



**BANCO CENTRAL DE RESERVA DEL PERÚ**

# **The Impact of the Agrarian Promotion Law on the Income of Formal Workers**

Omar Ghurra\* y Renzo Castellares\*

\* Banco Central de Reserva del Perú.

**DT. N°. 2023-006**  
Serie de Documentos de Trabajo  
Working Paper series  
Octubre 2023

Los puntos de vista expresados en este documento de trabajo corresponden a los de los autores y no reflejan necesariamente la posición del Banco Central de Reserva del Perú.

The views expressed in this paper are those of the authors and do not reflect necessarily the position of the Central Reserve Bank of Peru

# The Impact of the Agrarian Promotion Law on the Income of Formal Workers<sup>\*</sup>

Omar Ghurra<sup>\*\*</sup>      Renzo Castellares<sup>\*\*\*</sup>

August 2023

## Abstract

This research assesses the impact of the Agrarian Promotion Law (APL) on formal workers' income in sectors affected by the aforementioned law. To explore this impact, we use detailed information from the National Household Survey (ENAHO) and estimate the effect by applying a difference-in-difference (DD) estimator. We find in our baseline results that the APL had a positive impact of 52 % on the average income of formal workers in the long run (2001-2015). Finally, we estimate a DD model with propensity score matching (PSM) and then a DD model with instrumental variables (DDIV) to avoid potential endogeneity problems. We find that the effect of the APL is larger in terms of magnitude (115 % in the long run), which could be explained by a possible tendency of some workers to misreport their labor formality status (social desirability bias) on household surveys.

**Keywords:** Agrarian Promotion Law, exports, labor market, wages, formalization.

---

<sup>\*</sup>We appreciate the assistance of Samuel Martel during the development of this document. The opinions expressed in this work, as well as any lingering errors, are exclusively the responsibility of the authors.

<sup>\*\*</sup>Banco Central de Reserva del Perú. Jr. Santa Rosa 441, Lima 1, Peru. Teléfono: (+51-1) 613-2000, ext: 24072. Email: omar.ghurra@bcrp.gob.pe

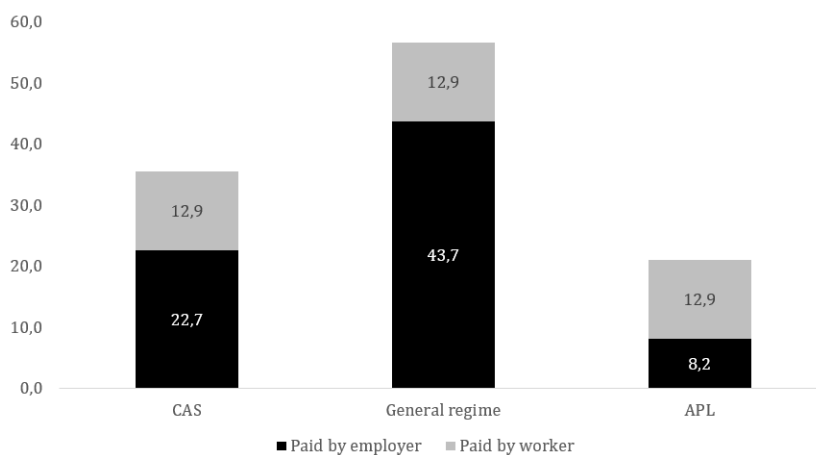
<sup>\*\*\*</sup>Banco Central de Reserva del Perú. Jr. Santa Rosa 441, Lima 1, Peru. Teléfono: (+51-1) 613-2000, ext: 23939. Email: renzo.castellares@bcrp.gob.pe

# 1. Introduction

In October 2000, Peru implemented a pivotal shift in its agricultural sector with the approval of Law No. 27360, also known as the Agrarian Promotion Law (APL). The aforementioned Law, which was repealed in December 2020, included: (i) firms involved in crop-farming and breeding activities, with the exception of the forestry industry, and (2) firms that carry out agro-industrial activities outside the province of Lima and Callao, provided that they use local agricultural products.<sup>1</sup>

After the implementation of the APL, the agricultural labor market became more flexible and attractive for hiring new workers as a result of the benefits that the law provided, such as payment of 15% as income tax (instead of 30% as in the regular regime); payment of a daily remuneration (DR) that already included the compensation for length of service (CTS); a monthly contribution of 4% to social security (ESSALUD) paid by the employer (instead of 9% as in the regular regime); 15-day vacation (instead of 30 days as in the regular regime); hiring of fixed-term personnel; and an indemnity for arbitrary dismissal equivalent to 15 DR for each year of service (a compensation approximately 50 percent lower than the regular regime).<sup>2</sup> Thus, activities associated with the Agrarian Promotion Law had lower non-wage labor costs compared to other labor regimes. For example, while in the general regime these costs represent 57% of the gross salary, in the agrarian regime they represented only 21% (Graph 1).

**Graph 1.** *Non-wage costs in Peru*



The CAS regime in Peru is a type of employment contract used by public institutions in Peru.

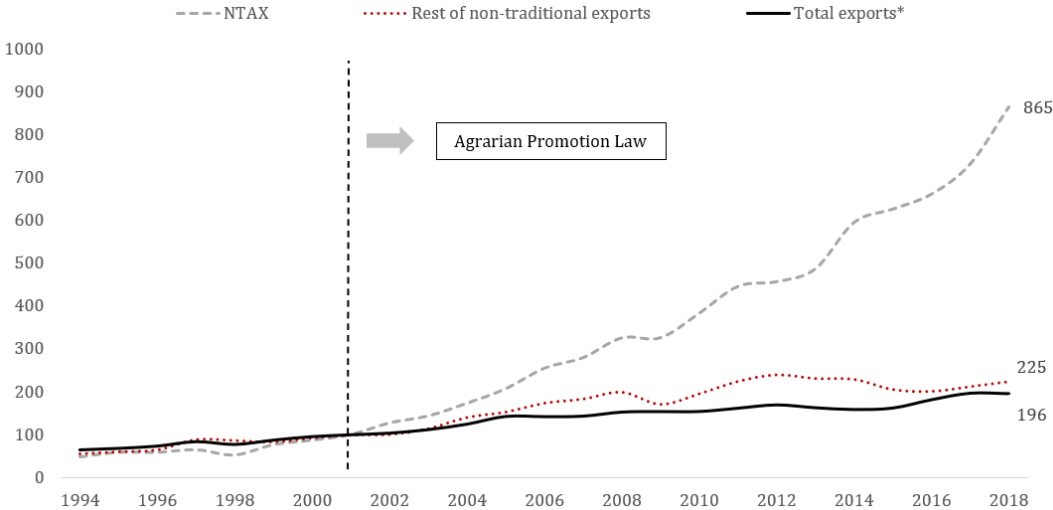
Source: Own calculations.

<sup>1</sup>It is worth mentioning that this law excluded agro-industrial activities related to wheat, tobacco, oilseeds, oils, and beer.

<sup>2</sup>The law also allowed for accelerated depreciation and early recovery of sales tax (IGV).

The Agrarian Promotion Law, when coupled with a thriving economic environment, paved the way for a surge in non-traditional agricultural exports (NTAXs or agro-exports). By 2018, NTAXs had increased almost ninefold since 2001, a growth rate outpacing other non-traditional exports (Graph 2).

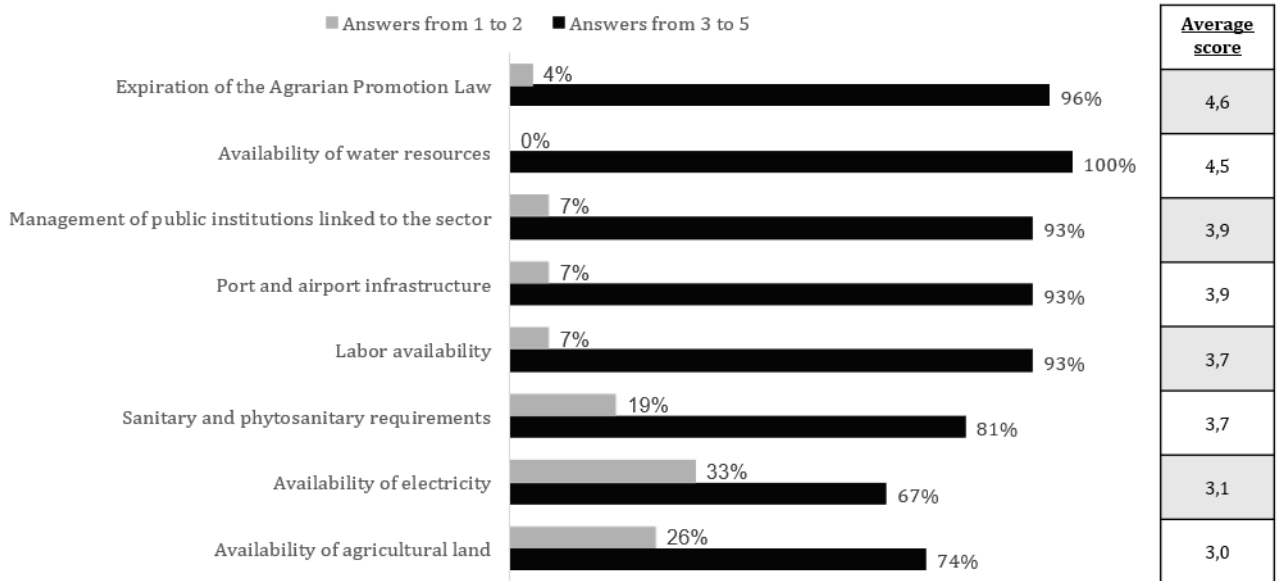
**Graph 2.** *Volume of exports (2001=100)*



\* Calculation excludes NTAXs.  
 Source: Central Bank of Peru.

The key role that the APL played in the recent NTAX growth is notably recognized by firms. A survey carried out by the Central Bank of Peru in 2019 among NTAX companies revealed that the primary impediment to the expansion of the NTAX sector was the expiration of the Agrarian Promotion Law. In the aforementioned survey, 96 % of executives from these companies pointed out that this limitation held paramount significance, with an average score of 4.6 on a scale ranging from 1 to 5 (Graph 3).

**Graph 3.** *Main constraints to the growth of the NTAX sector*



Source: Central Bank of Peru.

Even though the APL was implemented more than 20 years ago, the available empirical evidence regarding its effects on wages remains notably limited. Consequently, this study addresses this gap by quantifying the law’s impact on formal workers’ income under the scope of the APL. To achieve this, we use a difference-in-difference or double difference (DD) estimator, which corresponds to the difference in income between workers who are directly exposed to the law and those who are not. For this purpose, the treatment group comprises formal workers in sectors under the scope of the law. On the other hand, the control group comprises informal workers in the same sectors.

We find that the APL had a positive impact on the average income of formal workers in sectors under the scope of this law in the short, medium and long run. We also find similar results by combining our DD empirical strategy with propensity score matching to make the treated and control groups more similar. Finally, we estimate a DD model with instrumental variables to deal with potential endogeneity concerns. Similar to our previous results, we find a positive but larger impact of the APL on workers’ income.

The subsequent sections of this document are organized as follows. Section 2 presents the literature review. In Section 3, we present descriptive statistics of our dataset, while Section 4 outlines our empirical strategy to assess the impact of the

APL on the income of formal workers. Then, Section 5 presents our main results, whereas in Section 6, we conduct a robustness exercise. Finally, Section 7 concludes.

## 2. Literature review

To the best of our knowledge, no previous research has been devoted to conducting an impact evaluation of the APL on formal wages<sup>3</sup>. However, the literature related to this topic tends to highlight the positive influence of the APL on the sector. For example, Castellares et al. (2018) make a diagnosis of the NTAX sector and reveal the important role that the APL has played in the growth of agro-exports. Thus, given the increase in employment, the improvement in income, and the greater productivity in the sector, the authors propose extending this type of regime to other similar sectors, such as forestry or aquaculture.

That study reveals that, between 2008 and 2017, in the regions where the increase in NTAX was greater than the rest, the growth of average rural income was greater (3.8% in agro-exporting regions compared to 3.1% in the rest of the regions). This result is consistent by the fact that regions with a higher growth in exports also show greater employment opportunities for unskilled workers. This reduces the wage gap for those workers with less education and provides them with a way out of poverty Fukase (2013).

On the other hand, Castellares y Martínez (2023) assess the impact of the APL on NTAX by micro, small, and medium-sized enterprises (MSMEs); and on these firms' capability of accessing new foreign markets. Thus, the authors find that the APL explained 40% and 59% of the MSMEs' NTAXs and trade links, respectively, between 2001 and 2019. Hence, the APL may have involved approximately 100 000 additional jobs on average per year (64% of the jobs reported by APL firms). Their findings strongly suggest that the law's repeal, which took place very recently, may bring these positive effects on exports and employment to an end.

Finally, the rest of the articles related to the APL focus on its impact on agricultural working conditions, but not wages (Gamero (2011); CIJ (2014); and Vivas (2017)) or its impact on firms (Cuadros (2018); Fairlie (2019); and Francke (2020)).

---

<sup>3</sup>The publication is the technical (extended) version of our article published in the BCRP's Moneda Magazine. For more information, please refer to Castellares y Ghurra (2020).

### 3. Data

We use detailed data from the National Household Survey (ENAHO) to estimate the impact of the APL on wages. The ENAHO is a quarterly survey carried out by the National Institute of Statistics and Informatics (INEI) and allows for estimating annual employment and income indicators with a national and regional level of inference. The sample considered to quantify the importance of the APL corresponds to workers who are potentially exposed to the benefits of this law. Moreover, our sample only considers individuals belonging to the employed labor force who work between 24 and 60 hours per week.<sup>4</sup>

The activities included in the Agricultural Promotion Law (Table 1) are classified according to the International Standard Industrial Classification (ISIC revision 3). The categories covered are agro-industrial activities (Classes 1511, 1513 and 1542) and agro-industrial-related activities (Classes 0112, 0113, 0121, 0122 and 0130).

**Table 1.** *Activities affected by the Agrarian Promotion Law*

ISIC Rev. 3	Description
<b>Agro-industrial activities</b>	
Class 1511	Production, processing and preserving of meat and meat products
Class 1513	Processing and preserving of fruits and vegetables
Class 1542	Manufacture of sugar
<b>Related activities</b>	
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)

According to the ENAHO, approximately 198 thousand additional workers joined APL-related sectors since its implementation in 2001 until 2018 (Tables 2 and 3). The largest proportion of these workers belongs to the industrial class 0130: cultivation of agricultural products in combination with animal husbandry (mixed farming). It should be noted that, although this industrial class has always had the largest proportion of workers, its relative importance has declined over time. Thus, 121 thousand new workers were reported in the industrial class 0113: cultivation of fruits, nuts, plants, whose leaves or fruits are used to prepare beverages and spices.

<sup>4</sup>Unpaid family workers are excluded from the sample.

**Table 2.** *Number of workers in sectors affected by the APL (thousands of workers)*

ISIC Rev. 3 Class	Description	2001		2018	
		Workers	% of total	Workers	% of total
<b>Class 0112</b>	Growing of vegetables, horticultural specialties, and nursery products	49	5	63	5
<b>Class 0113</b>	Growing of fruit, nuts, beverage, and spice crops	119	11	240	19
<b>Class 0121</b>	Farming of cattle, sheep, goats, horses, asses, mules, and hinnies; dairy farming	38	4	28	2
<b>Class 0122</b>	Other animal farming; production of animal products N.E.C.	12	1	29	2
<b>Class 0130</b>	Growing of crops combined with farming of animals (mixed farming)	833	79	857	68
<b>Class 1511</b>	Production, processing and preserving of meat and meat products	1	0	3	0
<b>Class 1513</b>	Processing and preserving of fruits and vegetables	5	0	35	3
<b>Class 1542</b>	Manufacture of sugar	3	0	5	0
<b>Total</b>		<b>1 060</b>	<b>100</b>	<b>1 259</b>	<b>100</b>

Note: Considers individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. Source: ENAHO.



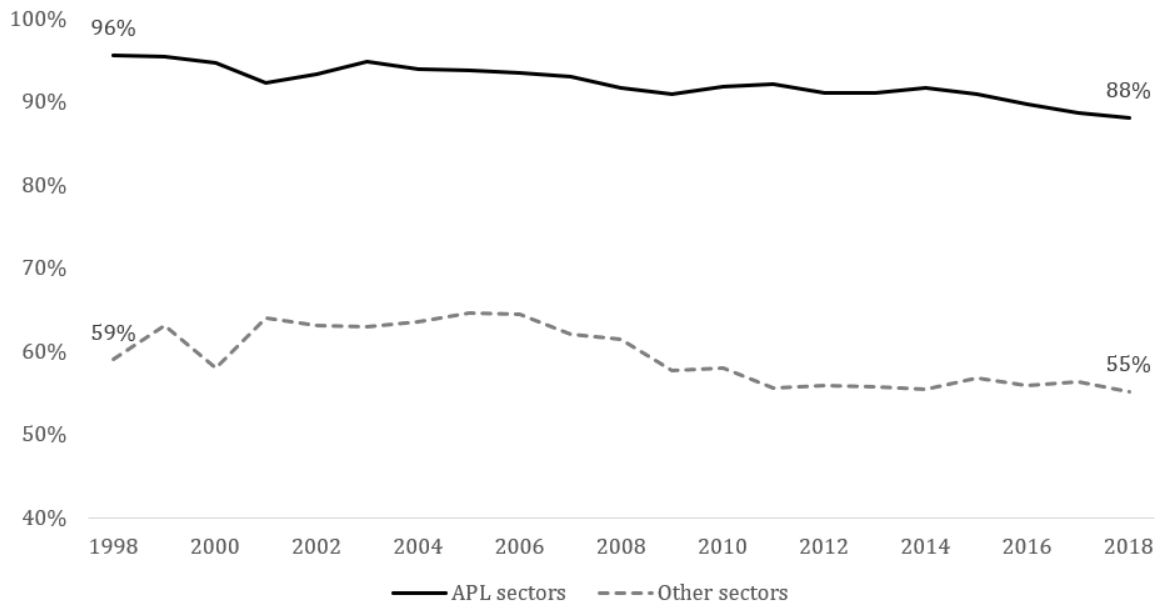
**Table 3.** *Employed labor force (Millions of workers)*

Year	APL sectors	Other sectors	Employed labor force
1998	1.1	3.3	4.3
1999	0.8	3.1	3.9
2000	1.0	3.3	4.3
2001	1.1	3.6	4.6
2002	1.2	3.6	4.8
2003	0.6	2.2	2.9
2004	0.9	3.2	4.1
2005	0.9	3.3	4.2
2006	0.9	3.7	4.6
2007	1.0	4.1	5.1
2008	1.0	4.1	5.1
2009	1.0	4.4	5.4
2010	1.0	4.5	5.5
2011	1.0	4.7	5.7
2012	1.0	5.2	6.2
2013	1.0	5.3	6.3
2014	1.1	5.4	6.5
2015	1.1	5.7	6.8
2016	1.2	5.6	6.9
2017	1.2	5.8	7.0
2018	1.3	5.8	7.1

Note: Considers individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded.  
Source: ENAHO.

In sectors impacted by the APL, labor informality is significantly higher than in other economic sectors of the country (Graph 4 and Table 4). On average, there's a gap of approximately 33 percentage points in informality levels between 1998 and 2018. This difference implies that the rate of informality among workers under the scope of the APL surpasses that of workers in the other economic sectors of the country by 33 percentage points.

**Graph 4. Labor informality rate (%)**



Note: Considers individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded.  
Source: ENAHO.

**Table 4. Labor Informality Rate (%)**

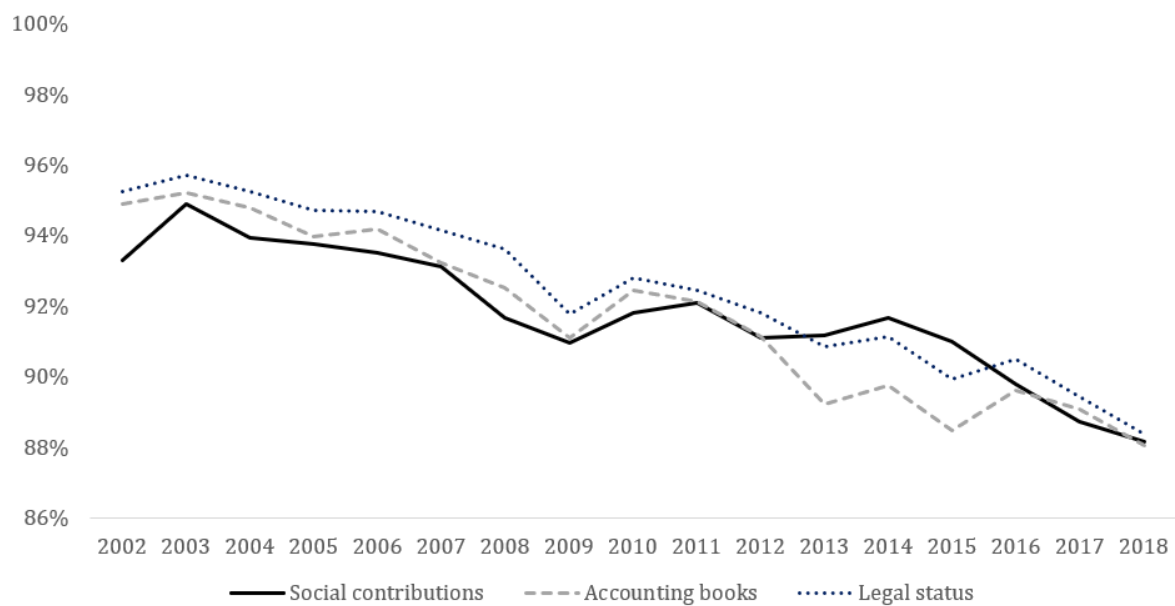
	All Sectors	APL Sectors	Other Sectors
1998	72 %	96 %	59 %
1999	73 %	95 %	63 %
2000	70 %	95 %	58 %
2001	73 %	92 %	64 %
2002	74 %	93 %	63 %
2003	73 %	95 %	63 %
2004	73 %	94 %	64 %
2005	73 %	94 %	65 %
2006	72 %	94 %	64 %
2007	70 %	93 %	62 %
2008	69 %	92 %	61 %
2009	66 %	91 %	58 %
2010	66 %	92 %	58 %
2011	64 %	92 %	56 %
2012	64 %	91 %	56 %
2013	63 %	91 %	56 %
2014	64 %	92 %	55 %
2015	64 %	91 %	57 %
2016	64 %	90 %	56 %
2017	64 %	89 %	56 %
2018	63 %	88 %	55 %

Note: Considers individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded.  
Source: ENAHO.

In this document, our definition of formality is based on the payment of social contributions. We chose this indicator from a broad range of options because it can be

calculated through the ENAHO since 1998. Even though the INEI currently provides an official indicator of labor informality, this indicator is only available from 2007 onwards and cannot be used in the evaluation conducted in this study. Still, our chosen indicator follows the same trend as other informality indicators (Graph 5) and registers a high correlation (0.7). We also considered alternative indicators based on the criteria of having accounting books or having a legal status, which are only available as of 2002.

**Graph 5.** *Labor informality rate according to different criteria (%)*

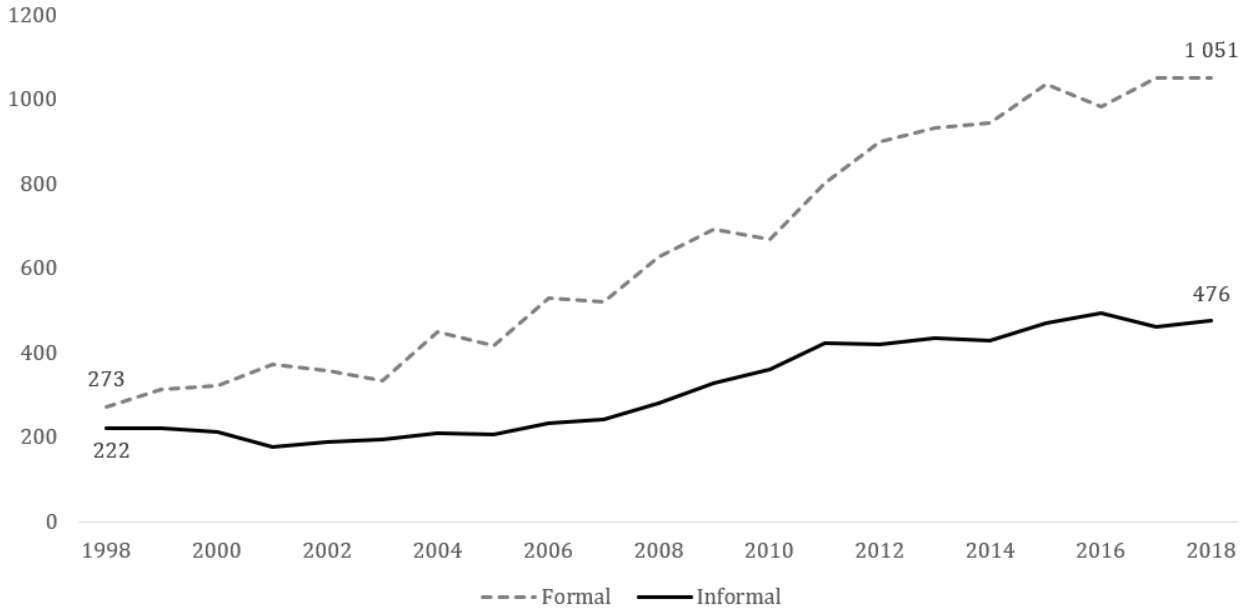


Note: Considers individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded.  
Source: ENAHO.

The average income of APL workers has followed an increasing trend over time. A positive trend is also shared by workers in the informal sectors, however, the income gap between formal and informal workers has been increasing since the enactment of the APL (Graph 6). This suggests that workers benefiting from the Agrarian Promotion Law have been earning increasingly higher incomes compared to similar workers in the informal sector.<sup>5</sup>

<sup>5</sup>Even though there is heterogeneity in the frequency of data collection by ENAHO, there is no evidence of seasonal patterns at the quarterly level in the wages of workers falling within the scope of the APL.

**Graph 6.** *Monthly income of workers in sectors associated with the APL  
(Current S/)*



Note: Considers only individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. Moreover, outliers are excluded by conditioning on the following observable characteristics: age, educational level, sector, hours worked, sex, urban, number of household members, domain, and number of workers in the company.  
Source: ENAHO.

## 4. Empirical strategy

In this section, we calculate the effects of the APL on workers' income using a differences-in-differences or double difference (DD) estimator. Intuitively, the methodology consists of comparing the average income for a treatment group and a control group before and after the implementation of the law. In this case, the treatment group includes workers who are directly benefited by the APL (formal workers), while the control group is made up of informal workers operating in sectors affected by the APL.

Formally, we estimate the following equation:

$$y_{it} = \beta_0 + \beta_1 formal_{it} + \beta_2 APL_t + \beta_3 formal_{it} * APL_t + X_{it}\delta + \alpha_t + \varepsilon_{it} \quad (1)$$

where  $y_{it}$  is the nominal monthly income (monetary and in-kind) of worker  $i$ ;  $formal_{it}$  takes the value of 1 if worker  $i$  has a formal contract and zero otherwise;  $APL_t$  takes the value of 1 from the effective date of the implementation of the

law (2001 onwards) and zero for previous years;<sup>6</sup>  $X_{it}$  is a vector of observable characteristics of worker  $i$ ;  $\alpha_t$  captures the effects common to all individuals in year  $t$  (year-level fixed effects) such as GDP growth and trade agreements, among others; and finally  $\varepsilon_{it}$  is the error term. In this case, we control for the following worker characteristics in our estimation: age, years of education, hours worked, sex, whether living in an urban area, number of household members, ISIC sector and firm size (number of workers).

The advantage of this estimation method is that it eliminates the idiosyncratic components of income that remain fixed over time through the first difference. In addition, the second difference allows us to eliminate changes in income due to aggregate and/or trend effects that are common to both groups. Thus, the coefficient  $\beta_3$  will capture the impact of the APL on the income of formal workers in the sectors affected by that law.

The key assumption of the double difference estimator is that, in the absence of the intervention (implementation of the APL), the income of formal workers would have followed the same trend as the income of informal workers. If so, the  $\beta_3$  coefficient captures the impact of the APL.

## 5. Results

Table 5 reports the impact of the APL under different specifications of equation (1). For example, the first model directly estimates the effect of APL without including any type of control variables. The second model controls for all time-varying effects that commonly affect all individuals through year fixed effects. Finally, the third model aims for a higher precision of the estimates by including the aforementioned control variables and year fixed effects. Our results show that Agrarian Promotion Law had positive and significant effects on formal workers' income in the long-term. Formal workers engaged in activities under the APL had an average income between 52% and 97% higher than workers in the informal sector. In absolute terms, the income gain is between S/ 159 and S/ 294 per month. This effect corresponds to the average income between 2001 - 2015 relative to the average income from 1998 - 2000.

---

<sup>6</sup>Although the law was introduced in October 2000, all of its benefits became effective on January 1, 2001. Therefore, we consider 2001 as the period from which the APL was implemented.

**Table 5.** *Long-term effects of the APL on income*

	(1)	(2)	(3)
<b>Effect (DD)</b>	<b>294.0***</b> (21.82)	<b>274.0***</b> (21.45)	<b>158.7***</b> (23.34)
<b>Effect as % of initial formal income</b>	<b>96.9</b>	<b>90.3</b>	<b>52.3</b>
Observations	68 766	68 766	68 765
Year FE	No	Yes	Yes
Controls	No	No	Yes

Note: the estimations only consider individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. Specifications (2) and (3) include year fixed effects. Specification (3) includes the following control variables: age, educational level, sector, hours worked, sex, urban, number of household members, domain and number of workers in the company in which he/she works. Finally, we exclude outlier observations by conditioning the income level on the aforementioned observable characteristics.

According to the estimates of Table 6, the Agrarian Promotion Law also had positive effects in the medium-term. When considering only the 2001-2010 period, the average income of APL beneficiaries is between 39 % and 63 % above the income prior to the implementation of the APL (1998-2000). In monetary terms, this gain is between S/ 120 and S/ 192.

**Table 6.** *Medium-term effects of the APL on income*

	(1)	(2)	(3)
<b>Effect (DD)</b>	<b>191,9***</b> (21,76)	<b>181,9***</b> (21,58)	<b>119,5***</b> (22,11)
<b>Effect as % of initial formal income</b>	<b>63.2</b>	<b>59.9</b>	<b>39.4</b>
Observations	40,766	40,766	40,765
Year FE	No	Yes	Yes
Controls	No	No	Yes

Note: the estimations only consider individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. Specifications (2) and (3) include year fixed effects. Specification (3) includes the following control variables: age, educational level, sector, hours worked, sex, urban, number of household members, domain and number of workers in the company in which he/she works. Finally, we exclude outlier observations by conditioning the income level on the aforementioned observable characteristics.

In the short-term, there are also positive and significant effects. In this regard, Table 7 depicts that the APL increased the income of formal workers between 28 % and 36 % with regard to the initial formal income.

**Table 7.** *Short-term effects of the APL on income*

	(1)	(2)	(3)
<b>Effect (DD)</b>	<b>108,9***</b>	<b>109,9***</b>	<b>84,32***</b>
	(22,54)	(22,58)	(21,99)
<b>Effect as % of initial formal income</b>	<b>35.9</b>	<b>36.2</b>	<b>27.8</b>
Observations	19,958	19,958	19,957
Year FE	No	Yes	Yes
Controls	No	No	Yes

Note: the estimations only consider individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. Specifications (2) and (3) include year fixed effects. Specification (3) includes the following control variables: age, educational level, sector, hours worked, sex, urban, number of household members, domain and number of workers in the company in which he/she works. Finally, we exclude outlier observations by conditioning the income level on the aforementioned observable characteristics.

These results suggest that the effects of the APL on the average income of formal workers increased over time. These results are consistent with the different income paths show in Graph 6, which suggest that the gaps between the average income of the formal and informal sectors have been increasing since the enactment of the APL.

### Matching

We estimate a double difference model combined with propensity score matching (PSM) as an alternative estimation of the impact of the APL on the income of formal workers. PSM is a technique often used in observational studies when experimental designs are not feasible. It serves to create a quasi-experimental setup by pairing similar observations, ensuring a like-for-like comparison.

The key principle behind PSM is its capacity to address selection bias. This method allows us to compare workers based on their observable characteristics, ensuring that paired individuals differ mostly in their exposure to the APL. In this way, we can closely mimic a randomized control trial scenario, increasing the validity of our findings.

In this case, the propensity score (essentially a calculated probability) denotes the likelihood of a worker being formal. This score was determined using the same observable characteristics that were incorporated in our primary differences-in-differences estimation. This methodology captures all recognized variables affecting a worker's

propensity to be under the formal category and, thus, to benefit from the APL.

After computing propensity scores for each participant, we adopted the ‘nearest neighbor’ matching approach. For every formal worker (those benefiting from the APL) we identified an informal counterpart with a propensity score that was almost identical.<sup>7</sup>

The impacts reported in Table 8 are in line with our previous estimates reported in Tables 5, 6 and 7, reaffirming the robustness of our initial results<sup>8</sup>. Under this approach, we observe that the APL’s influence led to a 57% increase in income over the long-term (equivalent to S/ 171). In the medium term, there was a 37% rise (amounting to S/ 112), while short-term income saw a 21% rise, translating to S/ 62.

**Table 8.** *Effects of the APL on income (Double differences with PSM)*

	<b>Long-term (2001-2015)</b>	<b>Medium-term (2001-2010)</b>	<b>Short-term (2001-2005)</b>
<b>Effect (DD-PSM)</b>	<b>171,3***</b> (24,52)	<b>111,9***</b> (24,67)	<b>62,08***</b> (24,95)
<b>Effect as % of initial formal income</b>	<b>56.5</b>	<b>36.9</b>	<b>20.5</b>
Total observations	66,459	40,047	19,254
Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Note: The estimations only consider individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. The score is estimated on an annual basis using the following control variables: age, education level, sector, worked hours, sex, urban, number of household members, domain and number of workers in the company in which he/she works. Finally, we exclude outlier observations by conditioning the income level on the aforementioned observable characteristics. All estimations include year fixed effects.

## Instrumental variables

To ensure that our previous findings are robust, we also estimate a difference-in-differences model with instrumental variables (DDIV). The advantage of using instrumental variables is that it isolates the effect of unobservable variables that are correlated with the explanatory variable of interest (formality) and at the same time

<sup>7</sup>In this case, this matching occurred without replacement and was restricted to individuals within the common support area. This restriction is paramount in retaining data quality and minimizing potential biases. For executing this matching, we leaned on the established programming routines developed by Leuven y Sianesi (2003).

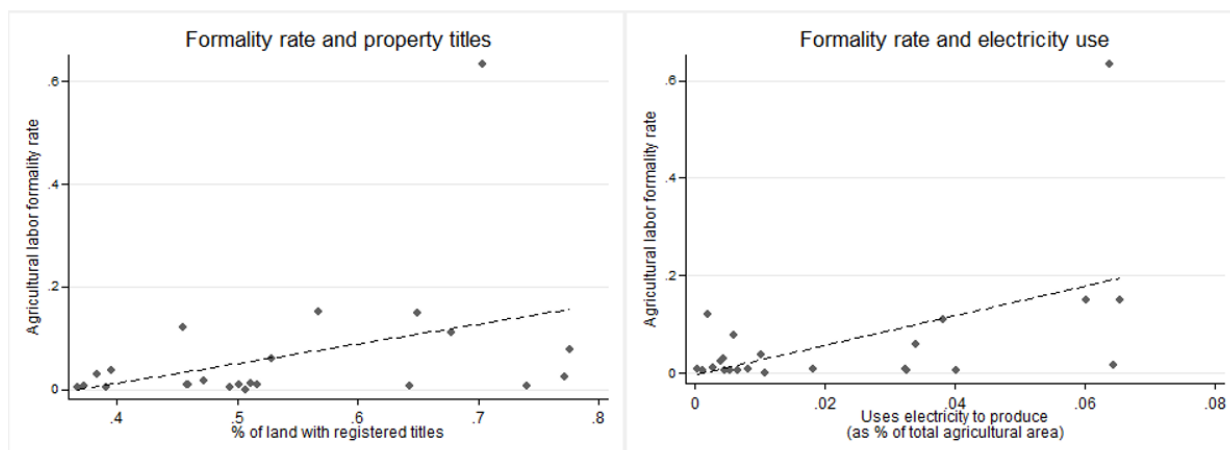
<sup>8</sup>The impact of the APL is also robust to changes in the definition of the span of long-term period. Extending the long-term period from 2015 to 2018 yields similar results. In this case, according to the double-difference model with matching, the effect of the APL was S/ 182 (60%) as of 2018.



affect the dependent variable (wages).

For the DDIV model estimation, we use two instrumental variables: the percentage of land that had registered titles and the percentage of areas that had access to electricity in 1994. This information is at the district level and was calculated from the 1994 National Agricultural Census. Empirical evidence supports the correlation between these chosen instruments and the median future labor formality rate in sectors associated with the APL. Likewise, all correlations have the expected direction. Thus, there is a positive correlation between the instruments and the formality rate (0.4 for property titles and 0.5 for access to electricity). These correlations suggest that the initial conditions of the districts under the scope of the APL affect the future level of labor informality. In this case, areas where land titles are not well defined or that have little access to electricity tend to have lower labor formality rates.

**Graph 7.** *Variables associated with formality*



Source: ENAHO and National Agricultural Census 1994.

The estimates of the DDIV model reported in Table 9 reinforce the positive and significant effects of the APL on the income level of formal workers<sup>9</sup>. In this case, the long-term effect is S/ 348 (115 percent), the medium-term effect is S/ 236 (78 percent) and we do not find any statistically significant impact in the short-term. It is important to highlight that the effect of the APL with the DDIV estimator is larger (in the long and medium term) than the effects reported previously. This result suggests the existence of a downward bias in the original double difference

<sup>9</sup>Our DDIV specification satisfies the criteria of the "weak instrument" test. As per prevailing norms within econometric literature, an instrument is deemed weak if the F-statistic of the first stage falls below the threshold of 10. Contrasting this benchmark, our estimates report an F-statistic greater than 45.

estimator.

**Table 9.** *Effects of the APL on income (DDIV)*

	Largo Plazo (2001-2015)	Mediano Plazo (2001-2010)	Corto Plazo (2001-2005)
<b>Effect (DDIV)</b>	<b>347,9**</b> (148,1)	<b>236,2*</b> (125,7)	<b>124.0</b> (112,3)
<b>Effect as % of initial formal income</b>	<b>114.7</b>	<b>77.8</b>	<b>40.9</b>
Total observations	68,765	40,765	19,957
Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

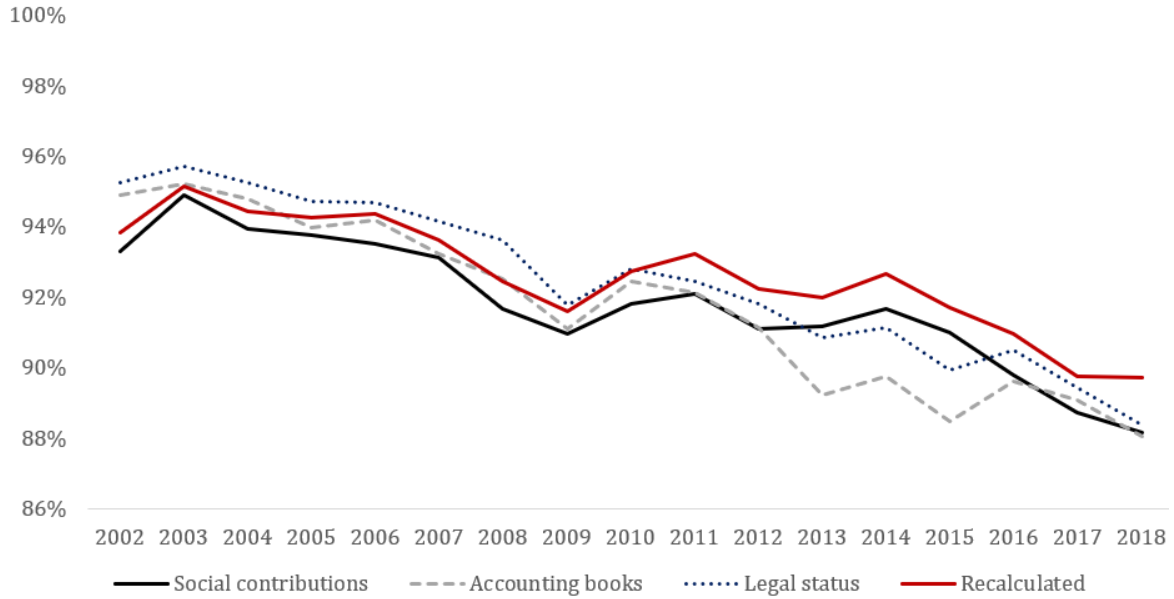
Note: The estimations only consider individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. All estimations include year fixed effects and the following control variables: age, education level, sector, worked hours, sex, urban, number of household members, domain and number of workers in the company in which he/she works. Finally, we exclude outlier observations by conditioning the income level on the aforementioned observable characteristics.

Due to the criteria that we use to classify formal workers, there is a probability that this variable is partially affected by the social desirability bias. This phenomenon typically appears in surveys and refers to the tendency of people to answer a questionnaire giving a more favorable self-image than normal.<sup>10</sup> In that regard, it is likely that the percentage of workers reporting the payment of social contributions is above the actual level. This would mean that informal workers are being considered as formal workers (when in fact they are not) and, given that informal workers have a lower income compared to formal workers, the effect of the double difference model would be smaller than the effect of the DDIV model.

We perform two analytical exercises to test the hypothesis around the influence of social desirability bias. As a first exercise, we recalculate the informality variable. In this case, workers earning below the daily remuneration defined by law and who reported the payment of social contributions were reclassified as informal workers. Based on these new calculations depicted in Graph 8, we observe that the levels of the ‘recalculated’ labor informality in sectors associated with the APL (red line) are higher than originally reported (black line).

<sup>10</sup>For more information, please refer to Grimm (2010).

**Graph 8.** Labor informality rate according to different criteria (%)



Source: ENAHO.

As an additional exercise, we re-estimate the difference-in-difference model using the recalculated informality variable. According to the results reported in Table 10, the effect of APL is greater than originally reported. Thus, these results are consistent with the hypothesis of the existence of social desirability bias.

**Table 10.** Re-estimation of the effects of the APL (Double differences)

	Long Term (2001 - 2015)		Medium Term (2001 - 2010)		Short Term (2001 - 2005)	
	Original	Readjusted Formality	Original	Readjusted Formality	Original	Readjusted Formality
<b>Effect (DD)</b>	<b>158,7***</b> (23,34)	<b>190,4***</b> (25,03)	<b>119,5***</b> (22,11)	<b>137,3***</b> (24,03)	<b>84,32***</b> (21,99)	<b>94,96***</b> (23,88)
<b>Effect as % of initial income</b>	<b>52.3</b>	<b>63.3</b>	<b>39.4</b>	<b>45.6</b>	<b>27.8</b>	<b>31.6</b>
Observations	68,765	68,765	40,765	40,765	19,957	19,957
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: The estimations only consider individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. All estimations include year fixed effects and the following control variables: age, education level, sector, worked hours, sex, urban, number of household members, domain and number of workers in the company in which he/she works. Finally, we exclude outlier observations by conditioning the income level on the aforementioned observable characteristics.

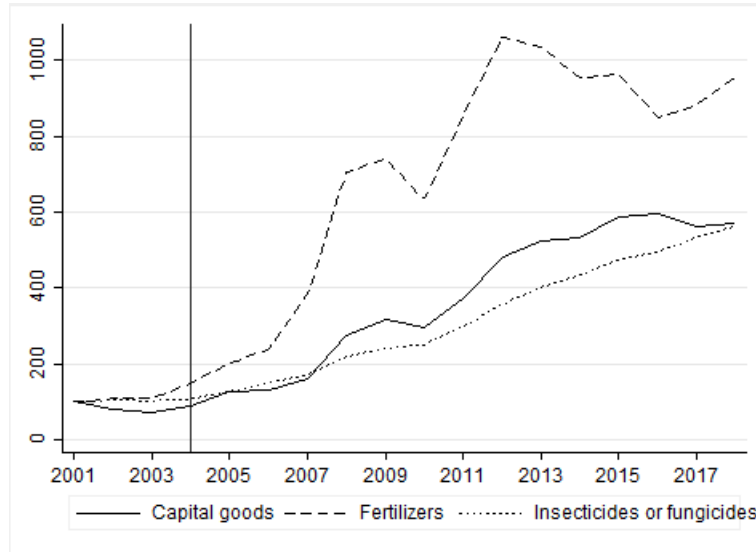
### **Short-term effects**

The diminished or non-existent impact of the APL in the short-term aligns well with the intrinsic dynamics of the NTAX sector. In this regard, legislative actions targeted at enhancing a specific sector do not function in isolation; rather, they interact with an array of other elements that collectively facilitate the sector's progress. In that context, the Agrarian Promotion Law was accompanied by additional factors that facilitated the takeoff of agro-exports.

The initial evidence presented in this document (Graph 2) supports this notion: NTAXs mirrored the trajectory of the rest of non-traditional exports until the implementation of the APL. Post-APL, however, there is a discernible divergence between the two sectors, underscoring the law's transformative potential. Moreover, economic activity from 2004 onwards further bolsters this narrative, given that imports of capital goods for agriculture, as well as important inputs for this sector (fertilizers, insecticides, and fungicides), began to take off (Graph 9). This is because the implementation of the APL may have contributed to the greater dynamism of the sector.

Lastly, the very nature of investment projects offers an additional layer of understanding. Given their inherently long gestation periods, these projects often involve extensive pre-investment research, land acquisition with its bureaucratic intricacies, and substantial capital allocations. This extended timeline intrinsic to such ventures offers a cogent explanation for the minimal or non-existent short-term effects (2001-2005) of the APL. In essence, transformative policies like the APL need time to permeate through intricate sectoral ecosystems and manifest their full impact.

**Graph 9.** *Imports of capital goods and inputs for agriculture*



Source: Central Bank of Peru.

## 6. Robustness

As a final exercise, we estimate a difference-in-difference model but considering sectors that were not under the scope of the APL. In this case, we should not find any statistically significant effect, since these sectors were not directly affected by the enactment of the law. We considered sectors that resemble the activities under the scope of the APL in one or more of the following aspects: high level of informality, belonging to the tradable activity of the economy, and/or reporting low labor productivity. We perform this placebo on the following sectors: fishing, manufacturing, commerce, low productivity services and the remaining activities of the agricultural sector that were not included under the scope of the law. As expected, the results reported in Table 11 show that the coefficient associated with the double difference estimator is not significant for any of the alternative sectors.

**Table 11.** *Estimation of double differences for other sectors*

	Fishing	Manufacturing	Commerce	Services*	Rest of the Agric. Sector
<b>Effect</b>	<b>88.5</b> (511,0)	<b>-641.8</b> (404,7)	<b>-55.2</b> (142,4)	<b>117.1</b> (100,9)	<b>107.7</b> (103,5)
Observations	2,074	24,241	41,036	42,821	17,329
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

\* Excludes high productivity services (financial services, telecommunications, real estate and business services) and those associated with public administration (including education, social and health services).

Note: The estimations only consider individuals who work between 24 and 60 hours per week. Unpaid family workers are excluded. All estimations include year fixed effects and the following control variables: age, education level, sector, hours worked, sex, urban, number of household members, domain and number of workers in the company. Finally, we exclude outlier observations by conditioning the income level on the aforementioned observable characteristics. The informality variable used for the chosen sectors has a treatment similar to that used for the sectors under the scope of the APL. The informality threshold for individuals who do not know whether they pay social contributions is equal to the median of the estimated score. In addition, informal workers are considered to be those who work in companies with 3 or less workers.

## 7. Conclusions

In this research, we evaluate the impact of the Agrarian Promotion Law (APL) on formal workers' income in sectors affected by this law. The APL considered crop-farming and breeding activities, with the exception of the forestry industry, and agro-industrial activities outside the province of Lima and Callao, one of the most important cities in Peru. This law allowed for greater flexibility and reduced labor and tax costs in the non-traditional agricultural sector.

To assess the effect of the APL, we use detailed information of workers collected by the Encuesta Nacional de Hogares (ENAH). We identify formal workers within the sectors under the scope of the APL as the potential beneficiaries (treatment group), and informal workers within the same sectors as the control group. With this classification, we estimate the impact of the APL following a differences-in-differences approach.

We find that the APL had a positive impact of 52% on the average income of formal workers in sectors under the scope of this law. This impact corresponds to the increase in average income between 2001 and 2015 compared to the average income between 1998 and 2000 (long term). On the other hand, when assessing the APL's effect over the medium term (2001-2010), we find a 39% effect, while for the short

term (2001-2005), the effect stands at 28 %.

As an alternative approach to estimate the APL's impact, we use a double difference estimator with propensity score matching, in order to make the treated and control groups more similar. In this case, the long-term effect amounts to 57 %, the medium-term effect reaches 37 %, and the short-term effect stands at 21 %.

To deal with potential endogeneity concerns, we also estimate a double difference model with instrumental variables (DDIV). In this case, the estimated long-term effect is 115 %, the medium-term effect is 78 %, and we do not find any short-term effects. The larger effects that we find, compared to the original estimates, may be explained by the social desirability bias, which leads workers to lie about whether they pay taxes or not.

Finally, our robustness tests indicate that there are no statistically significant impacts of the APL in other sectors with similar characteristics to those under the scope of the law. Furthermore, our results are robust to changes in the span of the long-term period.

## Referencias

- Aldana U. y Escobal J. (2016). Los Efectos de la Migración Interna entre el 2007 y el 2014 en el Perú, un Análisis a Nivel Provincial. Grupo de Trabajo: Programa Cohesión Territorial para el Desarrollo, 203.
- Castellares, R., Regalado, F., & Huarancca, M. (2018). Régimen de Promoción del sector agrario. *Revista Moneda*, (175), 30-35.
- Castellares, R., & Ghurra, O. (2020). Efectos de la Ley de Promoción del Sector Agrario en los ingresos de los trabajadores formales. *Revista Moneda*, (181), 32-36.
- Fukase, E. (2013). Export liberalization, job creation, and the skill premium: Evidence from the US–Vietnam bilateral trade agreement (BTA). *World Development*, 41, 317-337.
- Castellares, R., & Martínez, G. (2023). The Impact of Special Labor and Tax Regimes on the Extensive and Intensive Margins of Small Agricultural Exporters. Working Paper No. 003-2023. Central Bank of Peru.
- Comisión Internacional de Juristas. (2014). Los derechos sociales y regímenes especiales de promoción a la exportación: El caso de la agricultura de exportación en el Perú.
- Cuadros, F. (2018). Resultados del régimen de promoción del sector agrario (Ley N° 27360).
- Fairlie, A. (2019, September 20th). Régimen de promoción agraria. Retrieved from: <http://alanfairliereinoso.pe/?p=4790>
- Francke, P. (2020). Gobierno prefiere favorecer a grandes empresas y no a agricultores. Retrieved from: <https://www.youtube.com/watch?v=X1kt90PcNWk>
- Gamero, J. (2011). A 100 años de su implementación. Impacto de la Ley de promoción agraria 27360. Régimen laboral especial que discrimina a los trabajadores.
- Grimm, P. (2010). Social desirability bias. *Wiley international encyclopedia of marketing*.
- Leuven, E., & Sianesi, B. (2003). PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing.



Vivas, M. (2017). Análisis del régimen laboral agrario: ¿Ha sido realmente eficaz?  
Tesis de maestría.