The Impact of Special Labor and Tax Regimes on the Extensive and Intensive Margins of Small Agricultural Exporters*

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Abstract

This research assesses the impact of Peru's Agrarian Promotion Law (APL)—which reduced tax and labor costs by half since 2001—on (i) non-traditional agricultural exports (NTAXs) by micro, small, and medium-sized enterprises (MSMEs); and on (ii) these firms' capability of penetrating new foreign markets. To theoretically explore this impact, we devised a heterogeneous firm framework based on Melitz (2003), but also incorporated financial and labor frictions used by Manova (2013) and Helpman & Itskhoki (2007). We then conducted an empirical test by using detailed customs data at the firm level for 1994–2019. We find that the APL explained 40% and 59% of the MSMEs' NTAXs and trade links, respectively, from between 2001 and 2019. Hence, the APL may have involved approximately 100,000 additional jobs on average per year—*i.e.*, 64% of the jobs reported by APL firms. These findings strongly suggest that law's repeal, which took place very recently, may bring these positive effects on exports and employment to an end. They may also serve as a benchmark for the yet-to-be-explored benefits of special labor and tax regimes in emerging economies.

Keywords: Agrarian Promotion Law, exports, MSME, labor flexibility, financial frictions, extensive and intensive margins.

JEL: F10, F16.

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1 Introduction

Non-traditional agricultural exports (NTAXs) in Peru have soared over the last 20 years, with their value share in national non-traditional exports (NTXs) increasing from 19% in 1994 to 46% in 2019. It was during this period that the country became one of the world's main exporters of grapes (1^{st}), asparagus (1^{st}), blue berries (1^{st}), and fresh avocados (2^{nd}).

According to some authors, this export boom was triggered by the United States-Peru Free Trade Agreement and its predecessor, the ATPDEA;[1] others, for their part, highlight other relevant factors, such as technological changes in the industry, improvements in the performance of public technical institutions, and the implementation of irrigation projects (León, 2009; Monjaras, 2014; and Vásquez, 2015). However, the role of the Agrarian Promotion Law (APL) in this boom has scarcely been explored.[2]

In force since 2001, the special regime established by the APL has reduced by half the overall tax and labor costs borne by crop-farming, breeding, and agribusiness firms—a subgroup of NTAXs producers. Here are some key examples: the income tax rate (ITR) dropped from 30% to 15%; the compensation for unfair dismissal, from 1.5 monthly salaries to only 15 daily wages per year of service; the employee health insurance rate, paid by employers, from 9% to 4%; and the vacation leave period, from 30 to 15 days. Coincidentally, exports by this group of firms were 26 times higher between 1994 and 2019, twice as much as other agricultural exports that were not subject to the APL (Graph 1).

There is no *a priori* evidence that this remarkable growth did not benefit micro, small, and medium-sized enterprises (MSMEs). In fact, a theoretical framework of heterogeneous firms based on Melitz (2003) showed that the APL mitigated financial and labor frictions among cash-strapped companies, thereby reducing not only the productivity threshold from which these firms may start selling to foreign markets, but also that from which they can export at optimal levels. As a result, exports at the firm level (the intensive margin) and their access to foreign markets (the extensive

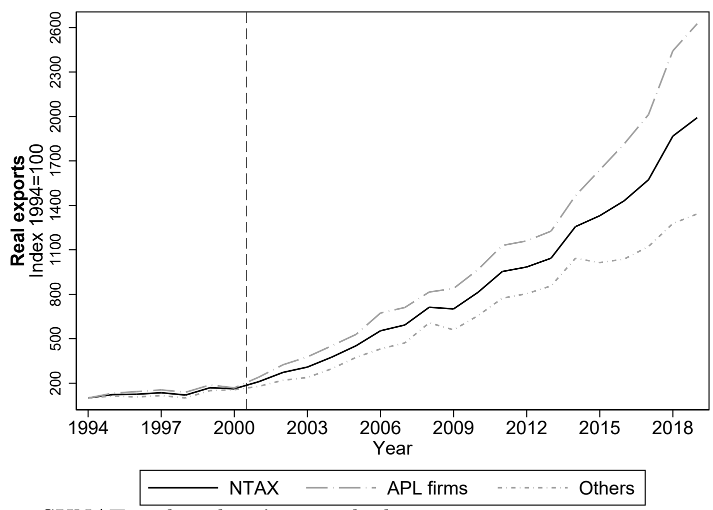
[1] The Andean Trade Promotion and Drug Eradication Act (ATPDEA) introduced tariff exemptions for a number of products. It is a system by which the U.S. unilaterally granted duty-free access to exports from Peru and other Andean countries. The ATPDEA replaced the Andean Trade Preference Act (ATPA) and was periodically renewed from 1991 to 2010.

[2] Most articles devoted to the APL focus on its impact on agricultural working conditions (Gamero, 2011; CIJ, 2014; and Vivas, 2017). Only few authors have explored the impact of the APL on firms and concluded that it has only benefited large producers (Cuadros, 2018; Fairlie, 2019; and Francke, 2020).

margin) increased, especially for lower-productivity firms (*i.e.*, MSMEs) that, in the absence of the APL, would have been confronted with significant financial constraints.

The aim of this research is to assess the APL's impact on MSMEs' NTAXs intensive and extensive margins. To propel the impact mechanism, we incorporated tax and labor cost reductions resulting from the APL into a heterogeneous firm model based on Manova (2013) and Helpman & Itskhoki (2007), whose predictions are consistent with the dynamics explained in the previous paragraph. Then, we use export data from customs records at transaction level for the 1994-2019 period to identify the APL's impact on the intensive and extensive margins, respectively.

Graph 1: Non-Traditional Agricultural Exports (NTAXs) Index by group



Source: Peruvian customs – SUNAT and authors' own calculations.
Note: The "APL firms" group includes crop-farming and breeding firms, as well as agribusinesses. The information above is detailed in Appendix A.1. The "Others" group includes all firms dedicated to other NTAXs. Exports are deflated using the Agricultural Export Price Index published by the Central Reserve Bank of Peru (BCRP). The vertical line indicates the date on which the APL came into force.

Our results show that the APL explains 40% and 59% of MSMEs' NTAXs and trade links, respectively, between 2001 and 2019. Therefore, the law would have created approximately 100,000 jobs on average per year —*i.e.*, 64% of jobs reported by this group of firms. The findings of this research may thus facilitate understanding of the potential benefits from similar reforms in other emerging economies.

This study is in line with the strand of the literature that focus on how labor market regulations may alter the impact of trade liberalization on labor outcomes. Fajgelbaum (2020), for instance, devised a model that succeeded in demonstrating how flexible job-to-job mobility plays a decisive

role in trade cost reduction and income generation. Wang *et al.* (2021) stressed that tariff reductions came along with a higher employment adjustment rate in China, especially in cities where the Hukou reform—a flexible labor market regime—was implemented. In the same vein, Erten *et al.* (2019) found that the effects of tariff reductions on labor market outcomes in South Africa led to a decline in formal and informal employment in the country's tradable sector; Ashan & Mitra (2014), on the other hand, identified a reduction in the bargaining power of Indian workers as a result of trade liberalization. Finally, Alessandria & Delacroix (2008) concluded that labor market reforms consisting of the removal of firing restrictions translate into lower welfare gains when a country has established trade linkages—unless two trading countries remove such restrictions in parallel.
Despite all this literature, and to the best of our knowledge, no previous research has been devoted to the impact of labor market reforms on trade. This article develops and empirically tests the predictions of a model through which these reforms affect export margins. It should be noted that previous studies have typically analyzed how trade is affected by a decrease in export costs caused by tariff reductions; in a different vein, we focus on lower export costs resulting from tax and labor cost reductions.

The remainder of this article is organized as follows. Section 2 reviews the stylized facts of NTAXs performance under the APL, especially among MSMEs. Section 3 details the APL's regulatory framework, while Section 4 presents our model. Finally, Section 5 describes our methodology and Section 6 summarizes our results. Concluding remarks are drawn at the end of the article.

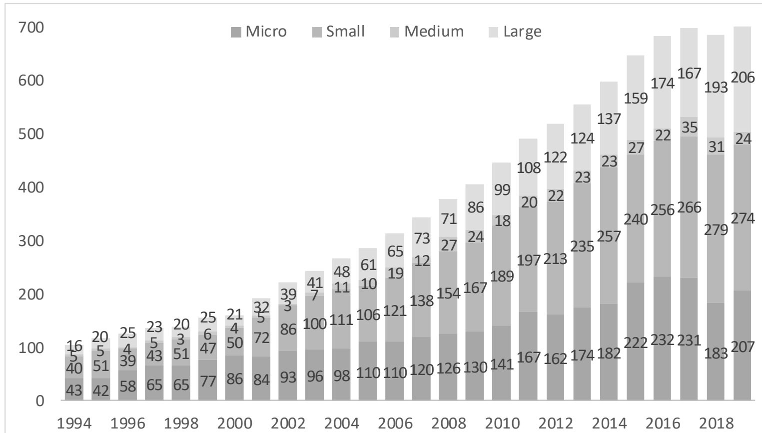
2 Stylized facts

Most of the exporting firms subject to the APL are MSMEs—they generate sales of up to 2.5 million USD per year in real terms. Although, on average, 80% of the firms for the 1994-2019 period were MSMEs (panel (a) of Graph 2), this share did not remain constant over time. The total number of firms almost quadrupled from 2001 to 2019, but with some differences across firm sizes. During this period, the number of MSMEs more than tripled, while the number of large firms multiplied by more than six.

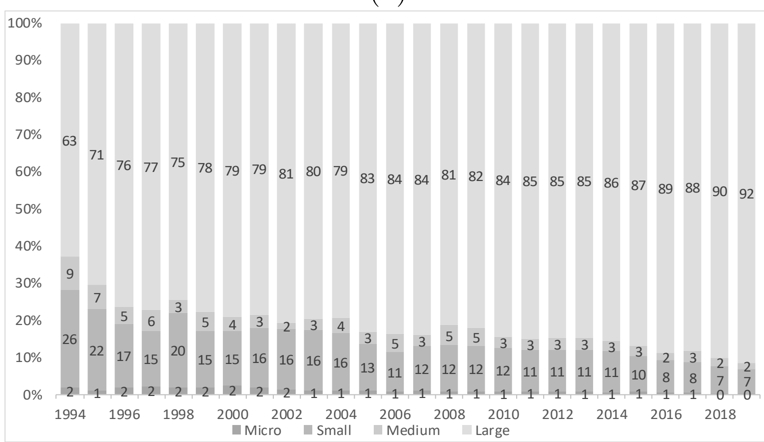
Moreover, while the majority of exporting firms subject to the APL are MSMEs, they are not responsible for most of the exports. From 1994 to 2019, on average, MSMEs exported only 18%

Graph 2: (a) Number of firms and (b) FOB export value share by firm size

(a)



(b)



Source: Peruvian customs – SUNAT and authors' own calculations.

Note: Both charts depict exporting firms whose production activity reports are included in the APL. We adopt the above firm size classification from Supreme Decree No. 013-2013-PRODUCE. Section 5 provides additional details about this graph.

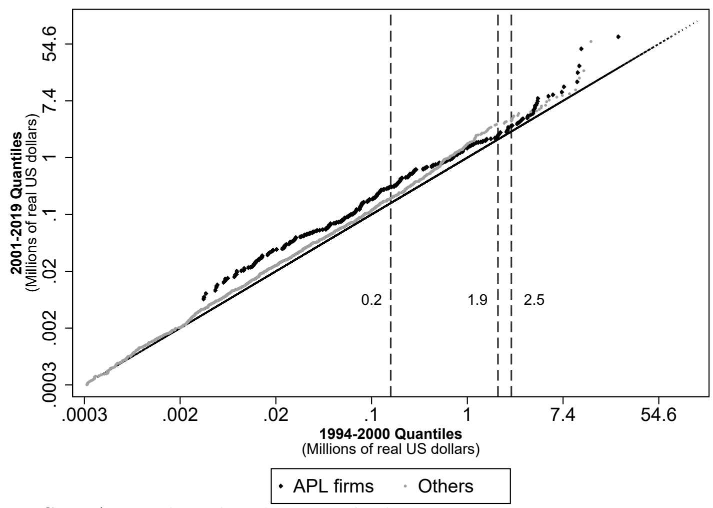
of the total FOB value exported by firms under the APL regime (panel (b) of Graph 2). In fact, large firms have been responsible for most of the total export value over time.

These numbers suggest that large firms were the main beneficiaries of the APL, even though MSMEs were the largest group of firms. Nevertheless, this may be a hasty conclusion: it does not take into consideration all NTAXs nor the fact that MSMEs may become large firms over time.

2.1 Intensive margin

To review the intensive margin of firms that were either subject or not subject to the APL, Graph 3 shows a quantile-quantile representation of the distributions of real exports per year at the firm level, before and after the law's enactment, for each group of firms. The graph below plots the quantiles of the same order between distributions as ordered pairs. If the distribution does not change from one period to another, the ordered pairs coincide with a 45-degree line. In that sense, real exports per year, at the firm level, increased for both the group subject to the APL (black points) and the rest of NTAXs during the 1994–2000 and 2001–2019 periods. It should be noted, however, that the increase was higher for the group of firms under the APL regime, particularly for the smallest subgroup.

Graph 3: Q-Q plot of the annual export distributions at the firm level, by group, before and after the APL



Source: Peruvian customs – SUNAT and authors' own calculations.

Note: The axis scale is in logarithms. Exports have been deflated as mentioned in the note for Graph 1. A firm is considered within each period if it exports at least once per period. In each period, we use the median of the constant annual FOB export value at firm level, so as to avoid the influence of atypical years. The vertical lines show the thresholds of firm size classification used by the authors.

We can also analyze the dynamics of exporting firms by using transition matrices. Table 1 shows the number of firms per firm size across the initial and final three-year periods following the APL's enactment. According to this table, the exporting MSMEs that became larger in the final three-year period—and whose values are highlighted in bold—represented almost one third (27%) of the MSMEs that were exporting during both triennia. Furthermore, 25% of the firms classified as "large" in the final three-year period were MSMEs in the initial triennium.

In contrast, Table 2 reports the number of firms per firm size across the initial and final triennia before the law's enactment. Also highlighted in bold, the exporting MSMEs that became larger represented less than a fifth (18%) of the MSMEs that exported across the two three-year periods.

Table 1: Firm size transition matrix for firms exporting under the APL
(Triennia after the APL)

Initial triennium	Final triennium: Stopped exporting	Micro	Small	Medium	Large
Started to export	-.-	166	109	7	14
Micro	122	87	**39**	**2**	**3**
Small	55	29	116	**15**	**22**
Medium	3	1	7	2	**8**
Large	6	1	8	3	84

Source: Peruvian customs – SUNAT and authors' own calculations.
Note: "-.-" indicates that no data exist for the domestic market. The table shows the average number of exporting firms subject to the APL. The matrix values were calculated from a simple average of 6 transition matrices, each of which corresponded to the following triennia pairs: 2001–2003 to 2004–2006, 2004–2006 to 2007–2009, 2007–2009 to 2010–2012, 2010–2012 to 2013–2015, 2013–2015 to 2016–2018, and 2014–2016 to 2017–2019. A firm is classified in a size category based on the median of its annual export FOB real value during the triennium. An enterprise is considered within a period if it exports at least once per period.

Moreover, less than a fifth (16%) of the firms classified as "large" in the final triennium were MSMEs in the initial three-year period. Therefore, we conclude that the percentages drawn from Table 2 increased by nearly 50% after the APL was enacted.

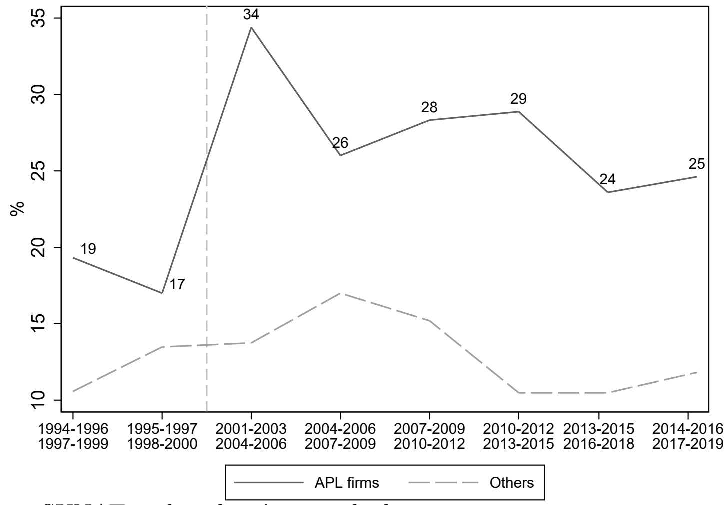
Table 2: Firm size transition matrix for firms exporting under the APL
(Triennia before the APL)

Initial triennium	Final triennium: Stopped exporting	Micro	Small	Medium	Large
Started to export	-.-	81	25	2	7
Micro	41	42	**11**	**0**	**0**
Small	20	10	24	**3**	**3**
Medium	2	1	1	1	**1**
Large	4	1	4	1	15

Source: Peruvian customs – SUNAT and authors' own calculations.
Note: See the note for table 1 for more details. The matrix values were calculated from a simple average of two transition matrices, each of which corresponded to the following triennia pairs: 1994–1996 to 1997–1999 and 1995–1997 to 1998–2000.

In addition to the foregoing, Graph 4 shows all data used in the two average transition matrices and compares firm size transitions over time between MSMEs subject to the APL and those dedicated to other NTAXs. Firms under the APL exhibit a significant upward break after the APL's enactment, which is not the case for the other group of firms.

Graph 4: Percentage of MSMEs that became larger firms in the final triennium (as a fraction of the MSMEs that kept exporting across triennia)



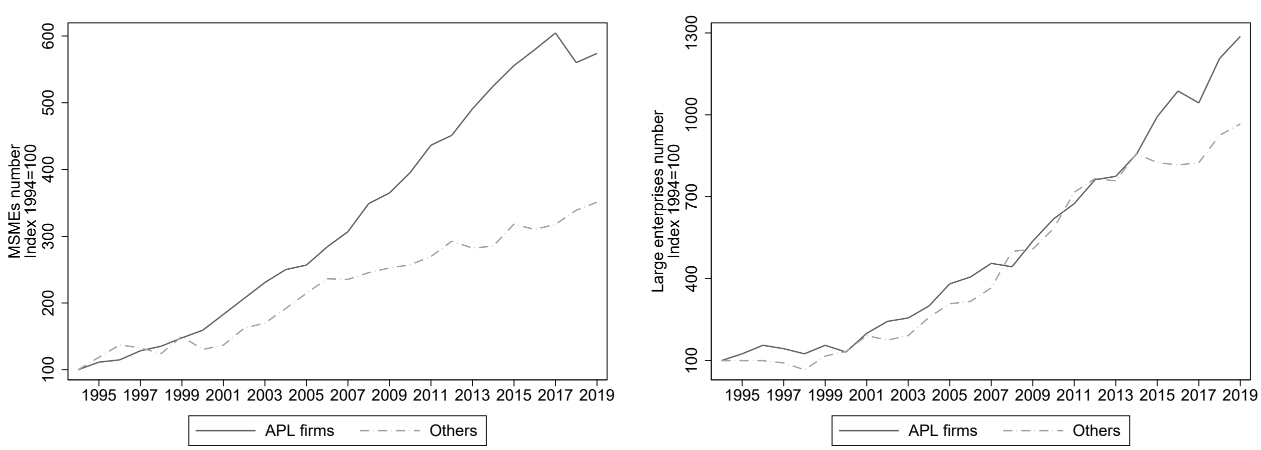
Source: Peruvian customs – SUNAT and authors' own calculations.

Note: The vertical line indicates the date on which the APL came into force. For more details, see the notes for Tables 1 and 2.

2.2 Extensive margin

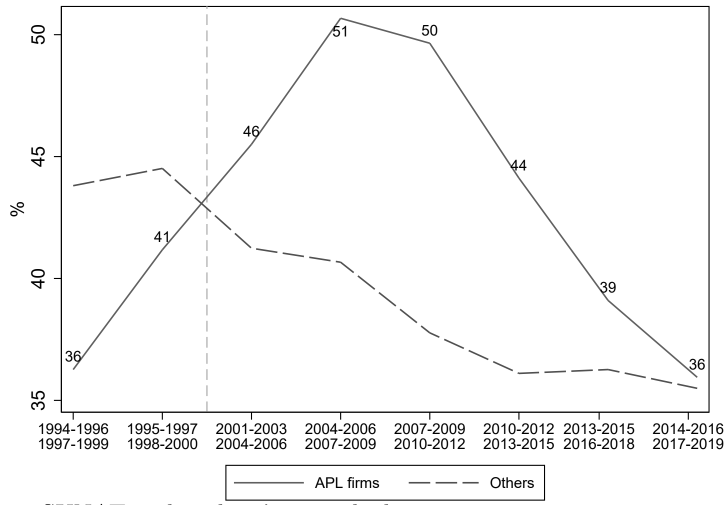
The export growth experienced by MSMEs as a result of the APL is also reflected in the extensive margin. According to the left panel of Graph 5, the number of MSMEs subject to the law grew faster than that of MSMEs dedicated to other NTAXs, especially since 2001. On the other hand, the right panel shows that, with the exception of the last few years, the number of large firms increased at a similar rate in both the "APL firms" and "Others" groups.

Graph 5: Number of MSMEs (left) and large firms (right) by group



Source: Peruvian customs – SUNAT and authors' own calculations.

Graph 6: MSMEs that increased their trade links in the final triennium by group
(as a fraction of the MSMEs that kept exporting across triennia)



Source: Peruvian customs – SUNAT and authors' own calculations.
Note: A firm is considered to have increased their trade links if the median of its annual 10-digit product-destination pairs is higher across triennia. We adopt Peru's 2007 product classification scheme for the whole sample. The vertical line indicates the date on which the APL was enacted. A firm is considered within a period if it exports at least once per period.

Lastly, Graph 6 reports the percentage of MSMEs that increased their trade links, measured as the number of product-destination pairs. The data therein show that this percentage was always higher for firms subject to the APL after its enactment.

3 Regulatory Framework (APL)

Law No. 27360, also known as the APL, was enacted in October 2000, but did not come into force until 2001.[3] Before this law's enactment, tax benefits were only granted to crop-farming and breeding activities (see Appendix B) and a number of bills were proposed to modify its predecessor (that is, Legislative Decree No. 885). The APL thus extended the reach to include agro-industrial activities, excluding those related to wheat, tobacco, oilseeds, oils, and beers. Nonetheless, it should be stressed that these activities were granted benefits only provided that they used local agricultural products from outside of Lima and Callao—Peru's capital city and main port, respectively.

[3]Although the APL became effective in November 2000, it was established that tax benefits would be applied only from the year 2001. Hence, for all practical purposes, the law is officially considered to be in force as of 2001.

Indeed, Law No. 27360 keeps many of the tax benefits established by Legislative Decree No. 885 in place. However, several modifications were made in terms of hiring process regulations, which led to greater labor market flexibility:

1. Beneficiaries were able to hire workers on a temporary, fixed term, or permanent basis. Contract duration depended upon the nature of the agricultural activity concerned.
2. Employees under this regime would earn a daily wage (RD in Spanish) of not less than S/. 16, provided that they worked, on average, for more than 4 hours a day. If Peru's minimum wage increased, the RD would be updated accordingly. The RD included the Compensation for Length of Service (CTS)—employers' contributions to unemployment benefits—and bonuses.
3. Employees were entitled to take 15 days of vacation leave for each completed year of service or pro rata for part thereof, as opposed to the 30-day vacation period granted under Peru's general labor regime.
4. Compensation for unfair dismissal was equal to 15 daily wages for each full year of service, with a possible maximum of 180 daily wages—that is, much lower than the compensation granted under the general labor regime.[4]
5. Employer contributions towards employee health insurance were equal to only 4% of employees' monthly salary—*i.e.*, less than the 9% rate required under the general labor regime.

A 2002 appendix of the APL explicitly defines the agro-industrial activities included therein; the list was based on the third revision of the International Standard Industrial Classification (ISIC)[5] and approved by Supreme Decree No. 007-2002-AG. In the same year, Supreme Decree No. 049–2002–AG approved specific enabling regulations for the APL to broaden those previously established by Legislative Decree N° 885. Thus, these two pieces of legislation defined registration requirements and continuing eligibility criteria for firms:

1. Firms must register under the APL regime annually.

[4] *Texto Único Ordenado de la Ley de Productividad y Competitividad Laboral* (Orderly Single Text of the Law on Productivity and Labor Competitiveness), a regulatory document that governs labor contracts, establishes that the compensation for unfair dismissal is equal to 1.5 monthly salaries for each full year of service, with a possible maximum of 12 monthly salaries. Thus, the APL reduces the costs associated with dismissal by nearly half.

[5] Unlike agro-industrial activities, breeding and crop-farming activities included in the APL are not explicitly defined in regulatory documents. However, the third revision of the ISIC provides a set of categories in which the two latter are also listed. These categories are detailed in Appendix A.1.

2. Beneficiaries under the regime must be primarily dedicated to crop-farming, breeding or agro-industrial activities; moreover, their net income from other activities must not exceed 20 percent of their expected total annual net income.
3. Beneficiary firms must report an investment program to the Peruvian Ministry of Agriculture. If they also wish to benefit from a higher depreciation rate and an anticipated VAT refund, beneficiaries must provide a detailed description of their program to SUNAT—Peru's National Tax Administration Supervisory Authority.

Peru has certainly not been the only country to establish a special regime for its agricultural sector. In fact, differentiated labor regimes of the same kind also exist in some of its Latin American counterparts, such as Chile, Argentina, Mexico, and Ecuador (see Vivas, 2017). In addition to allowing for temporary employment contracts, these regimes establish that employers must, among other requirements, ensure adequate working conditions, offer medical assistance, and provide information on the use of inputs such as pesticides; however, none of them grants as many benefits to firms as the APL regime does. Likewise, none of the Peruvian regulations preceding the enactment of the APL (see Appendix B) achieved its main contributions, that is, (i) higher labor market flexibility and (ii) the inclusion of a key element of the production chain (agro-industrial activities).

Although, at the end of 2019, Emergency Decree No.043-2019 extended the effective period of Law No. 27360 until the year 2031, it also reduced the extent of labor benefits granted to beneficiaries.[6] What is more, the APL was recently repealed and replaced by Law No. 31110, a new piece of legislation that increases even more both labor and tax costs—even for MSMEs.[7]

[6]The following modifications were included: (i) the daily wage is equal to no less than S/. 39.19 (US$ 11)—provided that employees work, on average, for more than 4 hours a day—and includes basic compensation, bonuses, and CTS (unemployment insurance); (ii) 30 days of vacation leave for each completed year of service; (iii) compensation for arbitrary dismissal is equal to 45 daily wages (RD) for each full year of service, with a possible maximum of 360 RD; and (iv) monthly employer contributions towards employee health insurance will gradually increase from 6 percent of the monthly salary in 2020 to 9 percent by 2029.

[7]As a first example of additional labor costs, once can take the Special Bonus for Agricultural Work (BETA), which is equal to 30% of the minimum wage—in fact, the bonus led to an increase of the minimum daily wage from S/39.19 to S/48.50. Furthermore, Law No. 31110 establishes that monthly employer contributions towards employee health insurance are to increase to 9% by 2028 for MSMEs, although Emergency Decree No. 043-2019 foresaw that the rate would gradually increase until reaching 9% in 2029. As far as tax costs are concerned, the income tax rate (ITR) will increase from 15% to 30%, although the process will be slower for MSMEs than for large firms.

4 The model

Based on Melitz (2003), we model an industry under monopolistic competition in which firms use labor as the only production factor and whose productivity levels may differ depending on labor efficiency. These firms are not only confronted with foreign market demand, production expenses and other shipping costs, but also incur labor search costs as in Helpman & Itskhoki (2007).

The aforementioned costs cannot be fully covered by means of the firms' current revenues or exports. As a matter of fact, some of them must be financed through both (i) credit—as in Manova (2013)—and (ii) non-distributed income from previous periods.

Nonetheless, less productive firms (*i.e.*, MSMEs) cannot fully gain access to the credit they need to export optimally. The amount that these firms can pay back to banks, which depends on their productivity, is not enough to compensate for the banks' outside options. Hence, MSMEs find themselves forced to export smaller amounts at suboptimal level so as to finance their costs through credit.

In light of the above, the benefits granted under the APL regime have two effects: they (i) reduce labor search costs and (ii) increase the profits generated by firms. This in turn has two consequences: (i) the exports of certain MSMEs reach optimal production levels and (ii) MSMEs export to new markets, even if they have not exported before.

4.1 Costs and technology

Without loss of generality, we assume that firms operate in a world with two countries (origin, o, and destination, d), s sectors, and a single period. If a firm wants to produce in sector s of country o, it has to incur an investment cost, $f_{e,s}$, to know its productivity, $\frac{1}{a}$, where a represents the labor required to produce one unit of a good. This productivity is a realization drawn from a $G(a)$ distribution, which is known by all firms and common across sectors, and has $[a_L, a_H]$ support, where $0 < a_L < a_H$.

In order to produce $q(a)$ units, a firm faces two costs: on the one hand, labor search costs, $b_s h(a)$—where $h(a)$ represents the firm's demand for labor and is equal to $aq(a)$—and, on the other hand, payroll costs, $waq(a)$, equal to $aq(a)$ after normalizing wages to one. The term b_s represents the cost of advertising a given number of job offers, which stems from labor market frictions that are modeled through a matching process. Thus, if there are N_s individuals looking for a job and V_s job offers, only H_s employment contracts are signed through the $l_1 V_s^{\eta} N_s^{1-\eta}$ process, where l_1 is positive and represents the efficiency of the match, and η is between 0 and 1, and represents the relevance of job offers. In view of this, the firm needs to publish $l_1^{\frac{-1}{\eta}} \frac{H_s}{N_s}^{\frac{1-\eta}{\eta}} h(a)$ job offers to hire $h(a)$ workers. Furthermore, firms incur in a cost of l_2 to advertise each job offer, which means that the total cost of advertising all vacancies is as follows:

$$b_s h(a) = \frac{l_2}{l_1^{\frac{1}{\eta}}} \frac{H_s}{N_s}^{\frac{(1-\eta)}{\eta}} h(a), \tag{4.1}$$

The search cost per worker, b_s, is lower as long as the efficiency of the matching process, l_1, increases, or the cost of advertising a job offer, l_2, decreases.

Additionally, firms incur two other costs in order to ship a product to a destination country d. On the one hand, exporting $q(a)$ units have a total variable cost of $\tau_d a q(a)$, where τ_d is greater than 1, and $(\tau_d - 1)aq(a)$ represents the iceberg cost associated with the distance—whether physical or cultural—to the destination country. On the other hand, firms face fixed export costs, f_d, that represent the necessary product adjustments to sell product concerned in country d.[8]

4.2 Demand

A firm with productivity $\frac{1}{a}$ faces a demand for its product in the d country's s sector, where the representative consumer loves variety.[9] This consumer has a utility function on sector baskets,

$$U_d = \prod_s C_{ds}^{\theta_s}, \tag{4.2}$$

where θ_s represents the relative importance of the s sector to the consumer's basket. The value of θ_s is between 0 and 1, and satisfies $\sum_s \theta_s = 1$. C_{ds} represents the sector basket and is an aggregation of product varieties in the sector s, where the production of a ω variety rests in the

[8] Manova (2013) explains that these fixed export costs include the following: specific investments to increase production capacity to serve the destination market, product customization, regulatory compliance in the destination country, and the creation or access to product distribution networks in that country. As far as the Peruvian agricultural sector is concerned, the costs associated with the signing of sanitary protocols proposed by the National Agricultural Safety Service (SENASA) can be considered as part of the same list—see Vásquez (2015).

[9] For the sake of simplicity, we assume that the firm's entire production is exported to the foreign market.

hands of a single firm in country o, and each firm only produces a single variety.[10] Specifically:

$$C_{ds} = \Big[\int_{\omega \in \Omega_{ds}} q_{ds}^{\alpha}(\omega) d\omega \Big]^{\frac{1}{\alpha}}, \tag{4.3}$$

where α represents a parameter that determines the elasticity of substitution between varieties, ε, ($\varepsilon \equiv \frac{1}{1-\alpha}$) and satisfies $0 < \alpha < 1$ ($\varepsilon > 1$). Ω_{ds} represents the set of consumed ω varieties and $q_{ds}(\omega)$ is the number of units in demand for a ω variety. Hence, the demand for a ω variety is given by:

$$q_{ds}(\omega) = \frac{p_{ds}(\omega)^{-\varepsilon}}{P_{ds}^{1-\varepsilon}} \theta_s Y_d, \tag{4.4}$$

where Y_d is the consumer's income and $P_{ds} \equiv [\int_{\omega \in \Omega_{ds}} p_{ds}^{1-\varepsilon}(\omega) d\omega]^{\frac{1}{1-\epsilon}}$ represents the price index that aggregates the prices of all varieties in the s sector, $p_{ds}()$. Since the demand function has a price elasticity equal to $\varepsilon > 1$,[11] the firm's revenues for exporting a ω variety in country d, $r(a) = p(a)q(a)$, decrease as price increases.

4.3 Sources of financing and credit constraints

Although firms receive their revenues, $r(a)$, at the end of the period, they must pay a fraction of their costs—both fixed and variable—in advance, at the beginning of that period. In that sense, firms are confronted with additional working capital requirements: they must gain access to long-term sources of financing to cover their short-term costs. These sources are (i) credit granted by banks—as in Manova (2013)—and (ii) the firms' own profits from previous periods (self-financing), and financing procedures are different for each of them.

Bank credit, on the one hand, fully finances a fraction of the variable cost, d_s, which is paid by firms in advance. Then, firms pay a fraction $(1-d_s)$ of their total variable cost, $[\tau_d a q_d(a) + b_s a q_d(a)]$, at the end of the period, after receiving revenues from their exports, $r(a)$. For the sake of simplicity, we assume that the d_s fraction is exogenous and falls within the $]0, 1[$ interval.

On the other hand, both (i) profits from previous periods and (ii) bank credit cover a fraction of the fixed export cost, which must be paid in advance. We assume that self-financing covers fixed export costs as would be expected from a business with retained earnings. Therefore, a firm uses

[10] Each ω variety corresponds to a single value from a and vice versa.
[11] Since the firm is in a monopolistic competition market, it would not otherwise be able to operate.

its revenues, $r(a)$, to pay only a fraction $(1 - d_s - \pi_s)$ of its fixed cost, f_d, where d_s is the amount paid through bank credit[12], and π_s represents an exogenous fraction of the fixed cost financed by means of retained earnings. It should also be noted that $\pi_s \in [0, 1[$.[13]

The term π_s, associated with self-financing, is a function of the initial profit (Π_0) received at the beginning of the period—Π_0 is exogenous and common to all firms. Specifically, $\pi_s \equiv g(\Pi_0 - \kappa[\Pi_0 - \delta f_{e,s}])$, where κ is the income tax rate and δ represents the initial investment's depreciation rate. The g function is increasing and differentiable with respect to the depreciation rate, δ, and decreasing and differentiable with respect to the income tax rate, κ. A higher depreciation rate—which in turn results in a higher tax shield—and a lower income tax rate both increase the initial net profits and, consequently, the fraction of the self-financed fixed cost, π_s.

To access bank credit, firms put forward a "take-it or leave-it" contract offer that specifies two sums: the amount of the debt at the beginning of the period, $d_s([\tau_d a q_d(a) + b_s a q_d(a)] + f_d)$, which is equal to a fraction of the variable and fixed export costs; and the payment made back to the bank at the end of that period, $F(a)$. If the probability that a firm operating in sector s of country o pays off its debt (λ_s) is equal to 1, the payment made to the bank will always be $F(a)$. However, if the loan cannot be paid back (probability of $1 - \lambda_s$), the collateral value of the firm's initial investment, $t_s f_{e,s}$, will be transferred to the bank, where $t_s \in]0, 1[$ and both λ_s and t_s are exogenous.[14]

Firms face two restrictions when signing the above-mentioned contract. Firstly, the amount paid to the bank, $F(a)$, cannot be higher than the profits they generated before the payment was made. Then, this payment is upper-limited by the the firms' operating profits (liquidity restriction). Secondly, banks have an outside option (an alternative investment) with a return equal to 0[15]. Therefore, for a bank to accept a contract (participation restriction), granting a credit to a firm with productivity $\frac{1}{a}$ must be at least as profitable as that bank's alternative investment.

[12] In this model, we assume, without loss of generality, that the fraction of variable costs financed through credit is the same as that of fixed costs (d_s).

[13] An additional condition is that $0 < \pi_s + d_s < 1$. In other words, current revenues always cover only a fraction of the fixed cost.

[14] Manova (2013) associates the term λ with the origin country's level of financial development. Indeed, the author's main interest is to compare countries with different levels of financial development and vulnerability—measured by d_s and t_s—with an emphasis on sectors.

[15] This does not lead to any loss of generality.

4.4 The problem

Based on the previous considerations, a firm in the s sector with productivity $\frac{1}{a}$ faces the following problem:

$$Max_{p_d(a)}\Pi_d(a) \equiv p_d(a)q_d(a) - (1-d)[\tau_d a q_d(a) + bh_d] - (1-d-\pi)f_d - [\lambda F(a) + (1-\lambda)tf_e]$$

s.t:

[firm demand]
$$\text{(i) } \mathrm{q}_d(a) = \frac{p_d(a)^{-\varepsilon}}{P_d^{1-\varepsilon}}\theta Y_d,$$

[firm labor demand]
$$\text{(ii) } \mathrm{h}_d = aq_d(a),$$

[liquidity constraint]
$$\text{(iii) } \mathrm{A}_d(a) \equiv p_d(a)q_d(a) - (1-d)[\tau_d a q_d(a) + bh_d] - (1-d-\pi)f_d \geq F(a),$$

[participation constraint]
$$\text{(iv) } \mathrm{B}_d(a) \equiv \lambda F(a) + (1-\lambda)tf_e - d[\tau_d a q_d(a) + bh_d + f_d] \geq 0,$$

where we intentionally omit the s subscript to simplify the notation.[16] The firm chooses price $p_d(a)$ at the beginning of the period to maximize its profits, generating $r_d(a) = p_d(a)q_d(a)$ revenues at the end of that period. By means of these revenues, the firm pays (i) the $(1-d)$ fraction of its variable cost, $[\tau_d a q_d(a) + bh_d]$, (ii) the $(1-d-\pi)$ fraction of its fixed cost, f_d, and (iii) $[\lambda F(a) + (1-\lambda)t_s f_e]$, the bank's expected repayment.

In the above maximization problem, constraint (i) represents the amount in demand for a variety produced by the firm, while constraint (ii) represents the firm's labor demand. Furthermore, restrictions (iii) and (iv) represent the conditions to be met for the loan agreement: the firm cannot pay an amount above its operating profits and must ensure that the bank accepts the contract. Finally, due to competition, the bank's expected profits, $B_d(a)$, are equal to 0, which means that restriction (iv) is binding.

The main departure from Manova (2013) is that $\Pi_d(a)$ contains two new terms: (i) π, which represents the fraction of fixed export costs financed by means of previous non-distributed profits, and (ii) bh_d, which represents the search costs incurred to hire h_d workers.[17] If both terms were equal to 0, the analytical framework would be the same as the one developed in Manova (2013).

[16] We keep this omission in the model section, but not for the discussion on productivity thresholds.

[17] It should be noted that labor demand depends on the trade relationship established with country d. This is because the firms that capitalize on export opportunities are typically in need of seasonal workers to meet demand in the destination market—*e.g.*, when no other suppliers of agricultural products are available during specific seasons.

4.5 Productivity thresholds

Not all firms can gain access to all the credit they need to export optimally. While the most productive—and largest—firms are not financially constrained, MSMEs are confronted with a number of limitations in the credit market. Hence, they find themselves forced to export at suboptimal levels or, even worse, to not export at all.

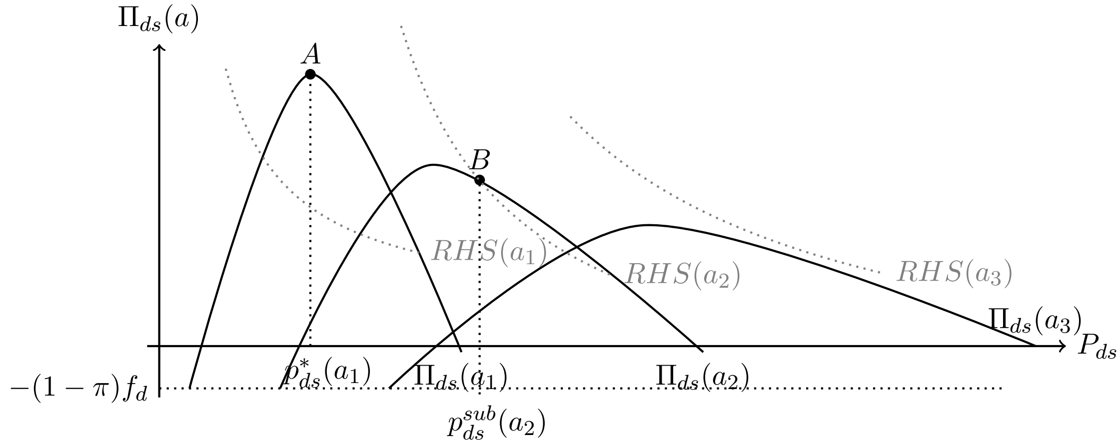
The t_s setting is equal to zero for simplicity. Based on restrictions (iv) and (ii), $F(a) = \frac{d[(\tau_d+b)aq_d(a)+f_d]}{\lambda}$, where λ represents a credit risk premium on the debt. Likewise, by using restrictions (iv) and (ii), the firm's objective function becomes $\Pi_d(a) = p_d(a)q_d(a) - (\tau_d + b)aq_d(a) - (1 - \pi)f_d$. Finally, the inclusion of both in restriction (iii) results in:

$$\Pi_d(a) = p_d(a)q_d(a) - (\tau_d + b)aq_d(a) - (1 - \pi)f_d \geq (\frac{1}{\lambda} - 1)d([\tau_d + b]aq_d(a) + f_d). \quad (4.5)$$

According to equation (4.5), the profits of a borrowing firm with productivity $\frac{1}{a}$ should be at least equal to the bank's profits from lending to that firm. Hence, there are three types of firms as it is shown in Graph 7, where the RHS curves represent the right hand side of equation (4.5) at each productivity level. A high-productivity firm with $\Pi_{ds}(a_1)$ profits has sufficient resources to pay off its bank debt at the optimal price, $p^*_{ds}(a_1)$—the equation (4.5) is not binding. In contrast, a low-productivity firm with $\Pi_{ds}(a_2)$ profits is unable to set its price at the optimal level: it would have to incur higher variable debt so as to be unable to repay the bank in full. Therefore, the firm sets a higher suboptimal, price $p^s_{ds}(a_2)$, and, as a result, the equation (4.5) is binding. Finally, a extremely low-productivity firm, with profits equal to $\Pi_{ds}(a_3)$, is totally unable to set a price at which it could repay its debt to the bank.

We can imagine a continuum of firms with different productivity levels ranging from $\frac{1}{a_3}$ to $\frac{1}{a_1}$ in Graph 7. Thus, one of them must be the marginal firm between firms with and without financial constraints, where the optimal price is, at the same time, the suboptimal price. This firm's productivity level equals to $\frac{1}{a^H_{ds}}$, that is, the threshold from which firms choose their optimal prices. On the other hand, there must be a marginal firm between financially constrained and non-exporting firms, where the RHS restriction is tangent to the Π_{ds} profit function. This firm's productivity level is equal to $\frac{1}{a^L_{ds}}$, the threshold from which firms start to export at suboptimal prices.

Graph 7: Firm profits by price, with optimal and suboptimal prices



4.6 The impact of the Agrarian Promotion Law (APL)

The APL reduced both productivity thresholds ($\frac{1}{a^L_{ds}}$ and $\frac{1}{a^H_{ds}}$), increased labor market flexibility, and rendered self-financing easier for firms. This translated into (i) a greater number of exporting MSMEs that succeeded in reaching optimal production levels and increasing their sales (intensive margin), and (ii) a greater number of MSMEs operating in foreign markets (extensive margin).

The inclusion of the APL in the model had two effects. On the one hand, the κ tax rate decreased after law's enactment, causing the self-financed portion of fixed costs, π, to increase. On the other hand, the labor benefits granted under the law led to an increase in the efficiency of the labor matching process, l_1,[18] which in turn reduced the labor search cost, b.

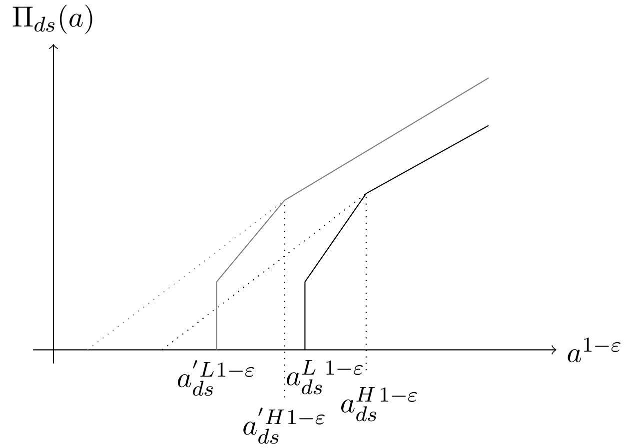
These two effects could be depicted into Graph 7. An increase in π would shift upward the profit curves of every firm, $\Pi_{ds}(a)$, thereby increasing (i) the number of firms that export at optimal prices (the RHS curves do not depend on π) and (ii) the number of firms that start to export. Similarly, a reduction in b would not only shift the optimal price of each firm to the left, but also shift downward the RHS curves. This would increase (i) the number of firms with pre-existing export activities that start to operate at optimal prices and (ii) the number of low-productivity firms that start their export operations.[19]

Graph 8 shows the impact of the APL on the two productivity thresholds. The solid gray line—which represents profits after the law's enactment—shows that both thresholds (${a_{ds}}^{L^{1-\epsilon}}$ and

[18] l_2 could be interpreted as the fee paid to the recruiter. This intermediary is typically used in agriculture for hiring labor—see OIT (2007), p. 51-52; and CIJ (2014).

[19] A formal development of the model can be found in Appendix C.

Graph 8: Firm profits from exporting to d destination and s sector by productivity, before and after the APL



${a_{ds}}^{H^{1-\epsilon}}$) shift to the left. If there were no financial frictions ($\lambda = 1$), profits from before and after the APL would be represented by the dotted lines. In that case, there would only be one productivity threshold separating exporting from non-exporting firms.[20]

5 Empirical strategy

5.1 Intensive margin

According to our theoretical model, the revenues of a exporting firm with productivity $\frac{1}{a}$, $r(a)$, satisfy the equation:

$$r(a) = \begin{cases} r^*(a), & \text{if } \frac{1}{a} \geq \frac{1}{a^H_{ds}} \\ r^s(a), & \text{if } \frac{1}{a^L_{ds}} \leq \frac{1}{a} < \frac{1}{a^H_{ds}} \end{cases}, \tag{5.1}$$

where $r^*(a)$ and $r^s(a)$ correspond to the revenues associated with the optimal and suboptimal prices described in the previous section, respectively. Therefore, the APL's enactment had two effects on the revenues of MSMEs, [21] which are reflected in:

$$\gamma(a) \equiv r^*(a)|_{b',\pi'} - r^s(a)|_{b,\pi} = [r^*(a)|_{b,\pi'} - r^s(a)|_{b,\pi}] + [r^*(a)|_{b',\pi'} - r^*(a)|_{b,\pi'}] > 0, \tag{5.2}$$

[20] As in Manova (2013), this unique threshold is less than $a^{L^{1-\varepsilon}}_{ds}$ or $a'^{L^{1-\varepsilon}}_{ds}$ as long as the fixed component of the debt exceeds the collateral value—$d_s f_d > t_s f_{e,s}$.

[21] The impact on an MSME could be $\gamma(a) = r^s(a)|_{b',\pi'} - r^s(a)|_{b,\pi}$, in which case the firm does not export at optimal levels. However, we omitted this scenario due to the great extent of the reform.

where b' and π' represent the search cost and the fraction of fixed costs financed by means of available profits after the law was enacted, respectively, with $b' < b$ and $\pi' > \pi$. The first term in brackets, on the right side of the equality in (5.2), shows the impact of starting to export at optimal levels. The second term in brackets represents an increase in optimal revenues resulting from a reduction in labor search costs.[22] In the absence of financial frictions, this term would be the only one different from zero: contrary to conventional wisdom, our mechanism includes an additional channel thanks to which exports by MSMEs also increased. Hence, the parameter of interest is $\gamma \equiv E[\gamma(a)|ActAPL_i = 1]$, where $ActAPL_i$ takes the value of 1 if firm i is dedicated to an activity subject to the APL and 0 if it belongs to the control group. The latter is made up of firms that met the following 3 criteria:

1. be classified as an activity other than those eligible to the APL regime (see Appendix A.1);
2. have exported at least one of the products also exported by firms whose activities are included in Appendix A.1; and
3. have dedicated 100% of their export activities to non-traditional agricultural products.[23]

Our identification strategy is based on a difference in differences (DiD) approach that uses two alternative datasets—pooled cross-sections (PCS) and panel data (PD)—for a total of 6338 and 391 firms, respectively. For both datasets, we assumed that, in the absence of treatment, the expected export value of MSMEs under the APL regime would follow the same trend as that of the control group.[24] Under the assumption of parallel trends, with t^* being the last period before treatment,

$$E[r^0_{t^*+s} - r^0_{t^*}|ActAPL_i = 1, \omega_i] = E[r^0_{t^*+s} - r^0_{t^*}|ActAPL_i = 0, \omega_i] \ \forall \ s \geq 1, \tag{5.3}$$

where the superscript denotes the counterfactual values—1 if the firm has been treated and 0 otherwise—and ω_i represents a vector of covariates.[25]

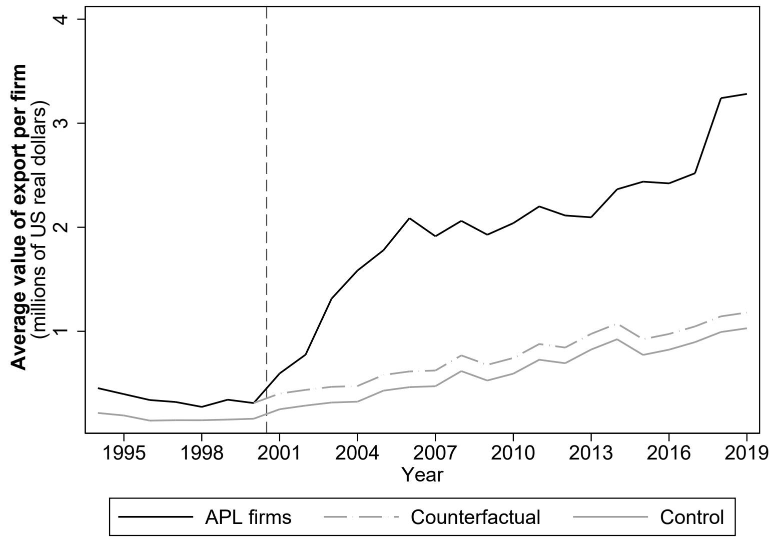
[22] As we describe in Appendix C, the optimal price and revenue are not a function of π.

[23] The resulting control group is a subgroup of producers dedicated to other NTAXs, which was used in Section 2. To a large extent, this group is made up of firms that belong to the same division (two-digit ISIC) of the classes (four-digit ISIC) depicted in Appendix A.1. It is worth mentioning that we eliminated some export products at the 10-digit level: only firms with economic activities subject to the APL export them, for which reason they would not have comparable firms in the control group. In Appendix A.4, we report a comparison between the treatment and control groups.

[24] Other assumptions include the following: (i) there are no spillovers between the treatment and control groups and, in the case of the pooled cross-sections, (ii) the samples are representative of the same population from year to year.

[25] This vector contains the trajectory of each of the covariates. In the PCS dataset, it contains the observable characteristics of the firms; in the PD dataset, their time-invariant, unobservable characteristics in addition to the observable characteristics.

Graph 9: Parallel trends for MSMEs exports–PCS



Source: Peruvian customs – SUNAT and authors' own calculations.

Graph 9 provides initial evidence in regards to the validity of this assumption for the PCS dataset: the average export value of MSMEs in the treatment group has a trend parallel to that of the control group during the pre-treatment period. Additionally, the graph shows that exports by the first group increased above the counterfactual trend after the law's enactment. An average firm in the PD dataset exhibits a similar trend (see Appendix A.5).

In order to estimate and identify γ, we use the specification[26]

$$r_{itj} = \delta_j + \delta_{prov,t} + \delta_{Exp} + \gamma law_t ActAPL_i + \beta' x_{it} + u_{it}, \tag{5.4}$$

where the i subscript denotes the firm; t, the year; and g, the ISIC economic activity reported by firm i. The dependent variable, r, represents current revenues (exports). Depending on the data sample, δ_j is equal to δ_g (a fixed effect at the ISIC level in the case of the PCS dataset), or to δ_i (a fixed effect in the case of the PD dataset). While $\delta_{prov,t}$ is a province-year fixed effect, δ_{Exp} is an experience cohort—year of export minus the firm's year of creation—fixed effect. law_t is a variable that captures the law's enactment date, and takes the value of 1 if the year is greater than or equal to 2001 and 0 if otherwise. $ActAPL_i$ takes the value of 1 if firm i is dedicated to an activity subject to the APL and 0 if it belongs to the control group. The x_{it} vector contains all the covariates listed in Appendix A.3—except for experience, which is already captured by the experience cohort fixed effects—and u_{it} is the error term.

[26]The results presented in the next section are also supported by semi-parametric methods of estimation that do not assume a linear function, in the same vein as Abadie (2005). These findings are available upon request.

In this specification, the fixed effects at the ISIC or firm levels, δ_j, allow us to control for differences predating 2001 in economic activities or firms, respectively. Thanks to the province-year fixed effects, $\delta_{prov,t}$, it is possible to control for changes in provinces over time, such as the implementation of irrigation projects—suggested in the literature—and weather variations. The experience cohorts, δ_{Exp}, can be used to control for groups of firms with different "ages" since their year of creation. The list of covariates includes the average gross domestic product (GDP) among destination countries at the firm level, an indicator of external demand associated with the Y_d variable in our theoretical model; distance, which is captured by τ_d in our model and can be both physical (in kilometers) and cultural (*e.g.*, common official language and contiguity); and the existence of free trade agreements. In that regard, the γ coefficient captures all variations in the treatment group that post-dated 2001 and did not result from the fixed effects or the covariates.

The estimation, for its part, includes clustered standard errors at the ISIC level. Bertrand *et al.* (2004) argue that DiD estimates usually depend on quite long time series. Nevertheless, the possibility of auto-correlated errors in the data generating process is typically ignored, thereby causing inference problems. A possible solution to this is to arbitrarily introduce a higher level of clustered standard errors into the variance and covariance matrices, so as to allow for intertemporal dependence. Therefore, the regressions will include clustered standard errors at the group level (ISIC), rather than at the group-year level (ISIC-year).

Other characteristics of the panel dataset are also worth mentioning. This group of firms exported at least for one year during the pre-treatment (1994-2000) and post-treatment (2001-2019) periods, which means that they had greater chances of surviving in export markets. For that reason, the estimated parameter appears to be more suitable for a narrower and probably more productive set of firms. Indeed, the APL possibly had a different impact than the one estimated using the PCS dataset.[27]

5.2 Extensive Margin

As in Helpman *et al.* (2008) and Manova (2013), the number of firms exporting to the sector s of country d, X_{ds}, can be expressed as:

[27] This might not be the case if the sample (auto)selection process, s_i—a vector of $Tx1$ dimension containing indicator variables that take the value of 1 if the firm exported in each year and 0 otherwise, is strictly exogenous after conditioning on the fixed effects and the evolution of exogenous variables (Wooldridge, 1995).

$$X_{ds}(a^L_{ds}) = \begin{cases} N_{ds}, & \text{if } a^L_{ds} > a_H \\ N_{ds}G(a^L_{ds}), & \text{if } a_L < a^L_{ds} < a_H \\ 0, & \text{if } a^L_{ds} < a_L \end{cases}, \tag{5.5}$$

where N_{ds} represents the mass of potential exporting firms. $X_{ds}(a^L_{ds})$ is an increasing function: if the productivity threshold above which firms start to export, $\frac{1}{a^L_{ds}}$, is too high, no firm will export to the destination-sector concerned. Ergo, the APL's enactment enabled (i) less productive firms to start exporting and (ii) firms with pre-existing export activities to enter new foreign markets, by reducing the lower productivity threshold.

The emergence of new product-destination pairs as a result of the law's enactment does not necessarily reflect a greater number of trade links.[28] Therefore, we modified X_{ds} in order to penalize the access to "easy" trade links by introducing an adjusted variable, $\widehat{X}_{ds} \equiv w_d X_{ds}$, where w_d falls within the [0,1] interval and changes over time.[29] We establish a ranking of destination countries based on their per capita GDP for each year. The country with the highest value is assigned a $w_d = 1$, whereas the one at the bottom of the ranking gets a $w_d = 0$.

Using said variable, we follow a synthetic control approach to evaluate the predictions of equation (5.5).[30] Specifically, we sum up $\widehat{X}_{ds}$ at the j group level (which will be detailed later) as follows:

$$z_j(a^L_j) = \sum_s \sum_d \widehat{X}_{ds}(a^L_{ds}), (d, s) \in \Omega_j \tag{5.6}$$

where, the $z_j(a^L_j)$ variable is the number of firm-product-destination triplets (or trade links) in group j, Ω_j represents all product-destination pairs included in group j, and a^L_j is a vector that contains the inverse productivity thresholds, a^L_{ds}, such that $(d, s) \in \Omega_j$. Then, we transform $z_j(a^L_j)$ into an index to compare the evolution of trade links.

We define the treatment group (j=1) as the one which is made up of firms dedicated to activities eligible to the APL. Our aim is to identify the following effect:

[28] Due to capacity constraints, a firm could stop exporting to nearby or lower-income destinations to begin new export operations in more distant or higher-income countries.

[29] The results presented in the next chapter do not change substantially if we use the unadjusted variable.

[30] We do not use a DD approach because the average number of MSMEs exporting to a given destination-sector in the treatment and control groups does not have parallel trends in the pre-treatment period. Although there is no evidence to support the identification assumption, we find a significant and positive effect of the regime in the results of this analysis.

$$\nabla = z_1(a_1^{L'}) - z_1(a_1^L) > 0, \tag{5.7}$$

where $a_1^{L'}$ denotes the inverse new—lower—thresholds from which firms start to export as a result of the APL, and $a_1^{L'} \gg a_1{}^L$.

In the same vein as Abadie *et al.* (2010), the group of J potential controls—the donor pool—is defined as follows: since the treatment group is made up of 8 classes (4-digit ISIC level), we include the rest of ISIC activities related to non traditional exports at the 2-digit ISIC level in the donor pool, so as to match the size of the treatment group and the potential control groups. By estimating the counterfactual value, $z_1(a_1^L)$, we define the synthetic control $\sum_{j=2}^{J+1} w_j z_j(a_j^L)$, which is a weighted sum of the trade links of each of the groups included in the donor pool that were not subject to the APL. To estimate these weights, w_j, we minimize the distance between the pretreatment characteristics of the treated unit and the synthetic control, including the independent variable (see Abadie *et al.*, 2010 for further details).

5.3 Data

We use detailed firm-level information from the 1994-2019 period to empirically test the APL's impact on both the intensive and extensive margins. We collect data on each export shipment—value, product, firm, and destination country—from Peru's National Tax Administration Supervisory Authority (SUNAT).[31] Additionally, we use information pertaining to the National Taxpayer Registry (RUC in Spanish) at the firm level to obtain: (i) a firm's location (the "Ubigeo" code associated with its tax address), (ii) start date (specifically, the year), and (iii) ISIC code (Revision 3). We use the Agricultural Export Price Index established by the Central Reserve Bank of Peru (BCRP) to deflate export values. It should be noted that we also adopt the BCRP's classification of non-traditional products.

We obtained information on control variables from different sources. The World Bank Development Indicators provide data on the destination countries' GDP for the 1994-2018 period. Moreover, data on (i) the distance from Peru to a given destination country, (ii) contiguity with that country, (iii) the d country's national language (whether it be Spanish or a different one),

[31] These data include the FOB value of each shipment as classified in the national subheading, a 10-digit subdivision of the list of internationally traded products. The first 8 digits of each product coincide with the Common Nomenclature of the Andean Community Member Countries (NANDINA), which is based on the Harmonised Commodity Description and Coding System (HS).

and (iv) the existence of regional trade agreements (RTA) in place between the two countries come from the *gravdata* database, published by the Center for Prospective Studies and International Information (Cepii).[32]

We use information from Supreme Decree No. 013-2013-PRODUCE to classify MSMEs by size, which establishes that firms are classified as micro, small, and medium-sized when their annual sales reach up to 150 UIT (Peruvian tax units), between 150 and 1700 UIT, and between 1700 and 2300 UIT, respectively.[33] Since firm sales—and, therefore, firm size classifications—vary every year, the MSMEs that make up the empirical section's group are defined as those that exported a maximum of US$ 2.5 million—the constant dollar threshold equal to 2300 UIT—on a yearly basis, whether it be throughout the pre-treatment period (1994-2000) or in the firm's first year of export activity.

Data availability comes with a number limitations. As we explain in Section 3, firms must register under the APL regime annually and voluntarily, provided that they meet certain requirements. In that regard, a firm whose activity is eligible to the APL, as shown in Appendix A.1, will not always enjoy the benefits granted under the regime. Thus, the estimated average effects reported in the following section do not necessarily correspond to the group of firms that did receive treatment—Average Treatment on Treated Effect (ATT)—but rather to that in which we intended to apply treatment—Intention to Treat Effect (ITT).

6 Results

6.1 Intensive margin

Table 3 reports the estimated impact of the Agrarian Promotion Law on the firms' intensive margin, considering different variations of equation (5.4). Columns (1), (2) and (3) show the results for the pooled cross-sections (PCS), whereas columns (4), (5) and (6) report those associated with

[32]Available information was initially from 2015 and earlier. However, since the first three variables do not change over time, we included data on all three of them from up to 2018. As far as RTAs are concerned, we updated data by incorporating the new agreements signed between 2016 and 2018, according to the Foreign Trade Information System (SICE) established by the UN. We report a more detailed description of the covariates in Appendix A.3.

[33]We use the 2007 UIT—equal to S/. 3450—to calculate these constant thresholds in dollars. Specifically, we divide the thresholds by the Sol/US dollar exchange rate (S/. per US$) of the same year. It should be noted that firm exports reflect total firm sales in the absence of domestic sales, which means that the number of MSMEs could be overestimated.

the panel dataset (PD). Columns (1) and (4) present the results from a standard difference in difference (DiD) estimator, but excludes the control variables and fixed effects that account for the experience of different firm cohorts in equation (5.4). Columns (3) and (6) report the results of the same specification while also including all controls.[34]

The specifications reported in column (2) and (5) of Table 3 deserve further discussion. In particular, we replace the term $\gamma law_t ActAPL_i$ by $\sum_{t=1995}^{2019} \gamma_t D(t) ActAPL_i$ in the equation (5.4), where $D(t)$ takes the value of 1 if the year is equal to t and 0 otherwise. As mentioned by Mora & Reggio (2012), this specification has two important characteristics: (i) the terms that correspond to the 2001-2019 period allow for differentiated impacts between periods (which means that, statistically, there can be testing restrictions between them) and (ii) the terms that correspond to the 1995-2000 period allow the treatment and control groups to have different—although not necessarily linear—trends before the law's enactment.

Furthermore, we estimate variations of equation (5.4) for two separate groups—that is, the agro-industrial firms, and the crop-farming and breeding firms, each of which has a different control group. As we explain in Appendix B, the APL had a predecessor enacted in 1997 that only granted tax benefits to crop-farming and breeding firms. Hence, under the assumption that a number of firms had "previously" enjoyed some of the benefits granted under the APL regime, the law could have had differentiated effects. That being the case, we include an indicator variable in equation (5.4) for this group of firms, which takes the value of 1 if the firm is dedicated to any of the crop-farming and breeding activities listed in Appendix A.1, and exported in the 1997-2019 period. As far as agro-industrial firms are concerned, we do not apply any changes to the baseline specification.

Our results show that the APL's impact on the firms' intensive margin is positive and statistically significant. The same holds independently for crop-farming and breeding firms, as well as for agro-industrial firms. This estimated impact is robust to the inclusion of several control variables and to the use of PCS and the PD datasets.

[34]It is worth mentioning that in these last two cases there is less information than in the previous specifications: data from 2019 on the GDP of the destination countries were not available.

Columns (2) and (5) of Table 3 show that the ITT estimates are heterogeneous over time.[35] In particular, we arbitrarily report the estimates for the 2006, 2012, and 2018 periods. In columns (2) and (5), the statistical test of joint significance rejects, at the 5% significance level, the null hypothesis of equal APL impacts for the 2001-2019 period.[36] In fact, the impact coefficients increase over time, which is in line with the results obtained by Garcia & Voigtlander (2019). These authors suggest that new export activities—either in the foreign market for the first time or in a new destination—gradually translate into productivity gains at the firm-level over time.

Based on the estimates of specification (5.4) reported in column (3), the export value of the MSMEs subject to the APL increased, on average, by US$ 0.91 million per year following the law's enactment. For those MSMEs with the highest probability of surviving in foreign markets, shown in the PD dataset (column 6), the increase was equal to US$ 1.66 million.

By means of the estimated coefficient reported in column (3)—0.9097, the most conservative estimate from the PCS and the PD datasets—and the number of years in which each MSME exported between 2001 and 2019, we estimate that the APL may have generated US$ 373 million additional NTAXs per year—40 % of the total NTAXs. To put this result in perspective, every US$ 1 million of NTAXs generates 262 jobs (Adex, 2020); in that sense, the APL may have led to the creation of nearly 100,000 (97,770) additional jobs on average per year, that is, 64% of the direct and indirect jobs reported yearly by MSMEs exporting NTAXs.

[35]The estimates also suggest heterogeneity in other dimensions. On the one hand, they were higher for non atritters, regardless of their specific economic activities. This is not surprising for a group of firms that were more likely to survive in foreign markets. On the other hand, the estimates for cross-farming and breeding firms were higher than those of agro-industrial firms, presumably because the former had previously enjoyed tax benefits.

[36]The results reported in these columns also provide evidence that there is no need for an extra assumption—from the family of assumptions defined by Mora & Reggio (2012)—of parallel trends: a statistical test of joint significance does not reject the null hypothesis of equality between the γ coefficients during the 1995-2000 period.

Table 3: Impact of the APL on the intensive margin: ITT estimates (firm-level)

	(1)	(2)	(3)	(4)	(5)	(6)
MSMEs (total)		**PCS**			**PD**	
ITT	1.1124***		0.9097***	1.6592**		1.6597***
ITT (2006)		1.1136**			2.2237***	
ITT (2012)		1.0992***			3.6913***	
ITT (2018)		2.2726***			12.1875**	
Firms (N)	6338	6338	5266	391	391	373
Observations (N*T)	20737	20737	17641	3462	3462	3199
MSMEs (crop-farming and breeding)						
ITT	1.3677***		0.9704**	2.4112***		1.9921***
ITT (2006)		1.4381*			2.8631***	
ITT (2012)		1.5292***			4.9075***	
ITT (2018)		2.5354***			15.2615**	
Firms (N)	5282	5282	4375	302	302	291
Observations (N*T)	16189	16189	13713	2486	2486	2292
MSMEs (agribusiness)						
ITT	0.8091***		0.7331***	0.5790**		0.8712***
ITT (2006)		0.5625*			0.9477***	
ITT (2012)		0.6292***			0.8732*	
ITT (2018)		1.2614***			3.6059***	
Firms (N)	4898	4898	4045	268	268	253
Observations (N*T)	14721	14721	12441	2232	2232	2044
Fixed effects						
ISIC	Yes	Yes	Yes	No	No	No
Firm	No	No	No	Yes	Yes	Yes
Province-year	Yes	Yes	Yes	Yes	Yes	Yes
Experience cohort	No	No	Yes	No	No	Yes
Covariables	No	No	Yes	No	No	Yes

Note: We use clustered standard errors at the ISIC-level for each specification. The control groups for the whole sample—crop-farming and breeding firms, and agribusinesses—are different from each other. We perform regressions in *Stata* by using the *reghdfe* command, which drops singletons within the used fixed effect groups. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

6.2 Extensive margin

The identification strategy to test the APL's impact on the extensive margin requires an adequate synthetic control. With this in mind, Table 4 compares the characteristics of the APL group and the synthetic control during the 1994-2000 period. According to the table, the synthetic control replicates the average characteristics of the treated unit, with a small difference in the experience and distance variables.

Table 4: Average characteristics of the APL firms group and its synthetic control (1994-2000)

Variable	Treated unit	Synthetic control
The number of firm-product-destination triplets excluding large companies in $group_j$ (Adjusted index, base=1994)	169.27	169.43
Exports $index_j$ (base=1994)	137.87	156.46
Number of products $index_j$ (base=1994)	155.80	154.84
Number of destinations $index_j$ (base=1994)	116.04	118.03
Average per capita GDP of destinations in $group_j$	21140	21285
$Contiguity_j$ (%)	7.1	7.2
common official $language_j$(%)	24.0	23.9
Regional Trade Agreements RTA_j(%)	4.5	4.9
$Exports_i$ (millions in US constant dollars)	1.32	1.21
$Experience_i$ (years)	7.06	8.24
$Distance_i$(km)	8827	8972

Note: Variables are aggregated differently so as to obtain a group-level indicator. The variables with i index result from a simple average across firms within the j group, whereas those with j index were obtained by adding the variable at group level. The donor pool contains ISIC NTX activities at the 2-digit level, as well as the control group used in the intensive margin section. We adopt a national-level product classification (10 digits).

Table 5 reports the weights in the the synthetic control. 33% corresponds to fishing, a seasonal activity that, similar to agriculture, depends on export opportunities. 23% corresponds to the control group that we used in the intensive margin analysis section, which demonstrates its utility as a fair point of comparison. Finally, 22% is assigned to wholesale trade. The weight of the remaining groups in Table 5 is small, while that of the remaining 33 activities in the donor pool is equal to 0.

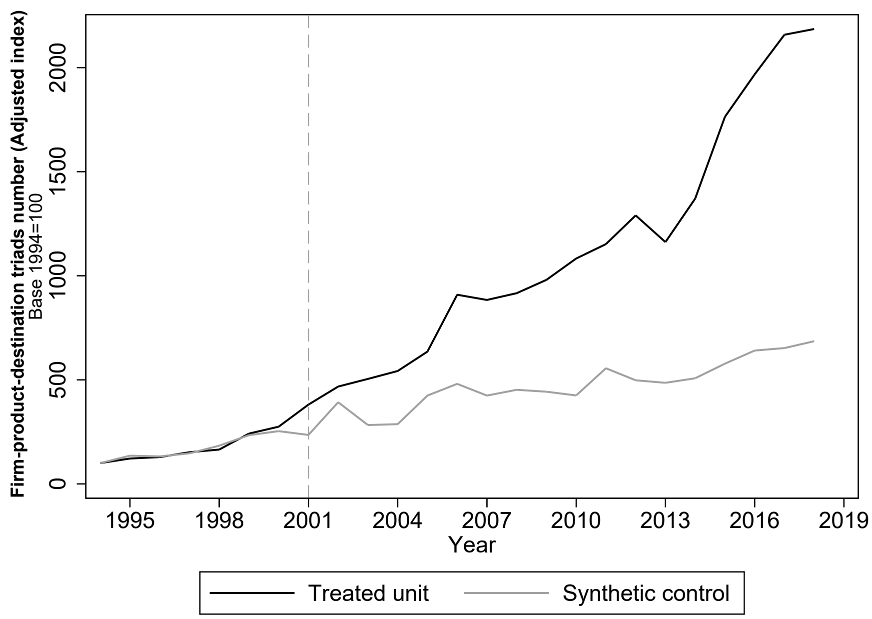
Graph 10, for its part, shows the index of all trade links associated with APL activities and the synthetic control, respectively. The number of firm-product-destination triplets under the APL regime increased above the results that one would have expected in the absence of the law. Moreover, its impact on trade links increased over time. Overall, the APL was responsible for 59% of such links established by MSMEs subject to the regime between 2001 and 2019.

Table 5: Weights of the groups selected in the synthetic control

ISIC rev.3 (Division)	Description	Weights (%)
5	Fishing, aquaculture and service activities incidental to fishing	33.4
-	Control group of the intensive margin section	22.6
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	21.7
27	Manufacture of basic metals	6.6
52	Retail trade	6.6
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	6
33	Manufacture of medical, precision and optical instruments, watches and clocks	3.1

Source: Peruvian customs-SUNAT, World Bank and CEPII.
Note: The donor pool contains 40 groups.

Graph 10: Trends in MSMEs trade links at aggregate level: APL firms group vs. synthetic control



Note: We adopt a national-level product classification (10 digits).

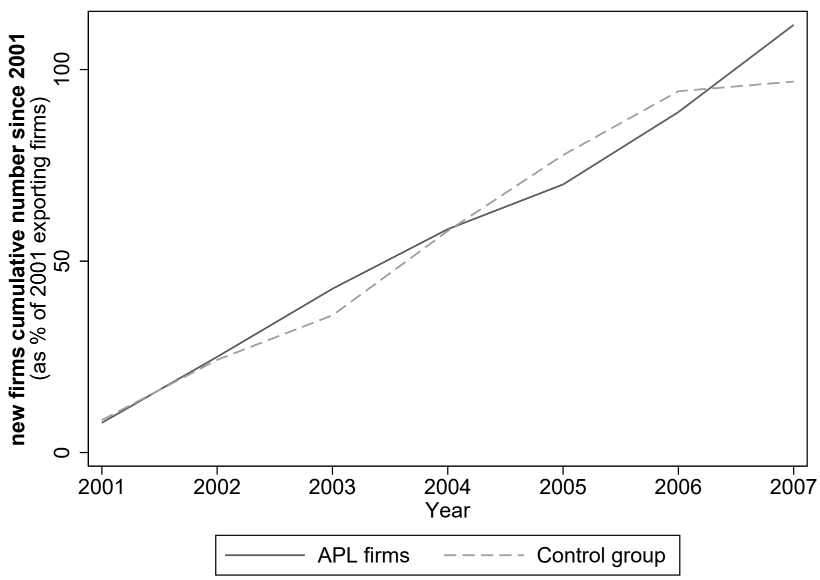
6.3 Robustness Analysis

6.3.1 Intensive margin

Creation of new firms

Given that firms in the control group export the same products as those subject to the APL, it is possible that the former created new secondary firms or subsidiaries dedicated to an ISIC activity so as to become eligible to the law.[37] A newly created subsidiary registered under the APL regime could potentially share its tax benefits with its parent firm, in which case there would be spillovers from the treatment group to the control group—and, consequently, biased estimates. If that were indeed the case, the number of new firms would be higher in the treatment group than in the control group for the years following the law's enactment. Nonetheless, Graph 11 shows that the proportion of firms created after the APL was enacted— as a percentage of total the number of firms that exported in 2001—is similar in both groups, which means that there is not sufficient evidence to support this hypothesis.

Graph 11: New firm trends by group after the APL



Source: Unique Taxpayer Registry Census - SUNAT.

General equilibrium effects on the control group

It is also possible that the firms subject to the APL could have caused negative effects on those included in the control group, as they both export the same products. Thanks to the tax benefits they were granted under the regime, the former faced lower costs, which not only allowed them to lower their prices in foreign markets, but also reduced the residual demand faced by the control group. On the other hand, firms under the APL regime may place upward pressure on wages by demanding more labor to export larger shipments. This would in turn translate into higher costs—and, therefore, lower exports—for the control group.

[37] Appendix A.1 shows the list of ISIC activities eligible to the APL.

To test these hypotheses, we only use observations from the control group. We split these observations into two subgroups: (i) firms highly affected by competition with their APL counterparts and (ii) firms moderately affected by that competition. In the event of spillovers, firms from group (i) would be negatively affected by competition and export less than those in group (ii).

We define a yearly competition measure for each firm in the control group, which is based on the market share of APL firms for each product exported by members of the two groups. If, for instance, a firm in the control group exports two products for which the aggregate shares of APL firms are 20% and 40% of their total exports, respectively, the competition indicator would take the average of these two values—30%. Subsequently, we split the control group into the two aforementioned subgroups based on a threshold established for this variable. Firms above that threshold were highly affected by competition with their APL counterparts and belong to group (i).

Table 6 reports the results of the above exercise for two thresholds: 30% and 50%. We find that the APL's impact on the firms that were highly affected by competition is not statistically significant. It should be noted that the same holds for the two thresholds and we used the specifications previously reported in Table 3. Therefore, we did not find evidence supporting the above described hypothesis.

Exclusion of the main export products and destination

According to Peru's available data on NTAXs, grapes, fresh asparagus, and avocados are the main products exported by firms under the APL regime—representing 42% of the total NTAXs (see Appendix A.2)—and the United States is the country's main export destination. That being so, our previous results might be influenced by the success of these products or the signature of the United States-Peru Free Trade Agreement in 2006, which entered into force in 2009.

To contrast both possibilities, Table 7 reports the estimates corresponding to Table 3, although excluding (i) grapes, fresh asparagus, and avocados, and (ii) shipments to the United States. The estimated coefficients in these specifications remain positive and statistically significant, especially for the specification (5.4) reported in column (3) and (6). It should be stressed, however, that the impacts are relatively smaller.

Table 6: ITT estimates on a fake treatment: splitting the control group (firm-level)

	(1)	(2)	(3)	(4)	(5)	(6)
MSMEs (total) - 30% threshold						
ITT	0.0586		0.1356	0.1195		0.0976
ITT (2006)		0.1427			-0.2023	
ITT (2012)		-0.0195			0.4052	
ITT (2018)		0.2084			-0.2511	
Firms (N)	4475	4475	3695	263	263	248
Observations (N*T)	12331	12331	10389	1979	1979	1979
MSMEs (total)- 50% threshold						
ITT	0.0548		0.0548	0.0223		0.1830
ITT (2006)		0.1279			-0.1887	
ITT (2012)		-0.0251			-0.3210	
ITT (2018)		0.5972			0.7178	
Firms (N)	4475	4475	3695	263	263	248
Observations (N*T)	12331	12331	10389	1979	1979	1979
Fixed effects						
ISIC	Yes	Yes	Yes	No	No	No
firm	No	No	No	Yes	Yes	Yes
Province-year	Yes	Yes	Yes	Yes	Yes	Yes
Experience Cohort	No	No	Yes	Yes	No	Yes
Covariables	No	No	Yes	No	No	Yes

See the note for Table 3.

6.3.2 Extensive margin

The robustness of synthetic control

Abadie *et al.* (2010 and 2015) propose robustness tests for the synthetic control approach. They consist in performing a placebo exercise with each of the donor pool's units: one estimates the APL's impact on each of them following the same methodology used for the real treated unit. Then, the estimated results of the latter are compared with those of each placebo. These results generate a distribution under the null hypothesis that there is no impact on the real treated unit. This hypothesis can be rejected at a given level of significance by comparing the results of the treated unit with the distribution.

Table 7: ITT estimates after excluding the main products or the main destination (US)

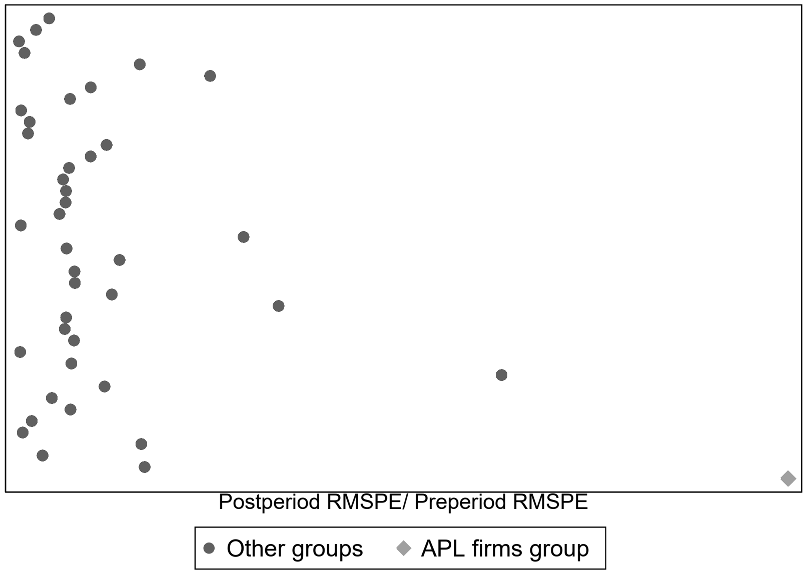
	(1)	(2)	(3)	(4)	(5)	(6)
MSMEs (total) - excluding grapes, fresh asparagus and avocados						
ITT	0.6151**		0.4931*	0.7770*		0.9194***
ITT (2006)		0.8920*			0.9682***	
ITT (2012)		0.6481**			1.0742*	
ITT (2018)		1.4171***			6.7508*	
Firms (N)	5865	5865	4860	364	364	346
Observations (N*T)	18671	18671	15820	3137	3137	2881
MSMEs (total) - excluding US						
ITT	0.7143**		0.5958**	0.9910		1.1787**
ITT (2006)		0.9265*			1.1909**	
ITT (2012)		0.8463*			2.9442**	
ITT (2018)		1.5188***			7.0271**	
Firms (N)	5472	5472	4474	316	316	296
Observations (N*T)	17545	17545	14725	2846	2846	2596
Fixed effects						
ISIC	Yes	Yes	Yes	No	No	No
Firm	No	No	No	Yes	Yes	Yes
Province-year	Yes	Yes	Yes	Yes	Yes	Yes
Experience cohort	No	No	Yes	No	No	Yes
Covariables	No	No	Yes	No	No	Yes

See the note for Table 3.

Under this approach, only groups with an acceptable Mean Square Error (MSE) in the pretreatment period are relevant enough to be compared with the treated unit. Therefore, the above cited authors suggest to perform an additional step by calculating the root MSE ratio for the post and pretreatment periods, so that any group is excluded. We performed this test in Graph 12, which shows that the group associated with APL activities is an outlier in the distribution.

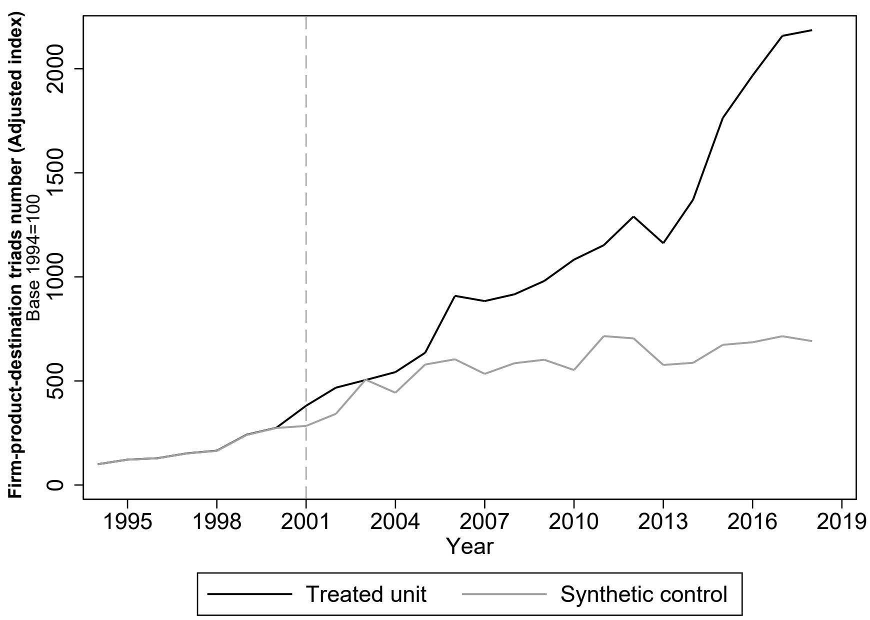
Ashok *et al.* (2015) and Ferman *et al.* (2020), for their part, recommend the application of a benchmark exercise. More specifically, they suggest to build the synthetic control by only using all the dependent variable's values in the pretreatment period instead of matching group covariates (see Graph 13). Once again, it was found that the APL caused an increase in the number of trade links (firm-destination-product triplets), but the effect was lower for the first years included in the sample.

Graph 12: Synthetic control robustness analysis



Note: The ordinate axis shows the index of the $J + 1$ groups in such a way that the treated unit is identified with value 1. RMSPE: Root Mean Square Predicted Error.

Graph 13: Alternative synthetic control



Note: Trends predating 2001 are identical because of the alternative synthetic control, which is used to replicate the treated unit's dependent variable trend from before that year. Moreover, the synthetic control did not replicate the average values of the 1994-2000 period's characteristics, as was the case in Table 4.

An alternative approach

Paravisini *et al.* (2011) assess the impact of credit on the extensive margin of Peruvian exports by using information at the firm-product-destination level. Thanks to their approach, they can control for specific shocks over time, in addition to controlling for fixed effects at the firm level. In particular, they analyze the effect of access to credit on the probability of exporting to a new market—that is, one that a firm has not previously reached.

Based on Paravisini *et al.* (2011), we perform a similar approach to assess the impact of being subject to the APL on a firm's probability of starting new export activities. Specifically, we use the following baseline specification:

$$E_{ipdt} = \delta_{ipd} + \delta_{pdt} + \eta law_t ActAPL_i + v_{it} \tag{6.1}$$

where i denotes the MSME; p, the product (6-digit level); d, the destination; and t, the year. E_{ipdt} is an indicator variable that takes the value of 1 if firm i exports to a pd market (product-destination) in a t year, and 0 otherwise, provided that the firm had not exported products to this market before the t period.[38] δ_{ipd} is a firm-product-destination fixed effect,[39] δ_{pdt} is a market-year fixed effect, and $law_t ActAPL_i$ takes the value of 1 if firm i is under the APL regime and $t \geq 2001$. Hence, η captures all the variability between a firm that received treatment and one that did not, given that they had the same initial conditions in foreign markets and were affected by the same market shocks over time.

We define the universe of potential markets as follows: first, we identify the firm-product pairs (at the Harmonized System's 4-digit level) that reported any positive export values during the 1994-2000 period; secondly, we identify the destination-product pairs (defined at the 6-digit level) with positive export values in the 1994-2006 period;[40] finally, the universe of potential markets for each firm is defined by the interaction between both groups. Therefore, the potential fullset of export markets for firm i includes all the destination-product pairs (at 6-digit level) exported by

[38] Contrary to Paravisini *et al.* (2011), we consider more than two periods in our estimation. Therefore, as part of our generalization, we consider that a firm's entry into a new market is conditioned by the fact that it had not exported to that market before—that is, during the analysis period. It should be noted that we do not allow for re-entries by definition and E cannot be defined for the first period of the sample.

[39] Unlike Paravisini *et al.* (2011), we include a δ_{ipd} fixed effect because we have an unbalanced panel at the ipd level. If firm i penetrates a pd market in a t year, each ipd observation in the sample corresponds to the years up to the t period.

[40] We choose this period to equalize the pre- and post- treatment horizons. The reason for this is that a longer horizon may allow firms to switch to export products that are not at the upper 4-digit level.

at least one firm in the 1994-2006 period. These 6-digit-level products are part of the 4-digit-level products exported by firm i concerned during the 1994-2000 period. It is worth noting that the universe of potential markets does not change over time, with the exemption of those in which the firm has already entered. With this in mind, our estimation resulted in more than 2 million observations.

The results reported in Table 8 are statistically significant and robust to the inclusion of several fixed effects. The APL's impact on a firm's probability of starting export operations in a new foreign market is equal to 0.3 percentage points. The magnitude of this impact is not trivial: the average probability of entering a new market during the pre-treatment period was 0.5%,[41] Therefore, the impact is equal to an increase of 51% with respect to that probability.[42]

It is worth mentioning that this analysis has some limitations: (i) the way in which we define the set of potential foreign markets excludes some markets[43] and (ii) only firms that exported in the pre-treatment period are analyzed. In contrast, although the synthetic control approach would not be affected by these two drawbacks, it does not allow us to control for heterogeneities at the product-destination and firm level. Therefore, both methodologies are complementary.

[41] This is calculated as $\frac{1}{6}\sum_{t=1995}^{2000}\frac{\sum_{ipd} E_{ipdt}}{n_t}$, where n_t is the total number of available firms-products-destinations (E could take the value of 0 or 1) in a t period. It is worth mentioning that 0.5% is also the value reported by Paravisini *et al.* (2011), although these authors analyze Peru's entire export universe during the 2008-2009 financial crisis.

[42] These results are robust to defining the number of products at the 2-digit level instead of at the 4-digit level, thereby expanding the set of potential markets. The estimates for each column of Table 8 would be 0.0010***, 0.0010*** and 0.0011***, while the pre-treatment average entry probability would be equal to 0.15%, with a 66% impact.

[43] Ideally, the full set of potential foreign markets for each firm is defined as the Cartesian product of the whole set of 10-digit products and all countries. However, the implementation of such scenario would be computationally complicated.

Table 8: The APL's impact on the probability of penetrating a new market: estimates from different specifications at firm-product-destination level

	(1)	(2)	(3)
ITT	0.0026***	0.0025***	0.0026***
Firms (N)	1217	1217	1201
Observations (in thousands)	2220	2220	2030
Fixed effects			
Firm-product-destination	Yes	Yes	Yes
Product-destination-year	Yes	Yes	Yes
Province-year	No	Yes	Yes
Experience cohort	No	No	Yes

Note: Product classification is at the Harmonised system (HS)'s 6-digit level. For more details, see Table 3's note.

7 Conclusions

The Agrarian Promotion Law (APL) reduced the tax and labor costs borne by firms dedicated to crop-farming, breeding, and agro-industrial activities by nearly half since its enactment in 2001. As a matter of fact, its benefits had a much greater impact as compared to previous legal regimes of similar kind in Peru and other Latin American countries. The APL has thus positioned itself as a reform of great significance.

Peru's non-traditional agricultural exports (NTAXs) have exhibited outstanding growth in the past two decades. At the helm of this process was a group of firms of different sizes and dedicated to activities eligible to the APL. Micro, small, and medium-sized entreprises (MSMEs) were also part of this group, and they increased their exports during the 1994–2000 and 2001–2019 periods more than any other NTAXs firms of similar size.

This research analyzes the link between the two above mentioned facts—*i.e.,* the APL's impact—by means of a model of heterogeneous firms based on Melitz (2003). In our model, which additionally incorporates financial and labor frictions used by Manova (2013) and Helpman & Itskhoki (2007), respectively, firms are confronted with liquidity problems because they receive their revenues from exports at the end of each period. Ergo, by lowering the income tax rate (ITR) and labor costs, it was possible to reduce both a fraction of the fixed export costs financed through export revenues and the unit variable cost; this in turn translated into higher operating profits. In that regard, MSMEs that used to be financially constrained were able to export at optimal levels: thanks to their higher operating profits, they became eligible for more funding from financial institutions—in other words, their intensive margin increased. It should be also noted that, as these firms initially had lower productivity levels, they had no access to further financing and, consequently, were unable to penetrate foreign markets; nonetheless, as the APL improved their image in the eyes of financial institutions, they were ultimately able to export to multiple markets.

This paper finds that the APL had a positive and significant impact, both statistically and economically, on exports by MSMEs—the intensive margin—and their capability of accessing foreign markets—the extensive margin. To achieve our research goals, we used detailed firm-level data on NTAXs for the 1994–2019 period, and applied a double-difference (DD) and synthetic control identification strategy.

As far as the intensive margin is concerned, our findings show that the APL is responsible for 40% of the MSMEs' NTAXs, which means that it created approximately 100,000 new jobs on average per year. The statistical significance of this result is robust to controlling for external demand, the distance to destination markets, free trade agreements, exporter experience cohorts, changes over time at the exporters' operation locations (*e.g.*, irrigation projects or climate variations), the exclusion of main products or shipments to the U.S., and the estimation of non-parametric forms of the difference-in-differences approach. In regards to the extensive margin, the APL was responsible for 59% of the MSMEs' trade links between 2001 and 2019. These results are robust to the placebo tests suggested by Abadie *et al.* (2010) and Abadie *et al.* (2015), and to the observations made by Ashok *et al.* (2015) and Ferman *et al.* (2020), based on which we developed a synthetic control approach that replicates the entire path of the dependent variable in the pre-treatment period. Lastly, following an alternative approach developed by Paravisini *et al.* (2011) for the extensive margin, we found that a firm's probability of penetrating a new market (product-destination pair) doubled in the first 6 years following the APL's enactment.

Arguments against the APL suggest that it may have generated some additional costs—to cite an example, Peru's National Treasury incurred losses by collecting only 50% of the income tax. However, our results appear to demonstrate that the APL caused both the intensive and extensive export margins to increase. As a result, the tax base may have expanded substantially, and possibly more than offset the collection shortfall resulting from a lower income tax rate—under a cost-benefit analysis, the APL may have been effective in tax terms. Additionally, critics stress that the APL had a negative impact on workers' benefits, pushing them into more precarious conditions. The results herein reported show that, in the absence of the APL, MSME exports—through the intensive and extensive margins—would not have risen as they did, which means that the salaries of formal workers would not have increased as suggested by Castellares & Ghurra (2020). Hence, in labor terms, a cost-benefit analysis of the APL should consider both the working conditions and the higher salaries and/or wages of formal workers.

A 2019 survey conducted by the Central Reserve Bank of Peru (BCRP) on potential barriers to growth in the agro-export industry shows that CEOs were particularly concerned about the possibility of the APL's expiration in 2021. Much to their dismay, the law was repealed and replaced by a new piece of legislation foreseeing an increase in tax and labor costs. Our results strongly suggest that the impact of this legal decision on MSMEs' export performance is likely to be detrimental. Conversely, the effects of the APL may be replicated in other emerging economies through reforms of the same kind.

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A Appendices

A.1 Economic activities included in the Agrarian Promotion Law

ISIC rev. 3.1	**Description**
Crop-farming and breeding activities	
Class 0112	Growing of vegetables, horticultural specialties and nursery products
Class 0113	Growing of fruit, nuts, beverage and spice crops
Class 0121	Farming of cattle, sheep, goats, horses, asses, mules and hinnies; dairy farming
Class 0122	Other animal farming; production of animal products n.e.c.
Class 0130	Growing of crops combined with farming of animals (mixed farming)
Agribusiness activities	
Class 1511	Production, processing and preserving of meat and meat products
Class 1513	Processing and preserving of fruit and vegetables
Class 1542	Manufacture of sugar

Source: International Standard Industrial Classification of All Economic Activities, Revision 3.1, and Supreme Decree N^{o} 007-2002-AG appendix.

A.2 15 main non-traditional products exported by firms dedicated to crop-farming, breeding, and agribusiness activities

Products	**Description**	**Share (%)**
0806.10.00.00	Fresh grapes	16
0709.20.00.00	Fresh asparagus	16
0804.40.00.00	Avocados	10
2005.60.00.00	Preserved asparagus	9
0810.40.00.00	Cranberries, bilberries and other fruits of the genus Vaccinium	6
0804.50.20.00	Mangoes and mangosteens	6
2005.99.10.00	Artichokes	4
0803.00.12.00	Bananas	3
0710.80.10.00	Asparagus	2
2001.90.90.00	Rest of vegetables, fruits or other edible parts of the plants	2
2005.99.90.00	Rest of prepared or preserved vegetables	2
0904.20.10.10	Paprika	2
0703.10.00.00	Onions and shallots	2
2005.99.20.00	Piquillo pepper (Capsicum annuum)	2
0811.90.91.00	Mango (Mangifera indica L.)	1
Top 15 products share (%)		**82**
Number of total products at national-level		**441**

Source: Peruvian customs – SUNAT and authors' own calculations.

Note: We adopt a 10-digit, national-level product classification. Export products correspond to the 1994-2019 period. Product shares are calculated in the same time frame. Products are standardized to Peru's 2007 National Classification of Goods.

A.3 Covariables' description at firm-level

Characteristics	Formula	Formula's Description
$Experience_{it}$	$t - T_i$	t year in which firm i exports minus the year in which the firm was created (T)
$Contiguity_{it}$	$\frac{\sum_{d\in\Omega_{it}} A_{dt}}{\lvert\Omega_{it}\rvert}$	A is equal to 1 if the destination d, to which firm i exports, is a neighbor country, and 0 if otherwise (CEPII)
Common official $language_{it}$	$\frac{\sum_{d\in\Omega_{it}} A_{dt}}{\lvert\Omega_{it}\rvert}$	A is equal to 1 if destination d, to which firm i exports, has the same official language, and 0 if otherwise (CEPII)
Weighted $Distance_{it}$	$\frac{\sum_{d\in\Omega_{it}} D_{dt}}{\lvert\Omega_{it}\rvert}$	D denotes the physical distance (in km) to country d (weighted based on its population) to which firm i exports (CEPII)
Regional Trade Agreement (RTA_{it})	$\frac{\sum_{d\in\Omega_{it}} A_{dt}}{\lvert\Omega_{it}\rvert}$	A is equal to 1 if the destination d, to which firm i exports, has a current RTA with the origin country, and 0 otherwise (CEPII y SICE)
Ln_{it}(Destination countries GDP)	$\frac{\sum_{d\in\Omega_{it}} Ln(PBI)_{dt}}{\lvert\Omega_{it}\rvert}$	Per capita GDP - constant 2011 international dollars (World Bank)

Source: SUNAT, World Bank, CEPII.

Note: Ω_{it} represents the destination set to which firm i exports in a t period. $|\Omega_{it}|$ represents the number of destinations to which firm i exports in period t.

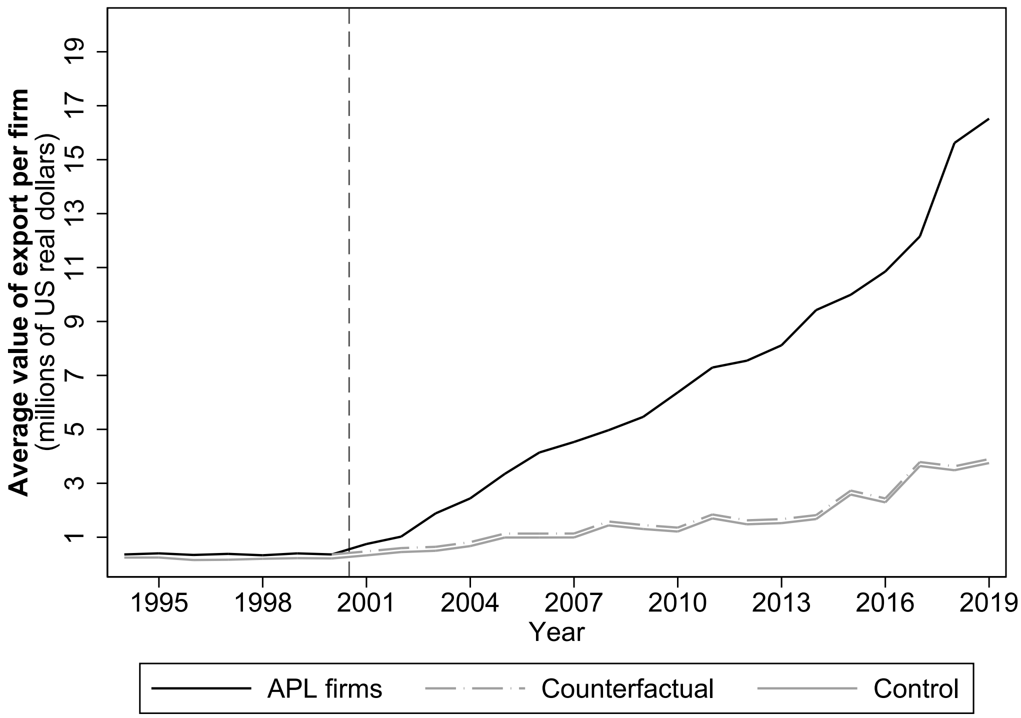
A.4 Covariables' mean at firm-level, by group and period

Covariable	Pre-treatment period: 1994-2000		Post-treatment period: 2001-2018	
	Treatment	Control	Treatment	Control
Ln(Destination countries GDP)	10.25	10.11	10.46	10.30
Experience (years)	6.68	9.09	7.66	8.66
Contiguity (%)	15.09	16.04	13.15	19.15
Common official language (%)	21.37	31.51	25.14	33.53
Distance (km)	7542	7208	8033	7528
RTA (%)	3.48	9.82	48.12	46.57

Source: SUNAT, World Bank y CEPII.

Treatment: APL firms. Control: Firms dedicated to other ISIC activities that export the same products as the APL firms. Sample means are restricted to MSMEs. The post-treatment average only takes information from up to 2018 due to data availability limitations: the GDPs of the destination countries were not available for 2019.

A.5 Parallel trends for MSMEs exports (Panel data)



B Regulatory Framework: background

Historically, a wide variety of regulations have aimed to foster the development of the agricultural sector. They have, among other things, granted certain labor benefits in response to seasonality, returned agricultural property to the business community, and recognized the importance of supporting small businesses through tax benefits.[44] The APL had, indeed, the very same purposes, but succeeded in granting labor and tax benefits with a much greater impact.

Legislative Decree No. 885, which preceded the APL, was published in 1997. Although the regime established by this decree was initially expected to end in 2001, Law No. 26865 extended its effective period until 2006. This piece of legislation established that firms in the crop-farming or breeding sectors were eligible to a wide range of tax and labor benefits; however, it excluded those dedicated to poultry farming, agribusiness, and forestry activities.

In order to remain eligible, firms subject to the decree were required to comply with their tax payment obligations in a timely manner. In return, they would be granted the following benefits:

1. an anticipated VAT refund for inputs used in the pre-production stage, which could not last more than 5 years;
2. a 15 percent Income Tax rate;
3. deductions of up to 20 percent on the net taxable income for hydraulic and irrigation investments;
4. a 20 percent depreciation rate per year for hydraulic and irrigation investments; and
5. a monthly contribution of 4 percent of the Minimum Wage towards employee health insurance.

From a labor perspective, this scheme falls short as compared to what would later become the Agrarian Promotion Law.

Enacted in 1998, Supreme Decree No. 002-98-AG established a number of regulations expected to shape the APL regime, as well as the ways in which firms could access its many benefits. One of those regulations established that firms were required to submit an affidavit to Peru's National Tax Administration Supervisory Authority (SUNAT) stating that their main production activity was either crop-farming or breeding.[45]

In 2000, various initiatives were presented to the Peruvian Congress to extend the reach of pre-existing agrarian regulations. These initiatives ultimately crystallized in bills No. 00217 and No. 00191, which sought to extend benefits to firms dedicated to agro-industrial activities; in bill No 00189, which provided a correct definition of agricultural producers; and in bill No. 00389, intended to achieve the inclusion of poultry activities.

In 2006, the year in which the benefits initially established by Legislative Decree No. 885 came to an end, Law No. 28810 extended the APL's effective period until 2021, without making any changes to its regime.

[44] It is worth mentioning a few examples. The Law for the Promotion of Non-Traditional Exports (Law Decree No. 22342) enables firms to renew their employees' temporary contracts indefinitely. Supreme Decree No. 011-91-AG establishes that eligible firms are entitled to land ownership. The Law for the Promotion of Investments in the Agrarian Sector was approved by Legislative Decree No. 853, and Law No. 26505 is referred to as The Land Law. Law No. 26564 foresaw that agricultural producers whose annual sales do not exceed 50 UIT (Peruvian Tax Units) were exempted from paying the General Sales Tax, the Municipal Promotion Tax, and the National Income Tax. Finally, Law No. 27400 established criteria for the issuance of documents pertaining to the payment of taxes on imports and input sales in favor of firms dedicated to agricultural activities.

[45] Today, firms can register under this regime by filling out SUNAT's 4888 Form.

C The model: Mathematical Appendix

C.0.1 Firms without financial constraints

Using restrictions (i) and (ii) of the firm's problem, and given that $B_d(a) = 0$, the level of profits, $\Pi_d(a)$, is:

$$\Pi_d(a) = \frac{\theta Y_d}{P_d^{1-\varepsilon}} p_d^{1-\varepsilon}(a) - \left[[\tau_d + b] a \frac{\theta Y_d}{P_d^{1-\varepsilon}} p_d^{-\varepsilon}(a) \right] - (1-\pi) f_d. \tag{C.1}$$

For firms in which constraint (iii) is not binding, the price that maximizes profits is $p_d^*(a) = \frac{[\tau_d + b]a}{\alpha}$. Therefore:

$$\Pi_d^*(a) = [1-\alpha] \frac{\theta Y_d}{P_d^{1-\varepsilon}} \left[\frac{[\tau_d + b]a}{\alpha} \right]^{1-\varepsilon} - (1-\pi) f_d. \tag{C.2}$$

Using notation at the sector level (the s subscript), this case corresponds to firms whose productivity level is above $\frac{1}{a_{ds}^H}$. From this threshold, firms that export in sector s generate operating profits, $A_{ds}(a)$, above the amount of their debt, $F(a)$, which means that a_{ds}^H satisfies $A_{ds}(a_{ds}^H) = F(a_{ds}^H)$. It also holds that:

$$F(a_{ds}^H) = \frac{d_s}{\lambda_s} [\tau_d a_{ds}^H q_{ds}(a_{ds}^H) + b_s h_{ds} + f_d] - \frac{1-\lambda}{\lambda} t_s f_{e,s}. \tag{C.3}$$

Therefore, for a firm whose productivity is exactly at the threshold level, constraint (iii) can be rewritten as:

$$\left[1 - (1-d_s)\alpha - \frac{d_s \alpha}{\lambda} \right] \frac{\theta_s Y_d}{P_{ds}^{1-\varepsilon}} \left[\frac{[\tau_d + b_s] a_{ds}^H}{\alpha} \right]^{1-\varepsilon} = \left[(1 - d_s - \pi_s) + \frac{d_s}{\lambda} \right] f_d - \frac{1-\lambda}{\lambda} t_s f_{e,s}, \tag{C.4}$$

which allows us to analyse the effects of exogenous variables on the level of productivity, $\frac{1}{a_{ds}^H}$, the threshold from which firms choose optimal prices.

C.0.2 Firms with financial constraints

In the case of firms for which restriction (iii) of the firm's problem is binding, it holds that:

$$A_d(a) \equiv p_d(a) q_d(a) - (1-d)[\tau_d + b] a q_d(a) - (1 - d - \pi) f_d = F(a), \tag{C.5}$$

regardless of the productivity level, $\frac{1}{a}$, where $\frac{1}{a} < \frac{1}{a_{ds}^H}$. The productivity level of these firms is less than $\frac{1}{a_{ds}^H}$, but their benefits from exporting to sector s of country d are still positive; turning them into firms that export although not at optimal levels.

Given constraints (i) and (ii), as well as the fact that $B_{ds}(a) = 0$ in constraint (iii), the price charged by a financially constrained firm with productivity $\frac{1}{a}$ must satisfy the following expression:

$$\frac{\theta Y_d}{P_d^{1-\varepsilon}} p_d^{1-\varepsilon}(a) - (1 - d + \frac{d}{\lambda}) [[\tau_d + b] a \frac{\theta Y_d}{P_d^{1-\varepsilon}} p_d^{-\varepsilon}(a)] = (1 - d - \pi + \frac{d}{\lambda}) f_d - \frac{1-\lambda}{\lambda} t f_e. \tag{C.6}$$

The price $p_d^{LHS^*}(a) = (1 - d + \frac{d}{\lambda}) \frac{[\tau_d + b]a}{\alpha}$ maximizes the value of the left side (LHS) of equation (C.6). The latter is greater than the optimal p_d^* price because $-d + \frac{d}{\lambda} = d(\frac{1}{\lambda} - 1) > 0$. Note that the value of the LHS of the equation (C.6) increases for prices inside the interval $[p_d^*, p_d^{LHS^*}(a)]$. Therefore, the price that maximizes profits for firms with financial constraints—the one that satisfies the equation (C.6)—falls within interval. This is because the right hand side (RHS) of equation (C.6) is always greater than the LHS of the same equation evaluated at the optimal price p_d^*.[46]

Finally, when the s susbcript is included back into the equation to denote a sector, the suboptimal price chosen by a firm with productivity $\frac{1}{a_{ds}^L}$—that is, the producitvy threshold from which firms start to export but remain financially constrained—satisfies:

[46]Given that for, financially constrained firms, $a > a_{ds}^H$ then $[1 - (1-d_s)\alpha - \frac{d_s \alpha}{\lambda}] \frac{\theta_s Y_d}{P_{ds}^{1-\varepsilon}} \left[\frac{[\tau_d + b_s]a}{\alpha} \right]^{1-\varepsilon} < [1 - (1-d_s)\alpha - \frac{(d_s \alpha)}{\lambda}] \frac{\theta_s Y}{P_{ds}^{1-\varepsilon}} \left[\frac{[\tau_d + b_s] a_{ds}^H}{\alpha} \right]^{1-\varepsilon} = [(1 - d_s - \pi_s) + \frac{d_s}{\lambda}] f_d - \frac{(1-\lambda)}{\lambda} t_s f_{e,s}$.

$$(1-\alpha)\frac{\theta_s Y_d}{P_{ds}^{1-\varepsilon}}\left[\frac{(1-d_s+\frac{d_s}{\lambda})[[\tau_d+b_s]a_{ds}^L]}{\alpha}\right]^{1-\varepsilon} = (1-d_s-\pi_s+\frac{d_s}{\lambda})f_d - \frac{1-\lambda}{\lambda}t_s f_{e,s}, \tag{C.7}$$

where the LHS of Equation C.6 has been evaluated in the price $p_{ds}^{LHS^*}(a_{ds}^L)$. Equations (C.7) and (C.4) allow us to calculate the impact of the model's exogenous variables on the two productivity thresholds: (i) the level of productivity from which firms start to export, although not optimally, and (ii) that from which firms generate optimal profits.

C.0.3 Impacts on the upper threshold

By deriving both sides of the equation (C.4) with respect to b_s and defining $\psi_{ds}^H \equiv \frac{1}{a_{ds}^H}$, we obtain

$$\frac{\partial \psi_{ds}^H}{\partial b_s} = \frac{\psi_{ds}^H}{\tau_{ds}+b_s} > 0. \tag{C.8}$$

Therefore, considering $\frac{\partial b_s}{\partial l_1} < 0$, it implies that $\frac{\partial \psi_{ds}^H}{\partial l_1} < 0$, reducing the productivity threshold. Hence, a more efficient matching process (higher l_1) allows less productive firms to overcome their financial constraint, thereby increasing their revenues and profits. Similarly, by deriving both sides of (C.4) with respect to π_s, the fraction of fixed costs financed by means of non-distributed profits is:

$$\frac{\partial \psi_{ds}^H}{\partial \pi_s} = -\frac{f_d}{(\varepsilon-1)\left[1-(1-d_s)\alpha-\frac{d_s\alpha}{\lambda}\right]\frac{\theta_s Y_d}{P_{ds}^{1-\varepsilon}}[\tau_d+b_s\alpha]^{1-\varepsilon}{\psi_{ds}^H}^{\varepsilon-2}} < 0. \tag{C.9}$$

Given the properties of g, it holds that $\frac{\partial \psi_{ds}^H}{\partial \kappa} > 0$, reducing the productivity threshold. In that regard, higher self-financing replaces the fraction of fixed costs financed by means of available revenues,[47] thus allowing less productive firms to generate greater benefits and, logically, repay their lending banks more easily—that is, without financial constraints.[48] Consequently, these firms can reach their optimal export levels. Income tax reductions enable firms to increase their working capital, overcome financial constraints, and operate at optimal levels.

C.0.4 Impacts on the lower threshold

On the other hand, we use equation (C.7) to obtain the APL's effects on the productivity threshold $\frac{1}{a_{ds}^L}$. By deriving both sides with respect to b_s, and defining $\psi_{ds}^L \equiv \frac{1}{a_{ds}^L}$,

$$\frac{\partial \psi_{ds}^L}{\partial b_s} = \frac{\psi_{ds}^L}{\tau_d s+b_s} > 0. \tag{C.10}$$

Since $\frac{\partial b_s}{\partial l_1} < 0$, it holds that $\frac{\partial \psi_{ds}^L}{\partial l_1} < 0$, which reduces the lower productivity threshold. Ergo, a more efficient labor matching process (higher l_1) causes less productive firms to start export activities in this market, even though they remain financially constrained. Similarly, by deriving both sides of (C.7) with respect to π_s, the fraction of fixed costs financed by means of non-distributed profits is:

$$\frac{\partial \psi_{ds}^L}{\partial \pi_s} = -\frac{f_d}{(1-\alpha)(\varepsilon-1)\frac{\theta_s Y_d}{P_{ds}^{1-\varepsilon}}[(1-d_s+\frac{d_s}{\lambda})\frac{\tau_d+b_s}{\alpha}]^{1-\varepsilon}{\psi_{ds}^L}^{\varepsilon-2}} < 0. \tag{C.11}$$

[47] If π_s reduces the fraction of fixed costs financed through credit, d_s, we obtain a similar qualitative effect. To do this, it is necessary to split the fraction of the variable and fixed costs that are financed through credit, which have been assumed to be equal to d_s.

[48] Strictly speaking, we need an additional assumption: optimal unit variable profits are greater than the bank's risk premium for each d_s fraction lent to the firm— $\frac{1}{\alpha}-1 > d_s[\frac{1}{\lambda}-1]$.

Given the properties of function g, it holds that $\frac{\partial \psi^L_{ds}}{\partial \kappa_{ds}} > 0$, reducing the lower productivity threshold. For that reason, the APL allows less productive—and smaller—firms to start exporting new products and/or to new destinations.