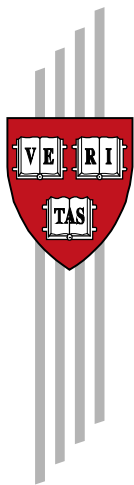


Special Economic Zones in Panama: Technology spillovers from a labor market perspective

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October 2016 (Revised May 2017)

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Working Papers

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Executive Summary

Over the past decade, Panama has experienced remarkable economic progress, having doubled its income per capita in the span of ten years. Panama has excelled at nurturing a competitive service sector for all Canal-related activities such as logistics, transportation, financial services, communications and trade. In parallel, the Panamanian government has 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 SEZs in Panama: Colón Free Zone, Panama-Pacific and City of Knowledge.

Colón Free Zone (CFZ) was created in 1948 as an import/re-export zone and today is the second largest SEZ in the world. CFZ is located on the Atlantic side of the Panama Canal, employs 30,000 workers, and its net exports account for 4% of Panama's GDP. The main economic activity of firms within this zone is retail and wholesale, followed by logistics 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 over one hundred firms, 40% of them foreign. Multinational heavyweights such as 3M, Dell, and Caterpillar have already relocated part of their regional operations to PP.

Finally, on a former military base close to the Canal, City of Knowledge (CK) emerges as a technology park, hosting an array of medium/small technology firms, the United Nations Development Program (UNDP) regional headquarters, and a college campus.

These three SEZs differ in nature as well as in their objectives, so their respective impact on the local economy should be assessed individually. That said, there are several metrics common to all three, such as employment and foreign investment – which can be analyzed in a comparative way. In this paper, we take a two-pronged approach in measuring the benefits derived from SEZs. 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 SEZs. This approach is limited to data compiled *within* the zones, and is therefore a very partial way to appraise SEZs.

A more comprehensive approach must assess the impacts of SEZs beyond their boundaries. In this regard, SEZs can only be deemed successful if they encourage technology spillovers or knowledge diffusion that enable the local economy to acquire new productive capabilities (Hausmann et al.,

2014). Our analysis seeks to gauge whether SEZs are fostering structural transformation within the Panamanian economy by appraising their ability to attract high-skilled immigrants with new productive capacities, who, in turn, generate positive spillovers for local workers.

When it comes to attracting FDI, Panama outperforms most Latin American countries. However, the role of SEZs in this success story is relatively modest. While foreign capital inflows to the country have been steadily increasing, the share of total SEZ-related FDI is small, and has decreased steadily since 2007. Moreover, only one out of the ten largest FDI projects undertaken in Panama over the last 12 years is linked to SEZs. Although SEZs, PP in particular, have indeed attracted foreign firms, they have not been the main driving force behind FDI flows into Panama.

Although they represent a small fraction of total employment, SEZs are a source of stable and well-paying jobs for Panamanian workers. Jobs within SEZs consistently benefit from lower levels of informality and self-employment, and fewer defined-term contracts. Salaries are also higher within SEZs, with PP standing out as the zone with the largest wage premium. We find that the bulk of this wage gap is not explained by worker characteristics, but rather, by an unobservable component, probably related to firms' productivity. A thorough econometric analysis – controlling for a set of characteristics at the firm level – confirms the hypothesis that firms within SEZ in Panama are indeed relatively more productive.

Finally, we evaluate the knowledge spillovers derived from immigrants in Panama. We find that immigrants in Panama are more educated, more likely to be entrepreneurs, work in industries that are more complex and earn higher wages than nationals. We formally test immigrant-to-nationals spillovers using econometric tools in order to establish a causal relationship between the share of immigrant employees 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 SEZs are functioning as channels that are not only moving people across borders, but are also transmitting know-how, benefitting Panama and its workers. As such, SEZs represent an enormous asset for Panama, as knowledge brought in by expats can expand and diversify Panama's export basket of goods and services (Bahar and Rapoport, 2016). In order to fully seize the dynamic benefits of SEZs, Panama needs to formulate policies aimed at maximizing spillovers, easing the flow of productive knowledge between SEZs and 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 incentive (Farole, 2011). Although this paper will refer indistinctly to these zones as Special Economic Zones, we must nevertheless establish the distinctions between each specific term. Free Trade Zones or Export Processing Zones usually refer to places exclusively focused on the import and re-export of tradable goods. Typically, these places take the form of entry ports or industrial parks close to borders, aimed at connecting the local economy to world trade. Larger-scale Special Economic Zones, which started to grow in 1980, combine residential, commercial and industrial activities for the same purpose. Finally, Science and Technology Parks serve as clusters of innovation and technology, which can ultimately upgrade the industrial capacities of the host country (Rodriguez-Pose and Hardy, 2014).

Special Economic Zones (SEZ) are not new, both in the developing and the developed world, and their origins can be traced back to the XVI and XVII centuries in Gibraltar and Singapore (FIAS, 2008). The main promoter of SEZs in the post WWII neo-liberal era has been China. Since 1979, more than 2,700 SEZ ranging from free trade areas to technological parks have been created in China, mainly around its coastal cities (Sigler, 2014). Other countries in South East Asia, such as Malaysia, South Korea, Sri Lanka and the Philippines, have also adopted SEZs as part of their economic policy toolkit.

In the Americas, Panama has been a pioneer in the creation of SEZs. In 1948, it established the Colón Free Zone (CFZ), an exclusive import/re-export area, in response to the economic decline of the city of Colón after WWII. By 2009, CFZ handled a total of \$8.5 billion, making it the largest free trade zone in the Western hemisphere and the second largest in the world, after Hong Kong (Sigler, 2014). CFZ specializes in the import and re-export of tradable goods throughout the Americas.

Later in the 2000s, when the United States government handed the Canal over to Panama, it left behind a group of military and civilian areas that today serve as sites for two more SEZs: City of Knowledge (CK) and Panama-Pacific (PP). CK, which began operating in 2000, is a 120-hectare science and technology park, aimed at building an international platform of knowledge creation and diffusion. It is mainly comprised of 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 U.S. military airbase – and today spreads throughout 1,400 hectares.

This paper will focus its analysis on the three Panamanian SEZs described above, which vary in size and nature. All in all, the 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 SEZs analyzed in this study.

One salient feature of SEZs around the world is the upward trend of private ownership and operation. While in the 1980s, less than 25% of SEZs worldwide were private, by 2008, this share was 62% (FIAS, 2008). Over time, administration of SEZ under a public-private partnership (PPP) arrangement has also become increasingly popular. SEZs in Panama have followed the same trend, with two SEZs managed under a PPP scheme (Panama-Pacific and City of Knowledge), and only one (Colón Free Zone) remaining under government administration.

Regardless of specific differences in size and type, all SEZ share a single common purpose: to attract foreign and/or local investment to bolster economic growth over time. Economic literature has identified four main objectives for SEZs (Engman et al., 2007; FIAS, 2008; Farole, 2011):

1. Attracting foreign direct investment (FDI).
2. Providing a laboratory for experimentation to achieve a policy objective which can later be scaled.
3. Acting as catalysts for structural transformation and ultimate diversification of the local economy.
4. Serving as regional pressure valves for increasing employment in disadvantaged areas.

SEZ benefits can be categorized into two broad groups: static, and what we will refer to as dynamic benefits. Static benefits are flows that occur within a specific timeframe and are relatively easy to measure. FDI, employment, and government revenues are all static benefits. Dynamic benefits are typically technology and knowledge spillovers derived from the existence of SEZs. These effects take more time to materialize and are therefore not circumscribed to a specific year. While there is abundant relevant literature assessing the static benefits of SEZs (Warr 1989; Chen 1993; Jayanthakumaran 2003; Mongé-Gonzalez et al., 2005), to our knowledge, there are no studies focusing on measuring dynamic benefits of SEZs.

Criticism of SEZs tends to focus on their operation as enclaves within the local economy, where incentives exclusively target trade flows between SEZ firms and the international market (e.g. import/export tax incentives). Hence, SEZs are often categorized as economically sub-optimal policies since they benefit a few and distort resource allocation (Engman et al., 2007). Panamanian SEZs are not exempt from this criticism. For example, while Colón Free Zone (CFZ) employs around 23,000 workers (21% of the province's total employment), the unemployment rate of Colón province is still the highest in the country, reported at 10.6% as of July of 2016.¹

In order to determine whether SEZs are a successful policy tool, it is not enough to measure static benefits alone, as firm-level investment and employment decisions are not fully representative of the total benefits that the Panamanian economy is reaping from its SEZs. Our approach focuses on linkages generated between SEZ firms and the local economy, instead. We evaluate the success of SEZs as policy tools based on whether they encourage technology spillovers or knowledge diffusion that enable the local economy to acquire new productive capabilities (Hausmann et al., 2014). Under this lens, SEZs are only valuable to the Panamanian government if they act as stepping stones for national strategies of productivity upgrading, industrialization and/or export diversification. It is there, in the most dynamic aspects of SEZs and their interaction with the rest of the economy, where the true potential for igniting a structural transformation lies, and where we will focus our efforts.

This paper is organized as follows: Section 2 describes the characteristics of the three SEZs analyzed in this study; Colón Free Zone, Panama-Pacific and City of Knowledge. Section 3 presents an assessment of the static benefits of these zones in terms of FDI, job creation, and firms' productivity. In Section 4 we delve into the dynamic benefits of SEZs, focusing on a specific transmission channel: knowledge spillovers of immigrants attracted by SEZs. Section 5 outlines a set of policy recommendations to maximize the productive and knowledge spillovers that emanate from Special Economic Zones.

¹ Source: INEC, Panama.

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

	Colón 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\$1,000	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 operations; 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.

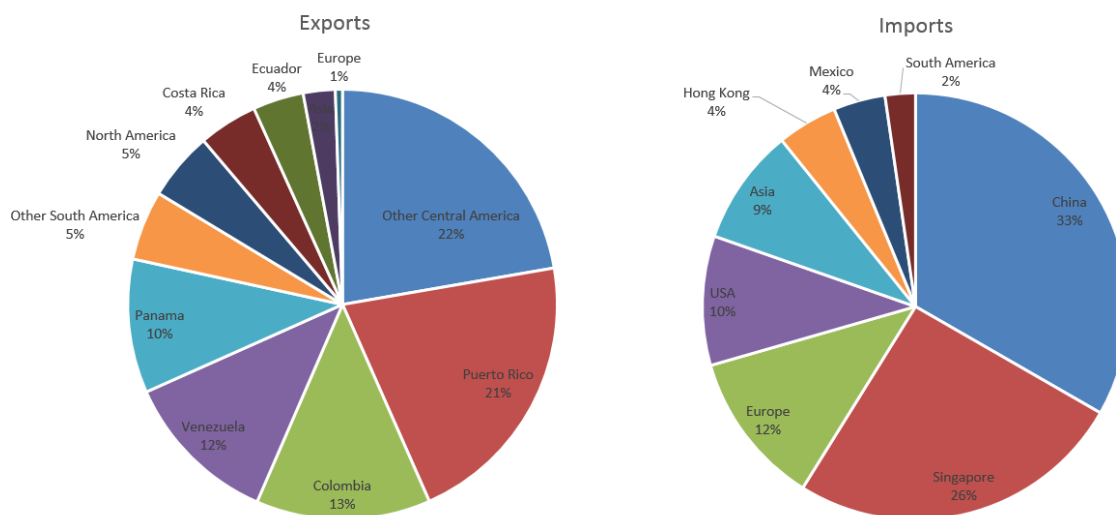
Source: own creation based on current legislation of SEZs in Panama.

2. Overview of the Special Economic Zones in Panama

2.1 Colon Free Zone (CFZ)

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

Figure 1: Exports and Imports of Colón Free Zone



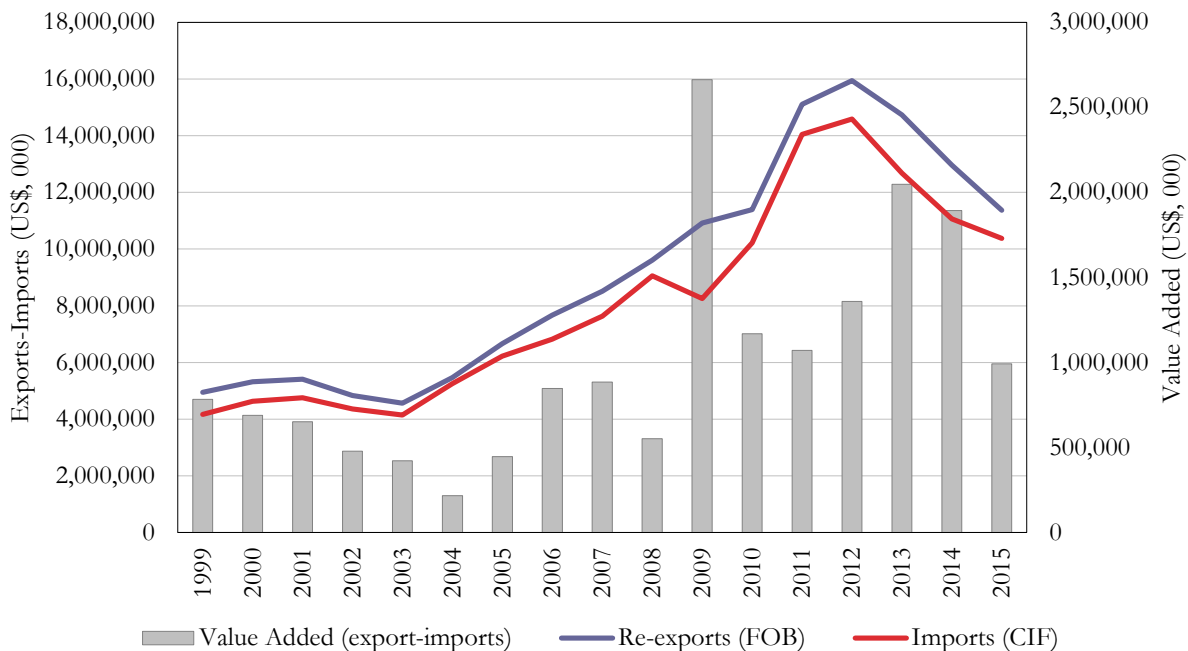
Source: INEC, Panama

In 2015, over 60% of total CFZ imports came from just two countries: China and Singapore, while 50% of re-exports were concentrated in Central America (**Figure 1**). In 2012, CFZ trade volume reached a peak, totaling US\$ 15.9 billion in re-exports, and US\$ 14.6 billion in imports. Since then, both re-exports and imports have been decreasing at a steady pace (**Figure 2**). By 2015, re-exports decreased by 30% compared to 2012, reaching a total of US\$ 11.4 billion. This negative trend can be explained by a slowdown in regional trade mainly driven by the deteriorated economic situation of Venezuela (CFZ's third main export destination) and new import taxes imposed on clothes and

shoes by Colombia (CFZ's second largest export destination).² This slowdown is also evident in the decrease of the value added (exports minus imports) generated by the zone, which by 2015 was only 992 million dollars, the lowest since 2009.

Today, firms complain that they have lost competitiveness because tax breaks granted to CFZ are not as generous as those enjoyed by other Panamanian SEZs. In addition, a controversial operation and services fee, implemented on a fixed scheme when the CFZ was booming, threatens firms' profitability,³ since CFZ economic activity is in decline (**Figure 2**) and such fees represent a high share of tenants' income.

Figure 2: Colón Free Zone re-exports and imports



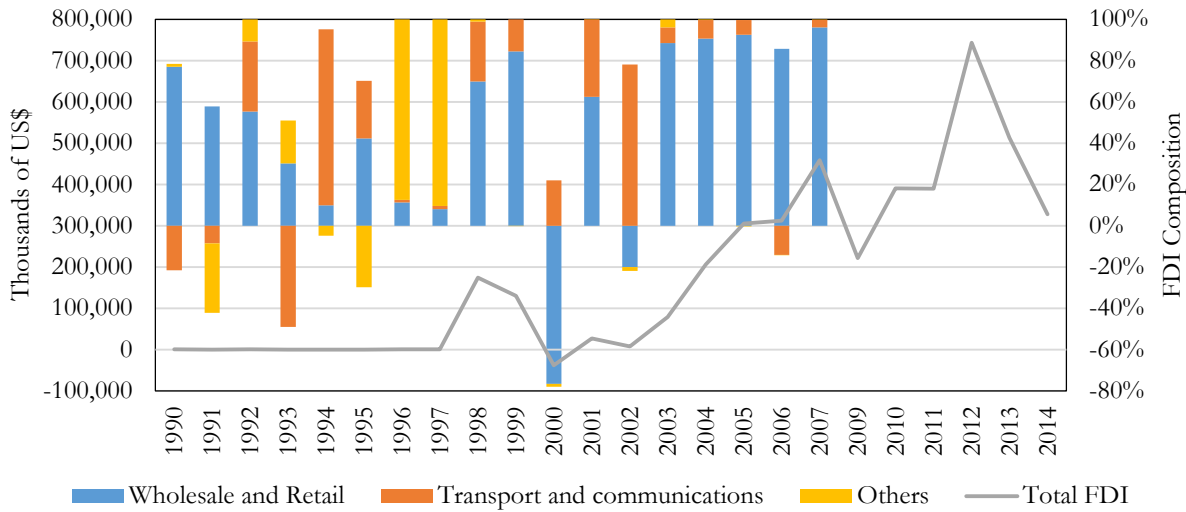
Source: INEC, Panama and WDI

From the early 2000s to 2013, the net flow of FDI directed at CFZ increased significantly, totaling over 700 million in 2012 (**Figure 3**). However, in 2014, these flows plummeted down to 2004 levels. The lion's share of this FDI has gone to wholesale and retail activities, which are the primary functions of CFZ.

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

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

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, the previous three years (2012-2015) saw 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 U.S. Howard Air Force Base and Fort Kobbe. It was created under Law 41 of 2004, which describes the zone’s main goal 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 Arraijan,⁶ on the west side of the Canal, PP hosts a business and industrial park, several housing projects, shopping malls, a special customs regime, four schools, two training centers, an international airport, and a “one-stop-shop” comprised of 18 government agencies to lighten the administrative burden for companies. The Panamanian government leased PP’s management to a private developer, London and Regional Properties, through a 40-year contract.

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

⁵ Superintendencia de Bancos, Panama

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

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 direct and indirect.⁷ However, when products are commercialized within the National Fiscal Territory, direct taxes (duties on income, dividends and money transfers) are applied, with the only exception of high-technology manufactured goods.⁸ In addition, companies can benefit from special immigration standards in which investors, workers, and their families are granted special visas. The arrangement allows for a tax-free, one-time import of any personal and domestic belongings for foreign workers. Finally, the zone grants exemptions in labor regulations, allowing 24/7 operations, an overtime fixed rate of 25% of base salary, and a special ceiling on the proportion of workforce from outside Panama (**Table 1**).

To date, 251 companies are registered in PP, generating 2,305 direct jobs.⁹ 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 operations in PP, attracting a substantive number of expats. In this regard, the special visas offered by PP seem like a step in the right direction, as the share of immigrants within PP is almost three times higher than the share of immigrants in Panama province.¹⁰ In particular, PP offers two types of visas; one for workers, and another for investors, both lasting a maximum of five years. However, immigrants are only eligible to apply for resident status if they previously hold an investor's visa.¹¹ The fact that PP expats cannot 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, spreading their knowledge outside PP.

⁷ The 12 activities were defined by a 2005 World Bank International Finance Corporation study, aimed at advising the Panama government in the development of PP. These activities are: back office operations; 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 All the tax exemptions described in Table 1 correspond only to exports, but not for merchandise sold within the national territory. In the latter case, only high-technology products and processes are exempted from taxes.

⁹ Panama-Pacific Agency, July 2016.

¹⁰ 2010 Population Census of Panama.

¹¹ Law 41 of 2004 is only explicit in terms of permanent residence permits in the case of Investor Visas (Article 101).

2.3 City of Knowledge (CK)

What once was the U.S. Clayton military base, today hosts a thriving community of firms, research centers, academic institutions and NGO's known as City of Knowledge. Located near the Panama Canal, and founded in the year 2000, CK offers an environment aimed at promoting innovation, culture and human development. The infrastructure of this technology park is a mix of old 1920's five-story buildings left behind by the US military, and modern facilities. The zone is home to a group of 75 small and medium companies ranging from computer software developers such as Infosgroup, to nano-technology labs like Nano Dispersion, to worldwide pharmaceutical leaders such as GlaxoSmithKline. In addition, CK is home to UNDP regional headquarters, a Florida State University satellite college campus, and two public institutes: SENACYT, a government entity that promotes R&D, and INDICASAT, a lab for scientific and technological progress. By 2015, the private firms located at CK employed 1,290 workers.¹²

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

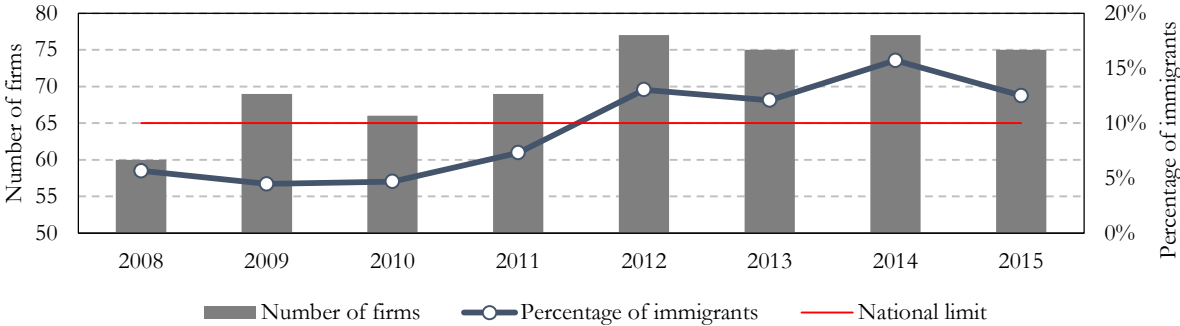
Firms hosted by City of Knowledge benefit from tax discounts and a special migratory regime, in the same way other Panama SEZs do. The exoneration of import and sales taxes are particularly beneficial for CZ enterprises, given the capital input-intensive nature of technology firms. In addition, firms that commercialize high-technology products or services are fully exempted from any other duties (**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 (the national limit of 10% does not apply), an exception that is highly valued by firms. Tenants who were interviewed reported that foreign workers bring a set of skills that are

¹² 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.

not found in Panama. Moreover, since 2012, the national cap of 10% foreign human capital has been surpassed systematically in CK, suggesting that high-skilled labor is indeed a binding constraint for these firms that has been overcome (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

As an SEZ, 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 inhibit 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. Regarding the former, a series of interviews conducted with CK tenants revealed the absence of functional synergies among firms, as well as a lack of linkages between academic institutions within the zone. Even though CK requires constant innovation for firms within the zone, there are no objective metrics to monitor any indicator of innovation or knowledge transfer.

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 within the CK does not accrue for Panamanian residence, which ultimately hinders the free flow of immigrants to the domestic economy. Finally, most of CK firms’ operations gravitate 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 properly assess the FDI impacts of SEZs, we would ideally need a valid counterfactual.¹³ We looked at several FDI metrics, contrasted Panama's FDI trend with the region's, and valued greenfield FDI projects. Our findings suggest that, even when successful in attracting foreign capital, SEZs have not been the workhorse behind the massive FDI inflows registered over the last ten years in Panama.

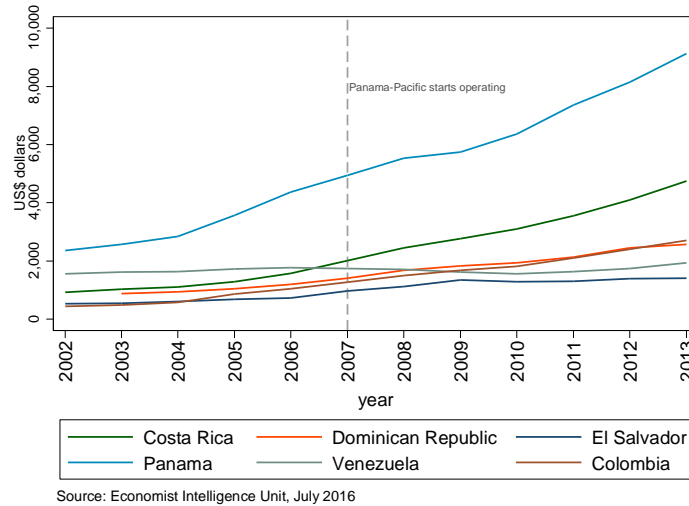
Since the early 2000's Panama has experienced a large increase in FDI. While in the year 2000, FDI inflows accounted for US\$830 million, by 2015, FDI totaled US\$5.8 billion.¹⁴ Panama has been successful in attracting foreign investors for various reasons: political and economic stability; security; trade liberalization; the creation of a business-friendly environment with low taxes; and a privileged geographic location. **Figure 5** shows how Panama outperformed almost all its neighboring countries in FDI. By 2013, the current stock of FDI per capita in Panama was US\$8,000, doubling that of Costa Rica (neighboring country with second-largest stock of FDI per capita).

What role do SEZs play in Panama's FDI story? Although it is hard to know precisely, we can observe that the spike in Panama's FDI in the year 2004 occurred three years before PP started operating, and during a year in which CFZ attracted less than US\$500 million in FDI, suggesting that SEZs were not the main driver of capital inflows.

¹³ The counterfactual is the amount of FDI that Panama would have received had it not created any of its Special Economic Zones.

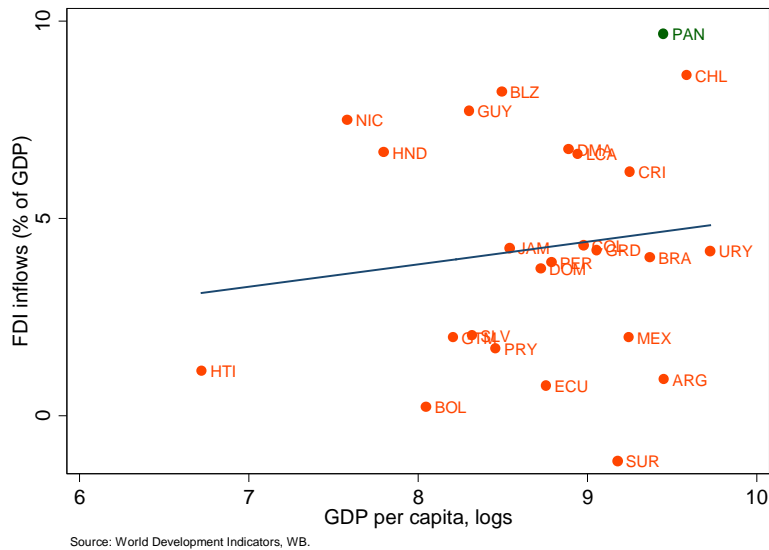
¹⁴ World Development Indicators, World Bank.

Figure 5: Stock of FDI per capita in the region



Compared to the rest of Latin American countries, Panama 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 capital. By 2014, FDI accounted for almost 10% of the country’s GDP, suggesting that international investors have strong confidence in the strength of Panama’s economy.

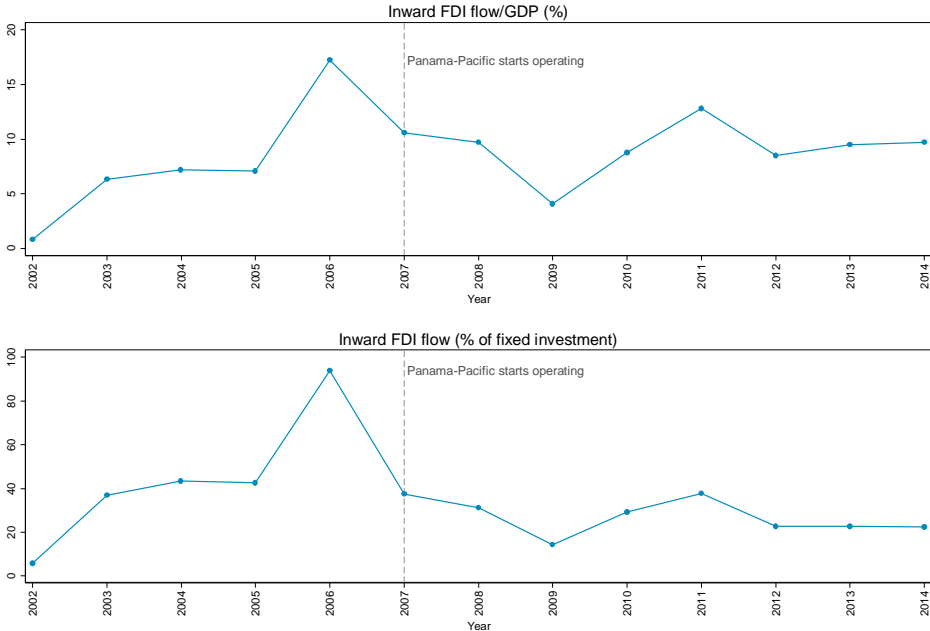
Figure 6: Inward Foreign Direct Investment of LA countries, year 2014



FDI, however, cannot be considered the main driver of investment or of GDP growth in Panama during the last fifteen years (**Figure 7**). In fact, after reaching a maximum in the year 2006, FDI as a share of investment and as a share of GDP in Panama slightly decreased. FDI inflows went from

90% and 40% of total investment in 2006 and 2007, respectively, to roughly 20% in 2014. Likewise, FDI accounts for less than 10% of present-day GDP. These two measures reveal that the relative importance of FDI in Panama’s total output has been stagnant, and has played a secondary role in the country’s economic boom over the past 10 years.

Figure 7: FDI share of GDP and investment in Panama



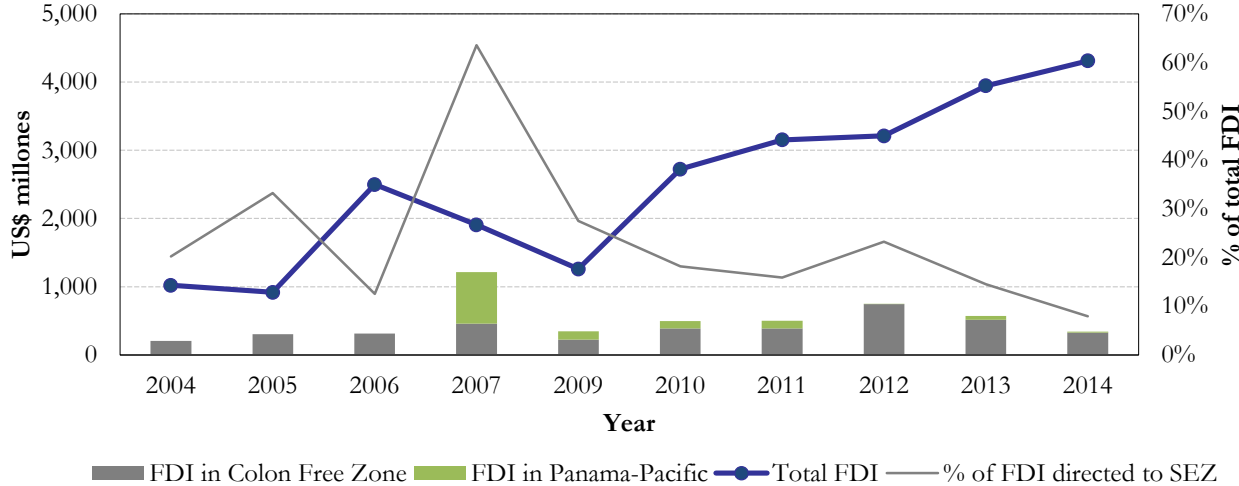
Source: Economist Intelligence Unit, July 2016

Using data from the National Statistical Office (INEC for its Spanish acronym) and the FDI Markets database,¹⁵ we found that the share of FDI directed to SEZs in Panama accounted for only 8% of total FDI in the year 2014 (**Figure 8**). Over the decade 2004–2014, the share of FDI directed to SEZs has been low, with the exception of the year 2007, when it reached a peak of 40%. It is worth noting that the bulk of FDI for that year corresponds to a US\$700 million investment by PP’s developer, London and Regional Properties. This investment will fully materialize over the course of the 40-year contract between the developer and the Panamanian government, which lasts until the year 2047.

¹⁵ 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.

As for FDI within specific SEZs, we can observe that the bulk of foreign capital in CFZ goes towards wholesale and retail activities, followed by logistics and transportation. PP, in turn, has already benefited from investments of several foreign companies, namely Hewlett-Packard (US\$111 million), BASF (US\$64 million), the Bank of Nova Scotia (US\$62 million) and 3M (US\$52 million), in addition to the aforementioned developer’s US\$700 million 40 year investment.

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, SEZs in Panama have been successful in attracting foreign capital, within the context of large capital inflows directed towards Latin America. 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. Upon assessing SEZ investment as a share of total FDI, we did not find compelling evidence suggesting that without SEZs, aggregate FDI would have been significantly lower. Moreover, the relative contribution of CFZ and PP to total FDI has been decreasing steadily since 2007, and only one of the ten largest FDI projects in Panama in the last 12 years is related to an SEZ (Figure A- 1).

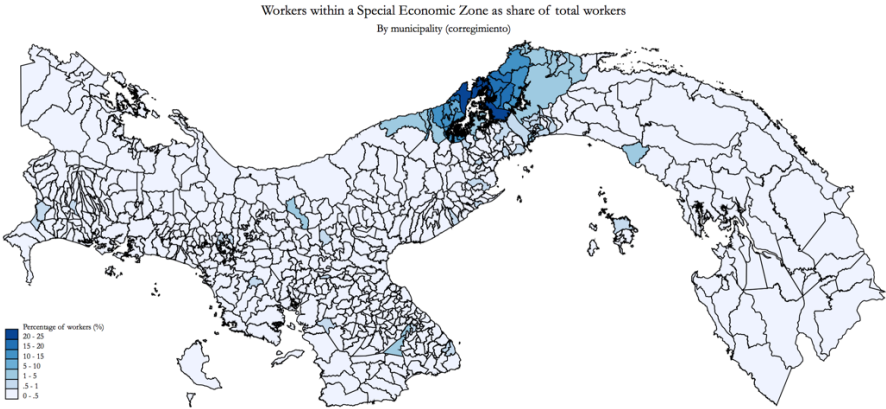
3.2 Employment

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

By 2010, CFZ and PP employed a total of 21,773 workers, which accounts for only 1.7% of total employment in the country.¹⁶ While the number of jobs in SEZs almost doubled over a period of ten years, SEZ employment as a share of total employment remained the same. From a static perspective, it would seem that SEZ employment was driven by the rest of Panama instead of employment growth in Panama being driven by SEZs. The assessment of a different causality would necessitate looking at the spillovers from SEZs, which we do in Section 4.

Among the three Panamanian SEZs, CFZ stands out as the most important employer (**Figure 9**), accounting for over 70% of total SEZ jobs. Despite the 30,000 jobs that CFZ currently generates, Colón 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 for critics who consider SEZs to be 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 municipality



Source: Own calculations based on Population Census 2010

Table 2 comparatively illustrates the quality of jobs offered by firms within and outside of SEZs for Colón and Panama provinces, respectively. The data shows that firms within SEZs benefit from lower levels of informality and self-employment, and fewer defined term contracts. It’s also evident that there are enormous differences in the distribution of jobs by type of occupation, both between

¹⁶ We use data from the 2010 Population Census to identify workers in CFZ and PP, based on industry classification and location. Panama uses the CIU Rev4 with minor adaptations. Particularly, it identifies industries exclusively related to SEZ activities.

CFZ and PP, and between SEZs and other firms within the same provinces. In CFZ, one in every three workers is non-qualified, as opposed to one in every four workers elsewhere in the Colón province. Conversely, in PP, the non-qualified occupations only account for 9% of total jobs, a share three times smaller than in CFZ and twice as small as in other non-SEZ firms in Panama province. 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 in CFZ.

Table 2: Quality of jobs in SEZ

	Outside SEZ	Within SEZ
Colón 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 types of occupations directly affects wages in CFZ, which are, on average, less than half than those in PP and only 7% higher than wages elsewhere in Colón province. Panel A in **Table 3** shows wages in the Colón province for firms within and outside CFZ. It is remarkable that wages for occupations that require relative high skills –such as mid-level technicians, managers and professionals – are not higher within CFZ relative to elsewhere in Colón (they are significantly lower for mid-level technician and clerical positions).¹⁷ Therefore, the (positive) wage gap between firms

¹⁷ The wages of managerial and professional occupations within Colón Free Zone may be underestimated. We identify CFZ workers as those who live within Colón province and declare that they work with a Free Trade Zone. However, the

within CFZ and other Colón firms is mainly driven by a wage premium in service and sales and non-qualified workers (machine operators actually earn 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 twice that of CFZ firms. In PP, every occupation earns significantly higher wages relative to firms in Panama province, with the exception of machine operators, who earn more in Panama province than they do within the SEZ.

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

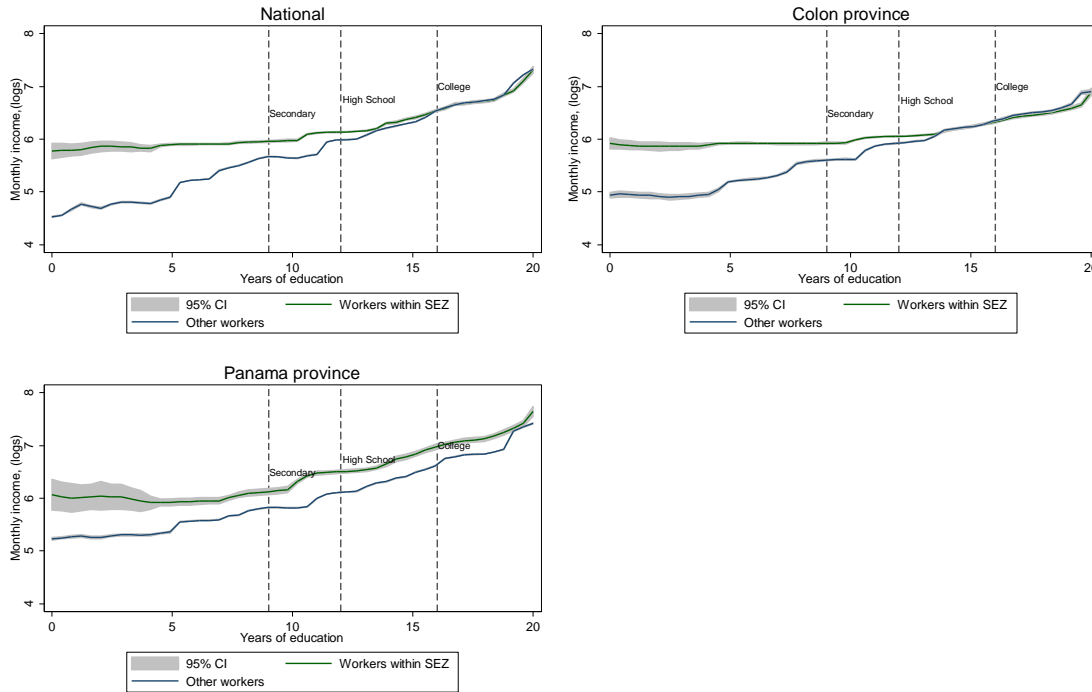
	Within SEZ (US\$)	Outside SEZ (US\$)	Difference	P-value
Panel A: Colon Free Zone	522.16	489.56	32.6	0.00
Managerial and professional	917.6	883.7	33.9	0.11
Mid-level and clerical	526.8	617.8	-91.0	0.00
Services and sales	548.3	389.4	158.9	0.00
Machine operators	443.5	612.1	-168.6	0.00
Non-qualified, others	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 10 depicts the wage level according to years of education for both CFZ and PP workers. The same features reported above are observed: there is 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 other than education must account for such a difference.

share of managers and professionals that work in Colón but live in Panama province is larger compared to other types of occupations (**Figure A-2**).

Figure 10: 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 are wages in PP significantly higher than wages outside the zone? Why does this gap decrease in the case of CFZ? Can these differences be explained by workers’ attributes (such as education or experience) or are they due to specific features of SEZs that are driving firms’ productivity?

To more precisely estimate the drivers of the wage gap within and outside these SEZs, we use a twofold Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca 1973). In very simple terms, this decomposition allows us to discern what share of the wage gap is explained by a certain set of worker characteristics (“quantity effect”), and how much of it is explained by factors that are not measured (“the unexplained part”). We use years of schooling, work experience, gender, a dummy for a college diploma and indigenous ethnicity as worker’s characteristics. We perform this decomposition for each of the two SEZs (Colón Free Zone and Panama-Pacific), comparing the intra-province wage gap of workers in firms within the SEZ to 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 the intra-provincial wage gap for 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 Colón province cannot be explained by workers' characteristics; 56% in the case of PP. These results suggest that in both SEZs, the lion's share of the wage gap cannot be explained by worker-related factors, and must therefore respond to firms' characteristics instead.

In summary, jobs created by SEZs in Panama represent a very small fraction of total employment in the country and are mostly generated by Colón Free Zone. The quality of jobs within these zones is higher than that of jobs generated outside of them. Particularly, SEZ jobs show lower levels of informality, self-employment and defined-term contracts. The types of occupations differ significantly across SEZs. While most of the 16,000 jobs generated by CFZ in 2010 were non-qualified occupations such as dockhand, warehouse employee, security guard and clerk, the 4,000 jobs in PP during the same period were more business-oriented. This divergence has a direct effect on the wage gap of the zones relative to firms located outside them. While salaries in CFZ are only

7% higher than in other Colón firms, in PP, this gap skyrockets to 69% with respect to non-SEZ firms in Panama province. 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. Conversely, the wage gap for PP is prevalent across all education levels. Overall, in both SEZs, observable worker characteristics account for less than 50% of the intra-provincial wage gap, leaving most of the gap attributable to unobservable features. In the next section we will try to shed light on these unobservables by analyzing differences in productivity for firms within and outside SZE's.

3.3 Productivity of firms

Are firms located in SEZs more productive than firms located outside their perimeter? In this section we try to answer this question using simple measures of productivity drawn from the 2012 Economic Census of firms. Our results reveal that firms within CFZ, on average, are more productive than other firms in Colón 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.¹⁸ These results are consistent 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 are firms within SEZs more productive than other firms? Agglomeration effects are usually the main explanation for productivity and welfare gains in these types 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 presence of sorting, in which more productive firms tend to agglomerate in the same geographical region (Behrens and Robert-Nicoud, 2014).

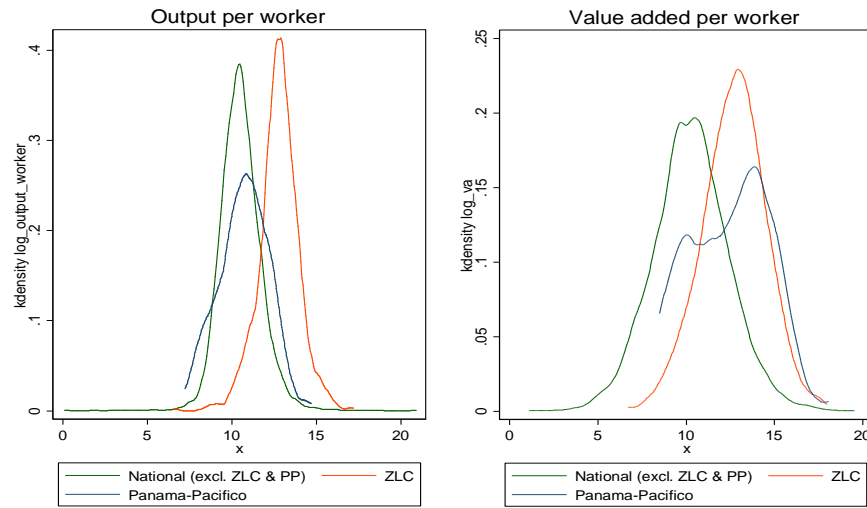
Figure 11 shows the distribution of Panamanian firms in terms of two productivity measures: output per worker and value added per worker.¹⁹ Not surprisingly, firms in CFZ have a higher

¹⁸ It is worth noting that the lack of statistical significance may be exclusively due to a problem of small sample size.

¹⁹ According to the data, out of a national total of 19,211 firms in existence in 2012, 930 firms were established in CFZ and 62 firms in PP. The 62 firms in PP were identified through geographic location declared by the firms on the Economic Census, and as such represents an approximation. At the time of this writing, PP hosts 251 firms.

output than those in PP and the rest of the country, as this is the largest import-export zone in the Americas. However, using value added, we find that PP firms are more productive relative to the other two groups.²⁰ In terms of value added per worker, firms in both SEZs seem to be more productive than the rest of Panamanian firms. In order to fully assess these firms' behavior in the absence of SEZs, we must first make intra-province comparisons and control for size of firms.

Figure 11: 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 takes the value of one if the firm is located within a SEZ, and zero if it is located outside an SEZ.²¹ For Colón 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 more productive 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 CFZ firms are 90% more productive than other Colón 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 Colón. CFZ firms are not only a significant source of competitive salaries for low-skilled workers (as shown in the previous section), but they have also made the local economy

²⁰ Value added is measured as total income minus total expenses divided by the total number of firm's workers.

²¹ For the matching estimates we use the nearest-neighbor matching approach. The number of matches specified was one. Finally, we estimate the average treatment effect on the treated (TOT).

more productive. Although this conclusion may be at odds with the high unemployment rate of Colón, it implies that unemployment in Colón would be much higher in the absence of CFZ.

The regression coefficients for firms located within PP are also positive but lower in magnitude and in significance relative to CFZ (columns 7 to 12 of **Table 5**). Firms in PP are 16% more productive than other firms in Panama province in terms of output per worker (column 8) and 29% in terms of value added per worker (column 11). However, these results lack statistical significance probably due to the small sample size available to us for this study: we were only able to identify 62 firms located in PP in the Economic Census of 2012.

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 only includes firms in the wholesale and retail industry in Colón province, with 827 located within CFZ and 287 outside. The sample for Panel B only includes 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 SEZs to firms outside SEZs 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 SEZs 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, in particular in CFZ, and (iii) firms within PP and CFZ tend to be more productive than firms located outside SEZs in their respective provinces. However, while private returns to firms established in these SEZs may be positive, social returns may not. In other words, SEZs may be beneficial for firms, but not for Panama. Hence, as we mentioned earlier, simple metrics of investment flows and job creation are not enough to assess SEZs impact on the Panamanian economy. In this section we shift gears and focus on measuring the dynamic benefits of SEZs, as represented by knowledge and technological spillovers. We highlight the importance of SEZs in attracting immigration, and how these immigrants may transfer productive knowledge to the local economy. Overall, we find strong evidence that supports the hypothesis that immigrants, and in particular those attracted by SEZs, 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 Panama's history. 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. A second example involves the construction and administration of the Canal, carried out by U.S. authorities and handed over to an efficient and transparent domestic administration. In the case of ports and logistics services, it's impossible to overlook Copa Airlines, which relied on foreign pilots, who then went on to train their Panamanian counterparts to accommodate its steady growth.

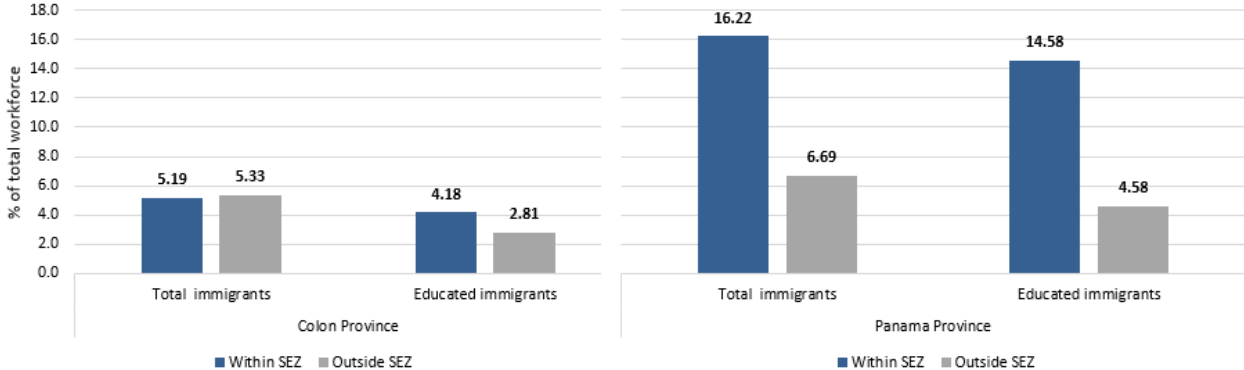
5. Description of immigrants in Panama

Since the year 2000, legislation such as the SEZ Law and the Headquarters Law have played an important role in attracting a significant number of foreign firms and workers to Panama .²² The

²² The SEZs' flexible migratory regime has not only contributed to this massive migrant influx, it has also played a major role in the enactment of the 2007 Headquarters Law in 2007. Designed to attract regional headquarters of large MNCs (200 million in assets or more), the Headquarters Law offers similar tax benefits to those of SEZ for ten types of back-

stock of immigrants doubled between 2000 and 2010. 70% of total immigration in 2010 settled in the province of Panama, a sign that the economic benefits are highly concentrated around the capital. A similar geographical disparity can be observed in SEZs. While only 5.2% of the CFZ workforce is foreign-born, PP’s share is three times higher, at 16.2% (**Figure 12**). Firms within CFZ employ a higher share of educated immigrants than firms elsewhere in Colón province.²³ In Panama province, the disparity is even more striking, with firms within PP employing educated immigrants at a rate that triples that of Panama province.

Figure 12: Share of immigrants in SEZ



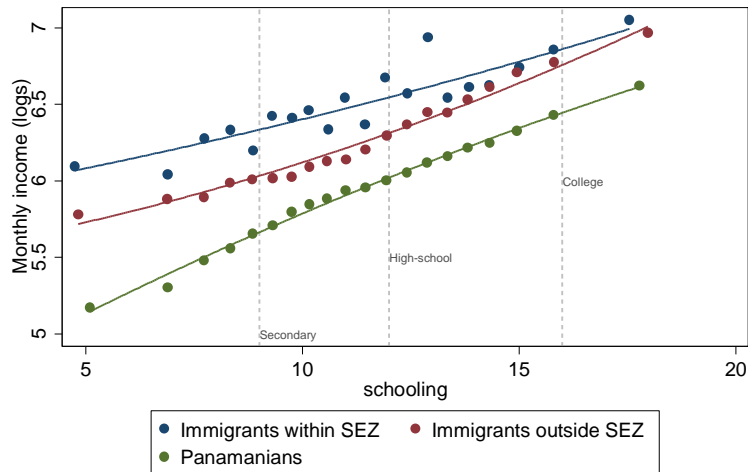
Source: 2010 Population Census

When comparing the salaries of local workers with those of immigrants nationwide, and 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 SEZs have even a larger wage premium than immigrants outside SEZs (**Figure 13**). These findings suggest that immigrants—especially those attracted to SEZs— 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).

office activities. In addition, this law offers special permanent and temporary visas for foreign personnel at a management or executive level and to their dependents.

²³ We define educated immigrants as immigrants who have at least a high-school diploma.

Figure 13: Income of Immigrants vs Panamanians, by years of schooling

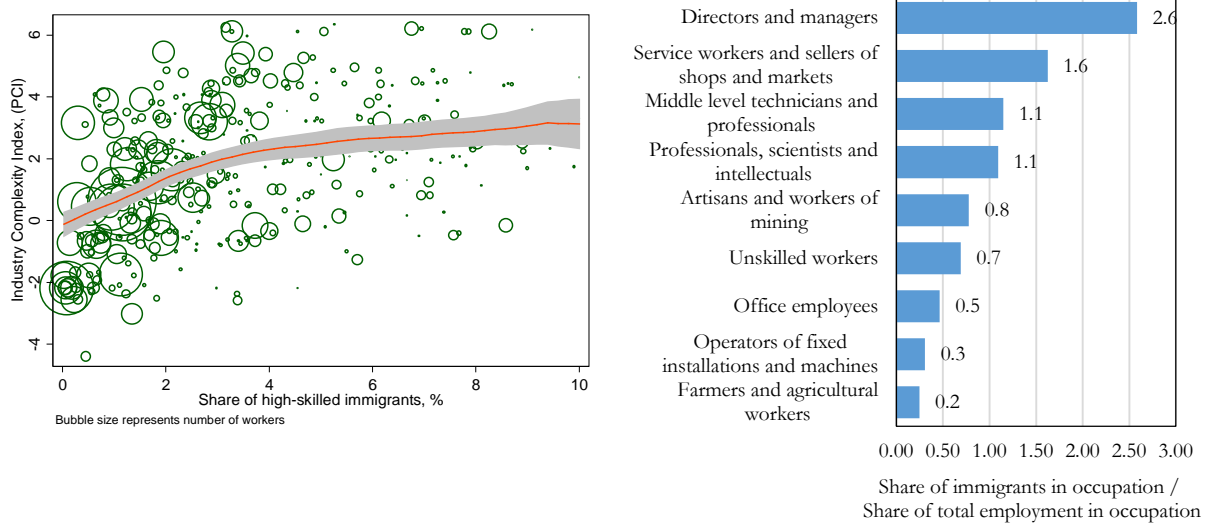


Relation of income and schooling controlling for experience, gender, race, occupation and industry. Lines represent quadratic fit after variables have been residualized. Source: Population Census 2010

Not only do immigrants earn more than their Panamanian counterparts, they are also overrepresented in occupations that require a set of high skills, and work in industries that are more complex (**Figure 14**).²⁴ Overall, these findings reflect a shortage in the local supply of labor for specific knowledge-intensive occupations, a constant complaint among managers of all firms interviewed for 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 positions were filled by immigrants, and ten different types of engineering jobs are held by a share of upwards of 14% foreign workers (**Figure A- 4** and **Figure A- 5**).

²⁴ Using complexity measures at the industry level, we were able to identify which Panamanian industries require a more complex set of productive capacities and ranked them according to their average product complexity index (PCI). For more details, see Hausmann et al. (2014) and Hausmann et al. (2016b).

Figure 14: Relationship between PCI and share of immigrants



Source: own calculations 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 that these skills may diffuse throughout the local economy, both in terms of productivity gains and the creation of new firms. Thus far, there have been few attempts at measuring these types 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 immigrants’ spillovers is by looking at their job trajectory in the host country, using data from the Social Security Administrator. However, as mentioned previously, we were unable to access data from the *Caja de Seguro Social de Panamá*. For this reason, we were only able to run our analysis with data from the Population Censuses of 2000 and 2010.

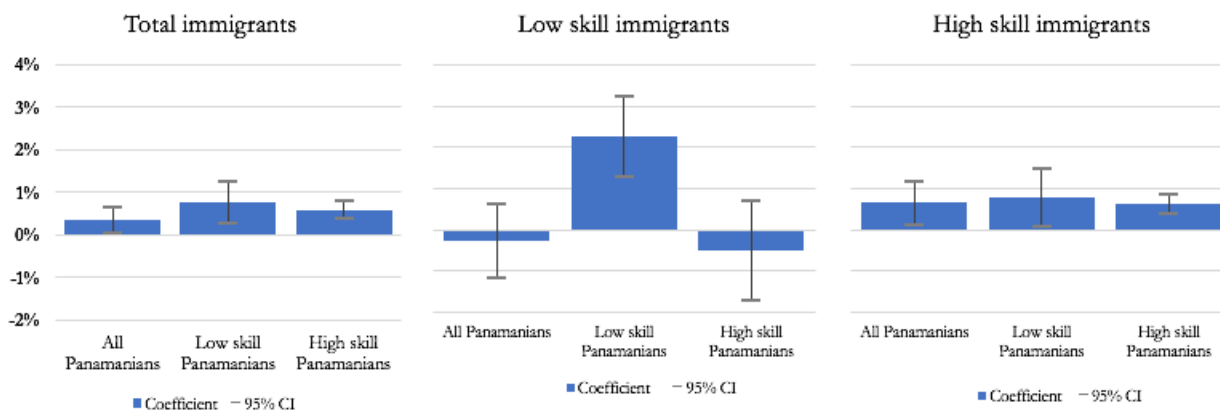
If immigrants bring a set of productive skills, and if those skills are spread among local workers, local worker productivity can be improved, thereby increasing their wages. Based on the extensive literature that measures the economic effects of immigrants on local workers (Borjas 2003, Card 2009; Ottaviano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

workers, since it's within this space where we believe there is a higher probability for 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 be choosing industries and provinces where wages are already high. To mitigate this problem, we use a series of fixed effects for industry and geographical location. We also extend our analysis by identifying immigrants who work in industries in which their countries of origin are competitive. In other words, if Panama receives a strong influx of Frenchmen with experience in wine production, it is likely that, over time, Panamanians will acquire this productive knowledge and become better at winemaking (Bahar and Rapoport, 2016).

Figure 15 shows a set of coefficients for the change in immigrant workers between 2000 and 2010 when the change in salary of Panamanians is regressed against it, depending on the skill level of workers. All of the OLS regressions show a positive correlation between the two variables. Overall, an increase of 10% in the share of immigrants is associated with an increase of 0.4% in the salaries of Panamanian workers. By controlling for fixed effects in industry and geographic location, our results are robust to demand shocks specific to an industry and/or location over this decade.²⁵

FIGURE 15: CORRELATION BETWEEN IMMIGRANTS' INFLOW AND SALARY OF PANAMANIAN WORKERS



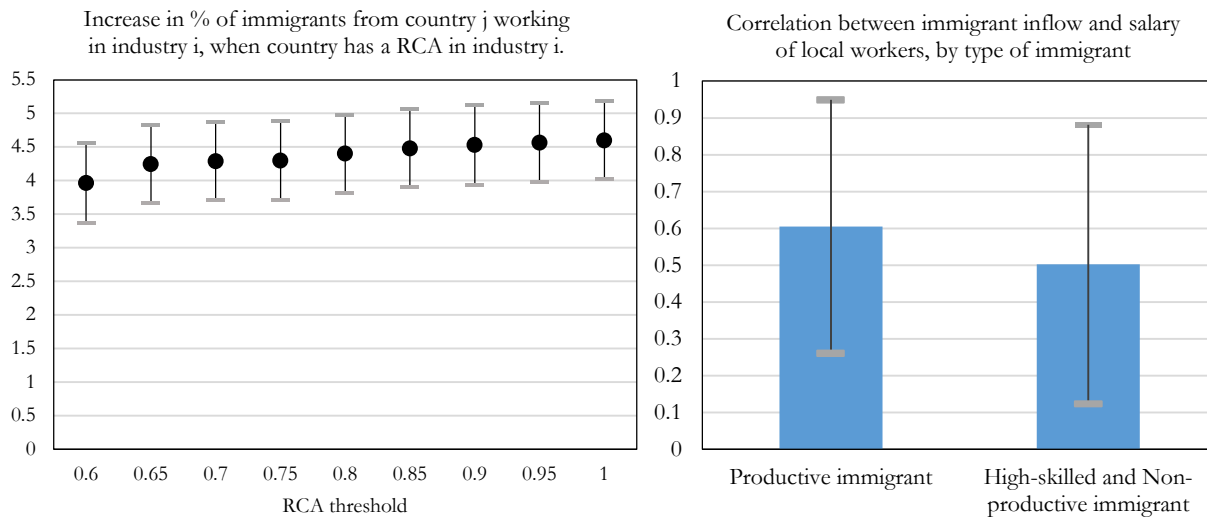
Source: Own calculations based on Population Censuses 2000 and 2010

²⁵ See model specification in Annexes.

We go on to classify immigrants based on their employer industry’s level of competitiveness, both in Panama and in their country of origin. In order to do this, we take the exports from the immigrants’ countries of origin and apply the concept of Revealed Comparative Advantage (RCA).²⁶ If this index is greater than or equal to 1, it means that the country has a RCA in that industry. Therefore, we will consider immigrants who work in industries where their countries of origin enjoy a RCA as *productive immigrants*.

Our analysis shows two important results: (i) immigrants are more likely to work only in 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 16). The combination of these two findings further reinforces our hypothesis that there is an effective diffusion of productive knowledge or know-how from immigrants to local workers.

Figure 16: Industries of productive immigrants and their effect on local wages



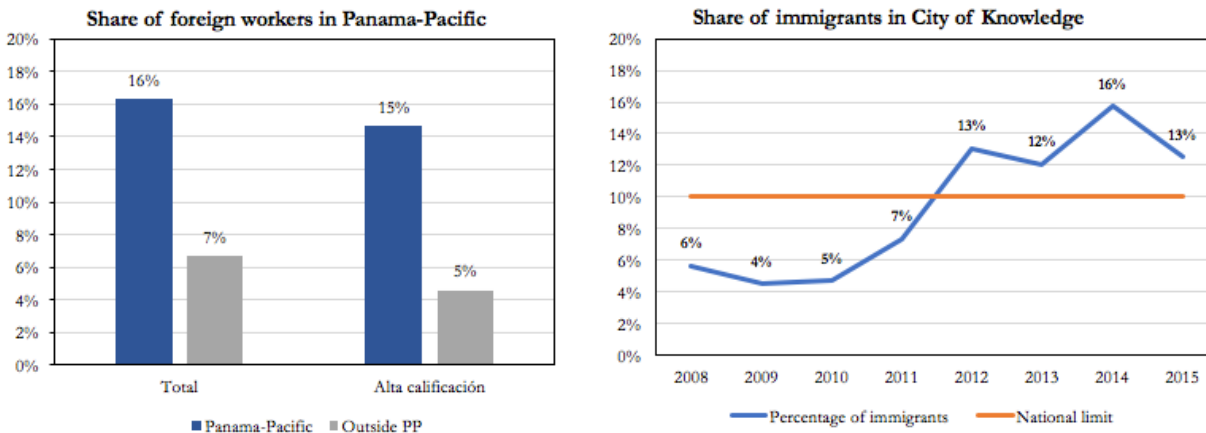
Source: own calculations based on Population Census 2000, 2010 and WITS (World Bank)

SEZs play a crucial role in allowing foreign workers to settle in Panama, and to unlock their potential for spreading productive knowledge into the national economy. Thanks to their successful migratory incentives, PP and CK have proven to serve this purpose well. Firms in both SEZs have

²⁶ Balassa (1965).

taken advantage of their exemption from the national foreign workers cap, hiring, on average, over 10% of their workforce from abroad (Figure 17).

FIGURE 17: SHARE OF IMMIGRANTS IN PANAMA-PACIFIC AND CITY OF KNOWLEDGE



Source: Population Census 2010 for Panama-Pacific. For City of Knowledge, administrative data provided by City of Knowledge Foundation.

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, have a more significant contribution to the economy of a country. 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. This final result —combined with the fact that immigrants have the potential to spread their knowledge to the local economy— underscores the importance of enabling the free flow of migrants across the economy, as they can also be net creators of employment. Unfortunately, there are numerous legal and administrative restrictions in place, which currently severely obstruct these flows.

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, SEZs have been catalysts for this transmission by promoting the attraction of foreign brains into Panama (Figure 17). Here, PP stands out as a landmark example: it generates a large inflow of educated migrants that greatly surpasses the average of firms elsewhere in Panama. Overall, SEZs are functioning as conduits that are not only moving people across borders,

but are also transmitting know-how. The Panamanian economy and its workers are the ultimate beneficiaries of this dynamic. The enhanced stock of knowledge and skills is a significant asset for Panama, as tacit knowledge brought by foreign workers can expand and diversify the basket of exportable products and services (Bahar and Rapoport, 2016).

Our findings run counter to the Panamanian immigration regime currently in place, which contains a set of bottlenecks that hinder the free flow of immigrants out of SEZs and into the Panamanian economy. Visas granted to immigrants in SEZs are relatively costly, have a short duration, and do not count for residency status in Panama. Furthermore, visas granted to foreign workers inside SEZs last only as long as the worker's contractual relationship, rendering a transition to other jobs inside or outside an SEZ impossible. Finally, a list of 27 occupations restricted exclusively for Panamanians also hinders labor movement and knowledge transmission.²⁷ Since April of 2015, the Panamanian Immigration Office, by request of the Panamanian Society of Engineers and Architects, is not accepting immigrants with any type of engineering degree. All these bottlenecks are hampering the potential positive spillovers derived from the knowledge and skills of immigrants.

When addressing these barriers, Panamanian authorities should regard any efforts to simplify immigration policies as a way of extending Panama's previous success stories regarding foreign workers: the banking sector, the Canal, ports and the airline business. Past experiences have proven that immigrants are important for the development of the economy, and Panama has displayed a substantial ability to attract them, retain them, and allow for 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.

5. Conclusions and policy recommendations

Are Special Economic Zones a positive policy intervention for Panama? Judging by their static benefits alone, the answer to this question is affirmative. SEZs have successfully attracted foreign investment and human capital into the country, in addition to providing stable and well-paid jobs for Panamanians. Firms within these zones tend to be relatively more productive, suggesting that firms

²⁷ There is a list of 27 occupations that are restricted to immigrants. Among these occupations: 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.

within SEZs benefit from agglomeration forces such as transport cost savings, a common pool of high-skill workers, and shared infrastructure (Glaeser, 2010).

That said, there are still a series of constraints that prevent SEZs from fully disseminating structural transformation. Restrictions to foreign workers such as limitations to free flow of labor across firms, hefty fees for visa renewals, regulated occupations, and inability to accumulate years for permanent residence, must be addressed by policymakers before the full power of SEZs to foster development throughout the country can be leveraged.

Colón 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 high-income jobs for low skilled workers in a province with one of the weakest labor markets in the country. Several bottlenecks are inhibiting CFZ's potential as a driver of economic development. First, the zone's lacking migratory benefits currently thwart its ability to attract foreign high-skilled workers. Secondly, authorities should evaluate the implementation of mechanisms to attract more FDI targeted towards the transportation and logistics sector, since this industry should be one of the spearheads in Panama's further growth (Hausmann, Morales, and Santos, 2016). Finally, the declining trade volumes registered in last years have highlighted the need to guarantee an appropriate cost-benefit balance to firms hosted at CFZ.

Panama-Pacific already has attractive tax, labor and migratory benefits in place. So far, the large number of firms that have relocated to this SEZ (around 250) suggests 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 transmission of skills and know-how to the local economy. 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. Large investments in infrastructure related to business services – such as the one-stop shop and the onsite customs office – represent significant sources of efficiency for firms within PP and could be shared with firms outside the zone. Finally, migratory regulations for foreign employees in PP should be revised to facilitate the free flow of immigrants, both inside the zone, and between the zone to the rest of the economy.

City of Knowledge has been successful in attracting high-tech firms and has become Panama's the main technology hub. However, a series of obstacles are deterring technology and knowledge transfers to the local economy, preventing CK from become a driver of innovation for the rest of

Panama. Firms within CK concentrate their efforts on research and development, and they are not encouraged to move on to the commercialization and sales phases of their business. This is inhibiting firms' ability to generate positive returns, ultimately hindering their potential for aggregating new and more complex products to the economy. Furthermore, we found no functional synergies between CK firms and the academic institutions within the zone.²⁸ Lastly, CK visas do not respond to a logic of maximizing immigrants' spillovers. Visas are expensive, of short duration, do not count for a path to residency, and do not consider workers' dependents. Ideally, CK should transition to a more flexible, modern visa scheme, similar to the one in PP.

A problem common to all three SEZs is a lack of firm-level data to measure performance. Knowledge and innovation diffusion is at the core of CK's mission; however, the administrators do not record data related to patent generation or even on research and development expenditures of firms. Likewise, although the law that created PP's explicitly describes that the zone's goal is to increase the economy's competitiveness, Panama-Pacific Agency does not register systematic data of firm's productivity or worker performance. If the Panamanian government wants to place its SEZs at the center of its development strategy, more efforts need to be made in terms of measuring 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, the government should ultimately care about social, not private returns. Therefore, it should take a closer look at the types of products and activities generated by firms within these zones and, particularly, at the formal links between these firms and the rest of the economy. In this paper we devoted special attention to a particular link: the spillovers generated by high-skilled immigrants attracted by these zones. If the government of Panama wants to strengthen the role of SEZs in Panama's development strategy over the coming years, several constraints must be addressed on this front.

²⁸ There have been some small scale, short-lived attempts, such as CAPATEC –a consortium of computer services companies– a step in the right direction.

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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

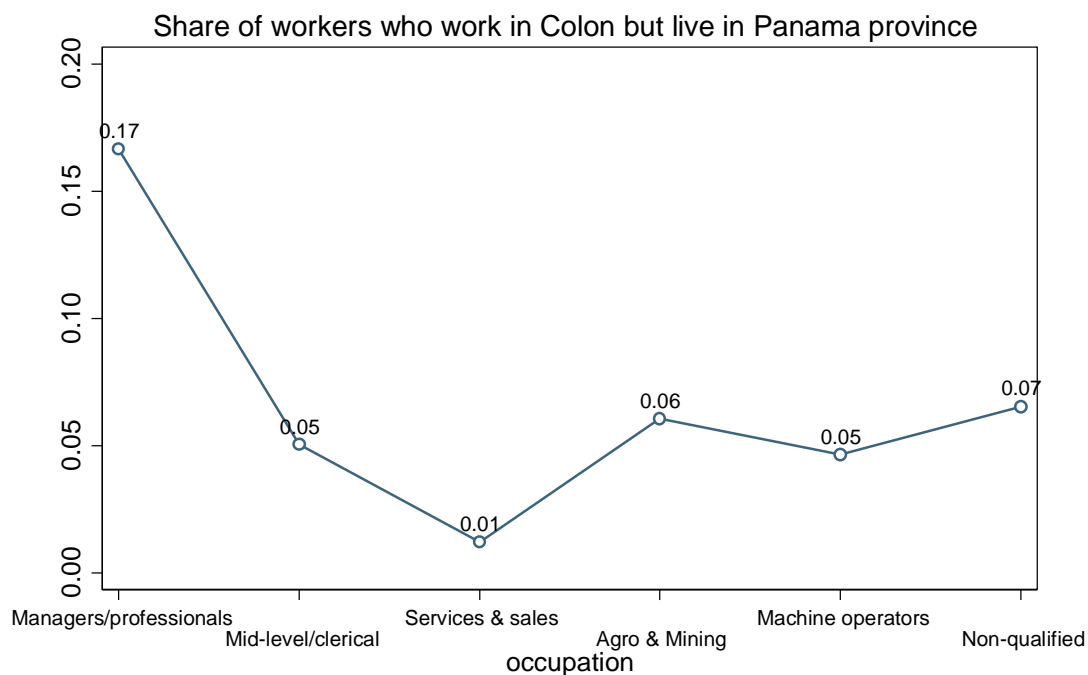
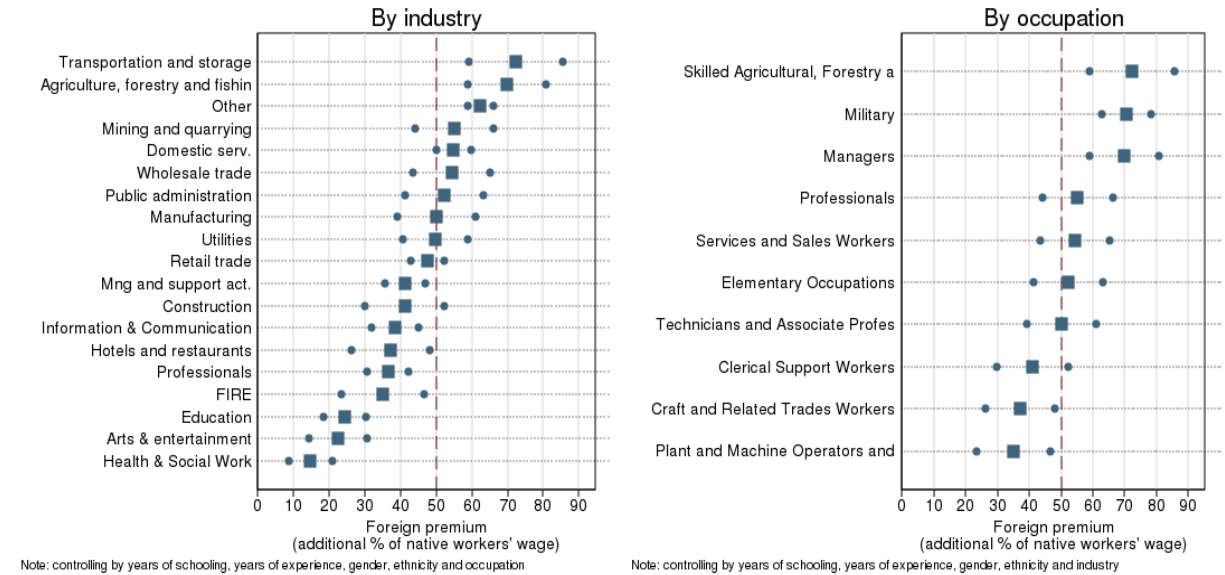


Figure A- 3: Immigrant wage premium by industry and occupation



Source: Population Census 2010 (INEC), own calculations

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 *patron*

	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.

A model to assess the impact of immigration on wages of local workers

To analyze the effect of immigrant inflows on the wages of local workers, we follow the standard approach that economists have used to measure the impact of immigration in the host country using data from several population censuses (Borjas, 2003; Card 2000, Basso and Peri; 2015; Card and Peri, 2016). The econometric specification is the following:

$$\Delta \log(w_{jr}) = \beta_0 + \beta_1 \Delta \text{immi}_{jr} + \delta_j + \phi_r + \epsilon_{jr}$$

where the subscript j refers to a industry (ISIC Rev3. at 2-digits) and r , to the geographic location (we define it at a district level). Hence, to run this regression we define a cell as a unique combination of industry-geographic location and within this cell we analyze the decadal change in the stock of immigrants (Δimmi_{jr}) and the change of salaries of Panamanian workers ($\Delta \log(w_{jr})$). The specification also controls for region and industry fixed effects to account for specific demand shocks in these two dimensions. With this specification, we recover the within-cell effect of immigrants in native's salaries, not accounting for cross-cells complementarities.

The most significant difference between our approach and the standard approach used by labor economists is the definition of the cell. The standard literature defines a cell in terms of the skill level of workers, namely education and experience. Conversely, we define a cell as a unique combination of an industry-location, as we are trying to measure knowledge spillovers, which are more likely to happen within an industry than within a specific skill-cell. In short, there is no reason to restrict the diffusion of know-how to workers with the same skill profile. However, to get a more comprehensive picture about cross-skills effects we also compute the within-cell effects of (low) high skilled immigrants on the wages of high (low) natives.

Figure A- 7 shows the results for β_1 for all the possible combinations of skill levels within a particular industry-location using the population censuses of 2000 and 2010 for Panama. Overall, an increase of 10 percentage points in the stock of immigrants (relative to the initial population), is associated with an increase of 0.4% in the wage of local workers. 7 out of the 9 coefficients reported are positive and significant, while the remaining two are not significant.

FIGURE A- 7: WAGE REGRESSIONS RESULTS

Dependent variable is the change in decadal wages of native workers, in logs.

	Total natives			Low-Skill Natives			High-Skill natives		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Clusters at a District Level									
Total immigrant inflow	0.043**			0.062**			0.11***		
	(0.0204)			(0.0256)			(0.0127)		
Low-Skill immigrant inflow		-0.073			0.343***			-0.452***	
		(0.0526)			(0.0505)			(0.0642)	
High-Skill immigrant inflow			0.101***			0.057			0.218***
			(0.0256)			(0.0351)			(0.026)
Observations	396,886	386,806	380,783	396,833	386,623	380,755	394,797	385,021	377,721
R-squared	0.86	0.88	0.89	0.84	0.86	0.87	0.79	0.81	0.80
Number of Industries	52	52	41	52	52	41	50	49	37
Number of geographic locations	80	79	80	80	78	80	80	79	79
Panel B: Trimming top and bottom 1%									
Total immigrant inflow	0.036**			0.079***			0.06***		
	(0.0161)			(0.0252)			(0.0111)		
Low-Skill immigrant inflow		-0.028			0.225***			-0.051	
		(0.0458)			(0.0498)			(0.0616)	
High-Skill immigrant inflow			0.065**			0.078**			0.064***
			(0.0268)			(0.0359)			(0.0121)
Observations	296,680	299,130	293,064	296,627	298,947	293,036	300,642	297,366	296,573
R-squared	0.86	0.87	0.89	0.84	0.85	0.86	0.78	0.81	0.82
Number of Industries	52	52	41	52	52	41	50	49	37
Number of geographic locations	79	79	79	79	78	79	79	79	78

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

Each cell shows the coefficient of the variable "change of immigrants as share of initial population" from different regressions in terms of the skills levels of both, natives and immigrants. All regressions are weighted by the total number of workers in the district-industry cell for the year 2000 and include Industry and District fixed effects. Robust standard errors clustered at the industry-district level. Sample restricted to private-sector workers between 18 and 65 years old in non-indigenous provinces. Only considered clusters with at least 10 workers as per year 2,000 and with immigrant presence over the next decade. Source: Population Census of 2000 and 2010.

These results suggest that knowledge spillovers may be occurring, but they have to be treated with caution as results may still be driven by specific demand shocks (i.e. omitted variable bias). To account for this endogeneity problem we enhance our analysis, by classifying 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:

1. Immigrants are more likely to work in just those industries where their countries of origin enjoy comparative advantages. Namely, if the RCA of the industry is 1, the likelihood of the immigrant of working in that industry in Panama, increased by 4.5 percentage point.²⁹
2. 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 16). Specifically, a one percentage point increase in the share of productive immigrants (over the share of high skilled but not productive immigrants) is associated with an increase of 1.02% on the wages of native workers.

The combination of these two last findings further reinforces our hypothesis that there is an effective diffusion of tacit knowledge or *know-how* from immigrants to local workers.

²⁹ Relative to the base line defined by the proportion of Panamanians working in that industry.