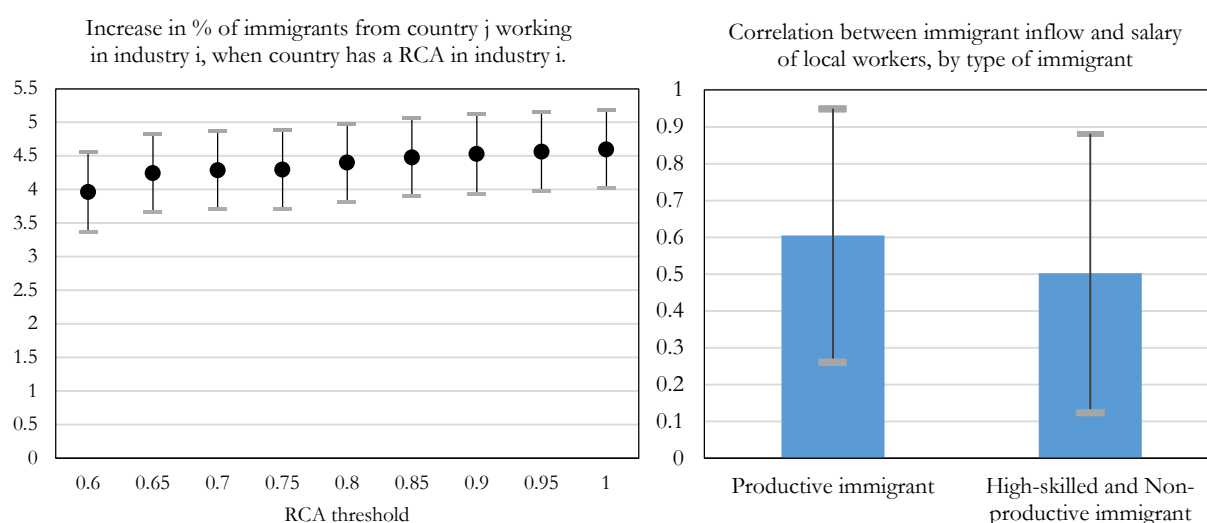
XX 17 shows the coefficient for the change in immigrants between 2000 and 2010 when the change in salary of Panamanians is regressed against it. All the OLS regressions show a positive correlation between the two variables, supporting the hypothesis that immigrants are increasing the productivity of local workers. By controlling for fixed effects at the level of industry and geography location, our results become more robust. However, we still cannot rule out other adjustment mechanisms that are affecting both the wages of Panamanians and the flow of immigrants in an industry-location cell.



Source: Own calculations based on Population Census 2010

We then classify immigrants based on the competitiveness level of the industry in which they work in Panama, in their country of origin. For this, we take the exports from the countries of origin of the immigrants and use the concept of Revealed Comparative Advantage (RCA) of Balassa (1965). If this index is greater than or equal to 1, it means that the country has a RCA in that industry. Therefore, we will call *productive* immigrants those immigrants who work in industries where their countries of origin enjoy a RCA. Our analysis shows two important results: (i) immigrants are more likely to work in just those industries where their countries of origin enjoy comparative advantages, and (ii) the effect of productive immigrants on the wages of Panamanians is significantly higher than that of highly qualified immigrants working in industries in which their home countries do not have a RCA (Figure 17). The combination of these two findings further reinforces our hypothesis that there is an effective diffusion of tacit knowledge or *know-how* from immigrants to local workers.

Figure 17: Industries of productive immigrants and their effect on local wages



Source: own calculations based on Population Census 2000, 2010 and WITS (World Bank)

Finally, we find that immigrants are more likely than Panamanians to become entrepreneurs (**Figure A- 6**). Entrepreneurs hire workers, invest in capital and technology and, above all, contribute to the economy of a country in several ways. In our specification, after controlling for different variables, the probability of becoming an entrepreneur increases by 4.8 percentage points when a worker is an immigrant. Given that the average rate of Panamanian entrepreneurs is only 1.7%, the results show that immigrants are, on average, 7 times more entrepreneurial than Panamanians.

7. Analysis of the results and final remarks

Our findings suggest that there are positive and significant spillovers from immigrants to local workers. As shown above, SEZ had played a catalyst role in this transmission by promoting the attraction of foreign brains into Panama. Here, PP stands out as a landmark example generating a large inflow of educated migrants that contrast with the average of firms elsewhere in Panama. Overall, SEZ are functioning as cranes that are not only moving brains geographically, but are acting as international transmitters of know-how. The Panamanian economy and its workers are the ultimate beneficiaries of this process. The enhanced stock of knowledge and skills is a significant asset for Panama, as tacit knowledge brought by expats can even expand and diversify the basket of product and services that Panama exports (Bahar and Rapoport, 2016).

Our findings become more relevant as we ran, within the course of our investigation, into a set of legal bottlenecks hindering the free flow of immigrants out of the SEZ. First, visas granted by immigrants in CK are to be given for only one year, are expensive (US\$ 2,000-US\$ 3,000), and do not add up years to apply for a residency permit in Panama. Second, in both PP and CK, when immigrants end a contractual relationship with their employers, their visas are immediately revoked with no chance to transition to other jobs inside or outside the SEZ. Finally, spread throughout several laws and decrees, Panama has a list of 27 occupations that are “only for Panamanians”, i.e. restricted to foreign born workers.²⁴ Moreover, since April of 2015 the Immigration Office of Panama, by request of the Panamanian Society of Engineers and Architects, is not accepting immigrants with any type of engineering degree. All these bottlenecks are minimizing the potential positive spillovers derived from the knowledge and skills of immigrants. Authorities should put special attention to these barriers, and consider them as an extension of the successful cases already registered in the history of Panama, in the banking sector, the Canal, the ports, or the airline business. The country has proved, time and again, how important are immigrants to the development of the economy and has displayed a substantial ability to attract them, retain them, and help their knowledge and capacities to spillover to the domestic economy. In the next section we summarize the most significant constraints that are preventing the knowledge to spillover, and propose policy guidelines to overcome them.

²⁴ There is a list of 27 occupations, stated by different laws, restricted to immigrants. Among these occupations are Nurses (Law 1 of 1954); Dentists (Law 22 of 1956); Agriculture Sciences (Law 22 of 1961); Architects (Law 15 of 1959); Doctors (Decree 196 of 1970); Economists (Law 7 of 1981); Lawyers (Law 9 of 1984); Chemists (Law 45 of 2001); Educators in the areas of history, geography and civic education; and all types of Engineers.

5. Conclusions and policy recommendations

Have the SEZ been a successful policy intervention in Panama? Looking at their *static* benefits, the answer is affirmative. They have successfully attracted foreign investment and human capital into the country together with providing stable and well-paid jobs for Panamanians. Firms within these zones tend to be relatively more productive, suggesting that firms within SEZ benefit from agglomeration forces such as transport cost savings, a common pool of high-skill workers, and shared infrastructure (Glaeser, 2010). And yet, there are still a series of constraints that are preventing SEZ from truly disseminating structural transformation. Restrictions to foreign workers in terms of hindrance of free flow across firms, hefty fees for visa renewals, restricted occupations, or inability to accumulate years for permanent residence, must be addressed by the authorities if they ultimately want to leverage on SEZ to foster development throughout the country.

Colon Free Zone stands out as one of the pillars of the Panamanian economy, representing around 4% of total GDP. More importantly, it represents an invaluable source of stable and well-paid jobs for low skill workers in a province with one of the weakest labor markets of the country. However, several bottlenecks are preventing to take full advantage of the CFZ potential. First, the zone lacks migratory benefits, which is thwarting its ability to attract foreign high-skilled workers. Second, authorities should evaluate the implementation of mechanisms to attract more FDI targeted in Transportation and Logistics, as this sector should be one of the spearheads of the future growth of Panama (Hausmann, Morales, and Santos, 2016). At last, the declining volumes registered in last years, have stressed the need to guarantee an appropriate cost-benefit balance to firms hosted in CFZ.

Panama-Pacific has already in place attractive tax, labor and migratory benefits. So far, the large number of firms installed in the former Howard base (around 250) insinuates these benefits have generated private returns. However, the government of Panama should take a closer look at the activities generated by these firms and assess whether they are enabling the level of skills and know-how of the local economy. First, authorities should evaluate if the 12 pre-established sectors defined by the World Bank ten years ago, are still relevant to the country's growth strategy. Second, large investments in infrastructure related to business services – the one-stop building and the onsite customs office – represent a significant source of efficiency for firms within Panama-Pacific and could be shared with firms outside the zone. Finally, migratory benefits of PP should be revised to

facilitate the free flow of immigrants, both inside the zone and from the zone to the rest of the economy.

City of Knowledge has been successful in attracting high-tech firms and position itself as the main technology hub in Panama. However, the zone has a series of frictions that are deterring technology and knowledge spillovers to the local economy, preventing CK to become a driver of innovation for the rest of Panama. First, firms within CK are focusing their activities towards research and development and they are not encouraged to move to commercialization and sales of their products. This is inhibiting firms' capacity to generate positive returns, ultimately hindering their ability to aggregate new and more complex products to the economy. Furthermore, we found no functional synergies among firms within CK, neither with the academic institutions within the zone.²⁵ Lastly, CK visas do not respond to a logic of maximizing immigrants' spillovers. Visas are expensive, of short duration, do not allow to accumulate residency years and do not consider worker's dependents. Ideally, CK should transition to a more flexible, modern visa scheme, similar to the one of Panama-Pacific.

A common problem across the administrations of these three SEZ is a lack of firm-level data to measure performance. Knowledge and innovation diffusion is at the core of City of Knowledge mission; however, the administrators do not record data related to patents generation or even on research and development expenditures of firms. Likewise, although the law that created Panama-Pacific establishes that the main goal of this area is to increase the economy's competitiveness, Panama-Pacific Agency does not register systematic data neither of firm's productivity nor workers' performance. If the government of Panama wants to situate its SEZ at the center of its development strategy, more efforts need to be done in terms of evaluating desired outcomes.

Hosting around 3,500 firms and generating more than 30,000 jobs, the three Special Economic Zones analyzed in this paper have been relevant actors in Panama's story of success. So far, these place-based policies have been effective in attracting both local and foreign firms. However, what the government should ultimately care about are social, not private returns. Therefore, it should take a closer look at the type of products and activities generated by firms within these zones and particularly, to the formal links between these firms and the rest of the economy. In this paper we devoted special attention to a particular link; i.e. the spillovers generated by high-skill immigrants

²⁵ There have been some attempts but of small scale and short duration. The example of CAPATEC –a consortium of computer services companies– points in the right direction.

attracted by these zones. If the government of Panama wants to uplift the role of SEZ in the development strategy of the country for the coming years, several constraints and frictions need to be released in this front.

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Annexes

Figure A- 1: Ten largest FDI projects in Panama

company	year	capex	jobs	subsector
First Quantum Minerals	2014	6400	3000	Copper, nickel, lead, & zinc min
SkyPower	2015	1000	179	Solar electric power
Wind 7	2008	700	125	Wind electric power
London & Regional Properties	2007	700	3000	Real estate services
Qatar Petrochemical Company (QAP)	2007	653.1	146	Petroleum refineries
Du-Temp	2007	653.1	146	Petroleum refineries
Union Eolica Espanola	2013	440	79	Wind electric power
InterEnergy Holdings	2014	427	76	Wind electric power
Wind 7	2008	400	72	Wind electric power
Trump	2009	400	2835	Accommodation

Source: FDI Markets database, Financial Times

Figure A- 2

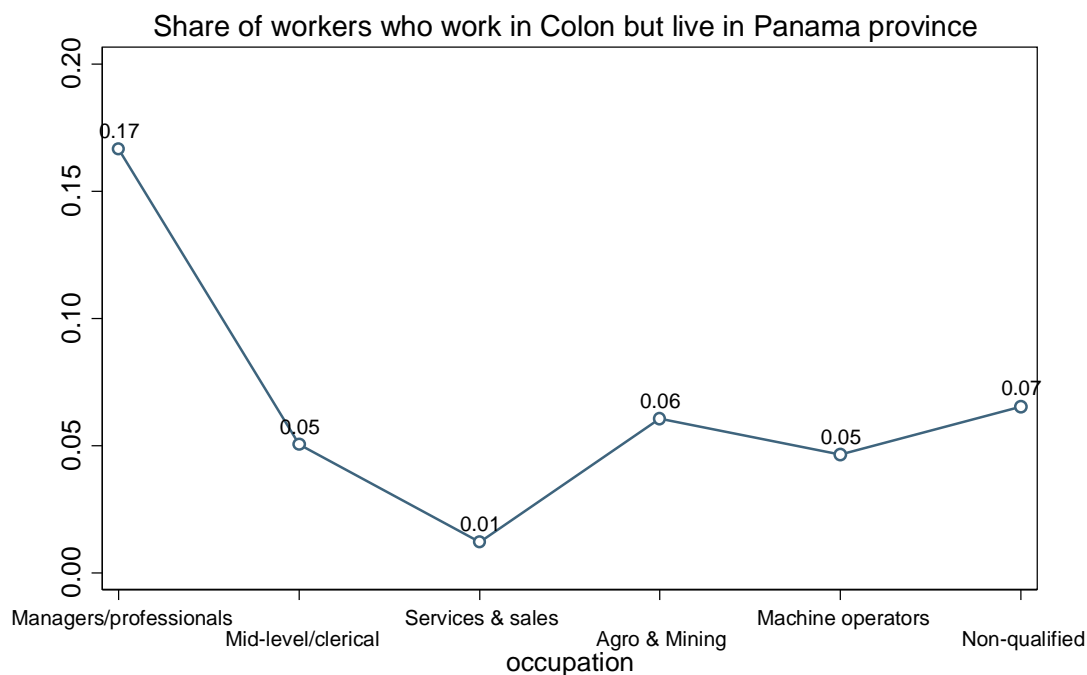


Figure A- 3: Immigrant wage premium by industry and occupation

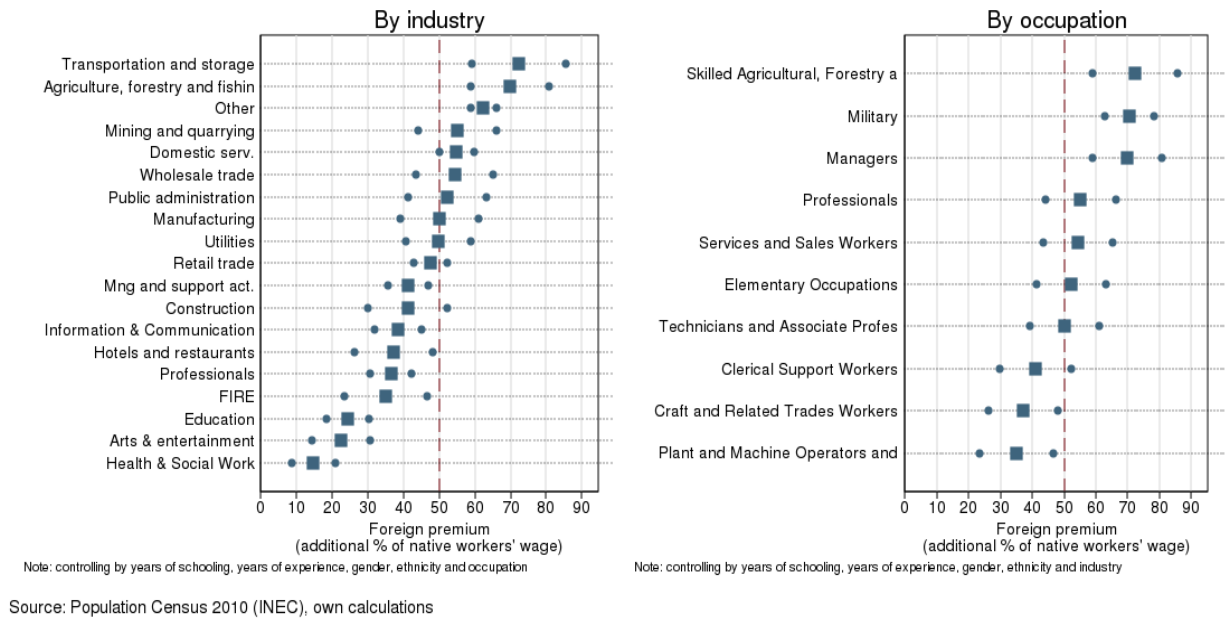


Figure A- 4: Managerial occupations (4-digits level) with highest share of immigrants

occup_name	tot_workers	share_immigrant
Gerente de empresa de producción de muebles	25	64%
Director regional o provincial de empresa	27	63%
Gerente de empresa de producción de cemento	17	59%
Gerente general de empresa de cuidados personales	7	57%
Gerente de empresa de productos de metal	15	53%
Director general de empresa de transporte	17	53%
Director de empresa de telecomunicaciones	29	52%
Director de empresa de comercio exterior (importación y/o exportación)	33	52%
Presidente de empresa	201	46%
Gerente general de comercio mayorista o minorista	203	45%
Gerente de empresa de comercio exterior (importación y/o exportación)	284	45%
Director de empresa constructora	82	44%
Gerente de comercio mayorista o minorista	862	31%
Gerente de hotel	341	30%
Gerente regional o provincial de empresa	252	28%
Gerente de centro comercial	178	28%
Gerente de empresa de telecomunicaciones	234	27%
Gerente de empresa constructora	645	26%

Source: Population Census 2010

Figure A- 5: Professional occupations (4-digits level) with highest share of immigrants

occup_name	tot_workers	share_immigrant
Ingeniero de minas	19	47%
Asesor de inversiones	186	39%
Ingeniero en imprenta	11	36%
Geólogo	57	35%
Diseñador de prendas de vestir (excepto calzado)	106	28%
Ingeniero químico	55	27%
Consultor legal	89	27%
Ingeniero civil en construcción de carreteras y calles	49	27%
Ingeniero civil en dragado	19	26%
Consultor de negocios	685	26%
Ingeniero mecánico	265	24%
Consultor de sistemas informáticos	381	22%
Ingeniero hidráulico	38	21%
Asesor administrativo	305	20%
Ingeniero mecánico en aeronáutica	61	20%
Ingeniero en telecomunicaciones	383	15%
Ingeniero civil	2632	14%

Source: Population Census 2010

Figure A- 6: Probability of immigrants of becoming entrepreneur

Dependent variable is dummy for <i>patron</i>												
	All immigrants				High school diploma or higher				College diploma or higher			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
immigrant	0.0570***	0.0504***	0.0468***	0.0476***	0.0459***	0.0384***	0.0357***	0.0364***	0.0366***	0.0278***	0.0259***	0.0264***
	(0.00106)	(0.00103)	(0.00102)	(0.00102)	(0.00119)	(0.00117)	(0.00117)	(0.00118)	(0.00146)	(0.00145)	(0.00145)	(0.00145)
Observations	1,164,601	1,164,601	1,164,599	1,164,599	1,164,601	1,164,601	1,164,599	1,164,599	1,164,601	1,164,601	1,164,599	1,164,599
R-squared	0.016	0.026	0.037	0.038	0.009	0.021	0.033	0.034	0.006	0.018	0.030	0.032
Occupation FE	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	4-digits	4-digits	NO	NO	4-digits	4-digits	NO	NO	4-digits	4-digits
Province FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

All models control for schooling, work experience, gender and race. HH services and Public Administration industries do not included.