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Do Creative Industries Drive Development? Evidence from Colombia's Orange Economy Policy

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Abstract

The *Orange Economy Policy* (PEN) was Colombia's flagship initiative (2018–2022) to position Cultural and Creative Industries (CCIs) as engines of economic development. Using administrative payroll tax data from 2016–2022, this paper employs difference-in-differences and synthetic control methods to evaluate PEN's impact on the formal economy. The results show that PEN increased firm creation and employment while reducing sole proprietorships and self-employment, consistent with a reallocation of economic activity toward more structured, firm-based production. These findings suggest that entry and hiring respond relatively quickly to targeted incentives, whereas wages and pension contributions depend on longer-term consolidation. The paper provides causal evidence on the effects of industrial policy in a non-traditional sector, highlighting its potential to promote formalization and reshape the organization of economic activity, while underscoring the importance of sustained implementation and institutional stability to translate short-term successes into long-term economic transformation.

Keywords: industrial policy, cultural and creative industries, firm entry, employment, formalization, economic development

JEL Codes: O25, O14, O12, O17, J23

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I. Introduction

The role of industrial policy in shaping structural transformation remains a central question in development economics. In particular, policymakers in middle-income countries face increasing pressure to identify new sectors that can support participation in the global economy while generating inclusive labor market outcomes. In this context, attention has expanded beyond traditional manufacturing toward activities based on knowledge, creativity, and intellectual property. The *Orange Economy Policy* (Política de Economía Naranja – PEN) was the Colombian government’s flagship strategy between 2018 and 2022 to promote Cultural and Creative Industries (CCIs) as a new engine of growth. By combining tax and non-tax incentives with an institutional framework aimed at fostering market development, the policy sought to position these sectors at the center of the country’s development strategy. Yet, whether such sectors can deliver both global competitiveness and inclusive labor market outcomes, and through which mechanisms industrial policy may shape these outcomes, remains largely an open empirical question.

This paper evaluates whether PEN increased formal employment and firm creation, facilitated transitions into formality through pension contributions, and generated skill-biased wage differentials. To do so, I exploit the policy’s eligibility criteria, which classify specific industrial codes as potential beneficiaries. I combine this institutional feature with monthly administrative payroll tax records covering the universe of formal firms from 2016 to 2020 and implement a difference-in-differences design complemented by a synthetic control approach.

The results show that PEN generated economically meaningful short-run effects. Targeted industries experienced an increase of approximately 7% in the number of firms and 9% in formal employment, with the strongest responses concentrated in activities classified as fully creative, highlighting substantial heterogeneity in treatment intensity across sectors. Declines in sole proprietorships and self-employment are consistent with a reallocation mechanism, whereby the policy shifts economic activity from individual and informal arrangements toward more formal, firm-based structures with greater hiring capacity. These findings are robust to alternative fixed-effects structures, event-study specifications that account for pre-trends and confounders, and regional estimations with population weights, and remain stable when accounting for the disruption caused by the COVID-19 pandemic.

By contrast, I find no significant effects on wages or pension contributions. This shows adjustments along extensive margins in the early stages of the policy, while intensive-margin outcomes may require longer periods of consolidation. The policy's initial momentum was further constrained by the pandemic and by the lack of continuity in the subsequent administration, highlighting the importance of policy stability for sectoral transformation.

This paper contributes to the literature on industrial policy and economic development in three ways. First, it provides causal evidence on the effects of a national industrial policy targeting an unconventional sector in development strategies. It speaks to long-standing debates on structural transformation and the role of the state in formulating industrial policy in middle-income economies, particularly in Latin America (Prebisch 1950; Furtado 1964; Pinto 1965; Sunkel 1969; Bértola and Ocampo 2012). These discussions have re-emerged in recent work on new industrial policy, which emphasizes political economy, coordination failures, and learning externalities as key justifications for targeted interventions (Rodrik and Sabel 2020; Mazzucato and Rodrik 2026; Juhász et al. 2024; Ferrannini et al. 2021; Samford 2022; Hankla 2025). Empirical evidence remains mixed: while some studies document spillovers, improvements in job quality, and gains from well-designed eligibility rules (Glaeser 2001; Freedman et al. 2023; Rodrik and Sabel 2020), others find limited effects, crowding out, or rent-seeking dynamics (Bartik 2018; Bruce and Deskins 2012; Partridge et al. 2020; Tuszynski and Stansel 2018; Patrick 2014, 2016). Taken together, this literature has largely focused on aggregate outcomes such as employment, productivity, or investment, with less attention to how industrial policy may reshape the organization of economic activity within sectors, particularly in terms of formalization and firm structure. This paper provides new causal evidence from a non-traditional target sector.

Second, the paper contributes to the literature on cultural and creative industries (CCIs) and development. Since the late 1990s, creative industries have been framed as a mechanism for transforming ideas into tradable assets protected by intellectual property rights (Howkins 2001; Richard Florida 2002; Potts and Cunningham 2008; Potts et al. 2008; Hartley et al. 2013; Lazzarotti et al. 2018; Towse and Navarrete Hernández 2020). While their economic relevance is well documented in advanced economies (Bakhshi et al. 2008; Bakhshi and McVittie 2009; UNCTAD 2008, 2016, 2022; UNDP-UNESCO 2013; Ferreiro-Seoane et al. 2022), evidence from developing countries remains limited. In Latin America, CCIs have been promoted as engines of diversification but face persistent structural constraints, including limited institutional coordination, restricted

access to finance, weak productive linkages, high informality, and strong market concentration (Keane et al. 2005; Rey Vásquez 2009; UNCTAD 2010; Lobos et al. 2021). For Colombia, existing work documents sectoral growth but weak spillovers to the broader economy (Campi et al. 2024). These features make CCIs a particularly relevant setting to study whether industrial policy can influence not only sectoral growth, but also the organization of economic activity, including the transition from informal and individual production toward more formal, firm-based structures. By documenting these effects in a non-traditional sector, the paper highlights a pathway through which structural transformation may occur outside manufacturing and provides the first causal evaluation of a large-scale policy explicitly designed to address these constraints.

Third, the paper contributes to the literature on formalization by showing that industrial policy can generate measurable changes in the organization of economic activity. The results indicate increases in firm creation and formal employment alongside declines in sole proprietorships and self-employment, a pattern consistent with a reallocation mechanism from individual and informal production, often associated with subsistence activities (Mondragón-Vélez and Peña 2010; Nguimkeu 2014, 2022), toward more structured, firm-based activity. Informality is a central constraint in CCIs in developing countries, where a large share of firms operates outside formal regulatory and tax systems. Recent work moves beyond a strict dualistic view, instead characterizing formality and informality as a continuum shaped by firm-level decisions and institutional frictions (Maloney 2004; Mondragón-Vélez et al. 2010; Ulyssea 2018; Fernández and Villar 2016; Badaoui et al. 2023). In this context, policies that increase compliance costs may discourage formalization, while targeted interventions that expand access to markets, finance, or productivity-enhancing inputs can make formality more attractive. Existing evidence is mixed: reducing registration barriers alone often yields limited effects (Rand and Torm 2012; McCaig and Nanowski 2019), whereas more comprehensive interventions, such as financial access, training, or business development support, can improve firm performance and increase formal participation (Fajnzylber et al. 2011; Floridi et al. 2021). By targeting CCIs through tax incentives and financial instruments, PEN provides a setting to evaluate whether industrial policy can operate as a mechanism for formalization in a sector characterized by high informality. This paper builds on this literature by showing that formalization can occur through sectoral reallocation, rather than through reductions in regulatory barriers alone.

Unlike traditional industrial policies focused on manufacturing or infrastructure, PEN targeted activities based on creativity, cultural production, and intellectual property. The policy thus represents an attempt to use CCIs as a development strategy to reduce dependence on commodities and move toward knowledge-intensive growth. By documenting both the policy's short-run gains and its structural limitations, including its uneven effects across firms and its limited capacity to overcome deeper constraints such as informality, this paper contributes to a still limited body of quantitative research on CCIs in developing countries and offers broader lessons for the design and sustainability of industrial policies in Latin America and other middle-income economies.

2. Institutional Background and Policy Debate

2.1. Institutional Background

A distinctive feature of PEN was its multi-stage institutional design. Figure 1 summarizes the timing of these steps. The policy built on earlier initiatives, particularly work by the Inter-American Development Bank in Latin America (Buitrago and Duque 2013; Benavente and Grazzi 2017; Luzardo et al. 2017; Rodríguez 2017), but acquired operational content in Colombia only after the enactment of the 2017 *Orange Law*, which broadly defined the creative economy as economic activities potentially subject to intellectual property rights (Sierra et al. 2020).¹

A precise operational definition was introduced in May 2019 by a technical committee led by the National Department of Planning (DNP), the National Department of Statistics (DANE), and the Ministry of Culture.² Using the International Standard Industrial Classification of All Economic Activities (ISIC), 103 four-digit activities were classified as part of the creative economy. Of these, 34 codes were designated as fully creative and 69 as partially creative. These activities were grouped into three broad areas: (1) Arts and Heritage, (2) Creative Industries, New Media, and Software, and (3) Cultural Industries.³

Subsequent policy adjustments further refined eligibility and implementation. In December 2019, tax exemptions were restricted to a subset of fully creative industries. In March 2020, the COVID-

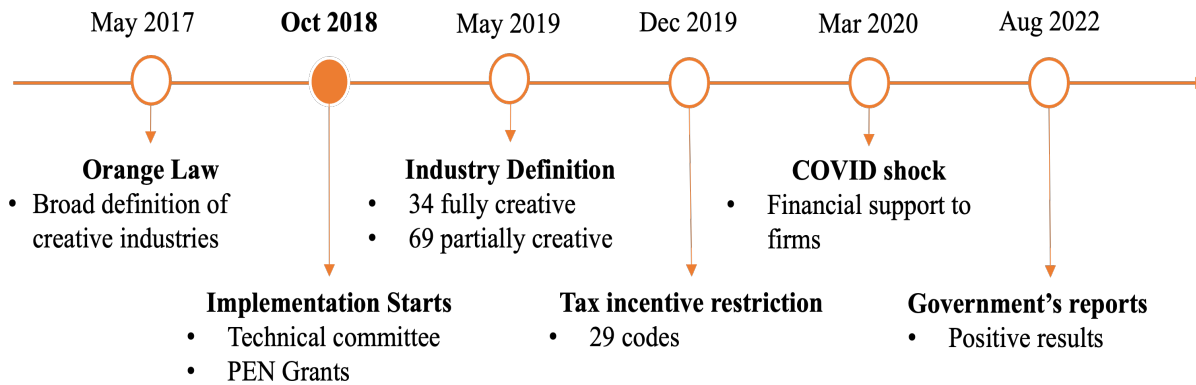
¹ Bill 1834, also known as the *Orange Law*, required implementation by the executive branch. In August 2018, the congressman who originally proposed the bill assumed office as President of Colombia, initiating its implementation.

² See (Departamento Administrativo Nacional de Estadística (DANE) 2019).

³ See Appendix A, Table 4 for the assignment of each code, and Figure 10 for examples of treated and control industries under ISIC classifications.

19 pandemic led to a nationwide lockdown, during which firms across all sectors received government support. In August 2022, as part of the outgoing administration’s accountability reports, PEN was presented as a successful policy with positive outcomes.

Figure 1. PEN Timeline



Source: Author’s production based on information provided by the National Department of Planning (DNP) and the National Department of Statistics (DANE).

PEN combined multiple policy instruments, including tax exemptions, grants, training programs, expanded access to credit, and the creation of local creative clusters (*Áreas de Desarrollo Naranja*, ADNs). Official reports indicate that the policy received approximately \$311 million between 2018 and 2022, including \$27.7 million in entrepreneurial grants (with an average size of about \$125,000). These reports attribute to PEN the creation of 1,227 new firms, 5,883 direct jobs, technical assistance to 664 firms, and the establishment of more than 100 ADNs.⁴

While several components were implemented simultaneously, the first grants targeted exclusively to creative entrepreneurs were allocated in October 2018, providing a natural starting point for the empirical analysis. Although total grant funding declined during the COVID-19 shock, the share allocated to creative industries increased substantially, rising from 10% in 2014–2017 to 44% in 2018–2022. This shift suggests that the policy not only altered the institutional framework but also redirected resources toward targeted sectors.⁵ The policy was discontinued after the 2022 change in administration, limiting its effective time horizon.

⁴ These clusters were designed to benefit from local tax incentives, primarily exemptions on property and business taxes. Although the initial goal was to create five ADNs, more than 100 had been established by the end of the administration.

⁵ See Appendix A, Figure 11.

2.2. Policy Debate

The role of CCIs in economic development remains contested. Potts and Cunningham (2008) identify four conceptual models: a welfare model, which emphasizes their contribution to social well-being but dependence on public support; a competition model, which treats CCIs as standard economic sectors; a growth model, which highlights their potential to generate spillovers and drive expansion; and an innovation model, which stresses the uncertainty inherent in creative production.

PEN was primarily grounded in the growth model, reflecting the view that CCIs can act as engines of development through knowledge spillovers, entrepreneurship, and cross-sector linkages. However, the coexistence of these perspectives creates important policy tensions. Some activities, such as cultural heritage, generate positive externalities and may justify public support even in the absence of private profitability. Others, including segments such as advertising, may not exhibit clear social returns beyond those of conventional sectors. Moreover, the uncertain and uneven nature of innovation complicates the realization of spillovers, particularly in developing country contexts.

These trade-offs are reflected in the design of PEN. Policymakers distinguished between *fully* and partially creative industries and restricted tax incentives to a subset of activities, aiming to balance scale with targeting. A narrow focus risked limiting aggregate impact, while a broader definition could dilute the policy by subsidizing activities with limited creative content. This challenge is compounded by the high degree of heterogeneity across CCIs. Activities such as crafts and software development differ substantially in their productivity, scalability, and capacity to generate spillovers, raising questions about the distribution and sustainability of policy gains.

Institutional design also shapes who ultimately benefits from these policies. Gains may accrue disproportionately to specific groups of firms or entrepreneurs, particularly those operating in more technology-intensive segments (Batabyal et al. 2025). In line with this, PEN combined tax incentives with financial instruments such as “orange bonds,” designed to expand access to capital for selected creative sectors, including software, audiovisual production, and design.⁶

More broadly, the growing policy interest in CCIs across developing countries reflects their perceived potential to foster innovation, entrepreneurship, and structural transformation. In some segments, CCIs have exhibited growth rates above those of the broader economy, positioning them

⁶ For a detailed discussion of financing mechanisms for CCIs in Colombia, see (Sierra et al. 2020).

as a potential lever for post-crisis recovery and long-term development (Lazzeretti et al. 2018; Ferreira-Seoane et al. 2022). Colombia’s PEN is part of this broader shift, while also illustrating the challenges of translating this promise into effective and inclusive policy outcomes, particularly in economies characterized by dependence on commodities and the need to move toward higher value-added activities in global markets.

3. Data

This paper uses a panel of administrative data collected monthly by the Colombian government on social security contributions and payroll taxes for the universe of formal firms, disaggregated at the 4-digit industrial level (ISIC) for the period 2016–2022.⁷ The dataset covers Colombia’s 32 regions (*Departamentos*) and includes information on wages, the number of employees and self-employed individuals, as well as their combined total, referred to as “workers.” It also contains data on “businesses,” used here as a synonym for “establishments,” which include both sole proprietorships, where a single individual owns and operates the business, and other business structures, referred to as “firms.” Additionally, the dataset provides information on the number of days contributed to pensions.⁸ The data are obtained from the *Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social* (UGPP), the institution responsible for regulating social security contributions.

Figure 2 presents the distribution of economic activity across industrial sections. The figure reports the share of firms accounted for by each sector over the period 2016–2022, distinguishing between all activities included in the PEN definition and the subset of “PEN-fully” industries. Industrial codes belonging to CCIs generally represent a small share within each industrial section, except in Accommodation and Food Service Activities (Section I), Information and Communication (Section J), Education (Section P), and Arts, Entertainment, and Recreation (Section R).⁹ As expected, Sections J and R exhibit the highest concentration of fully creative industries, accounting for 62 percent and 66 percent, respectively. On average, industries classified under the broader PEN

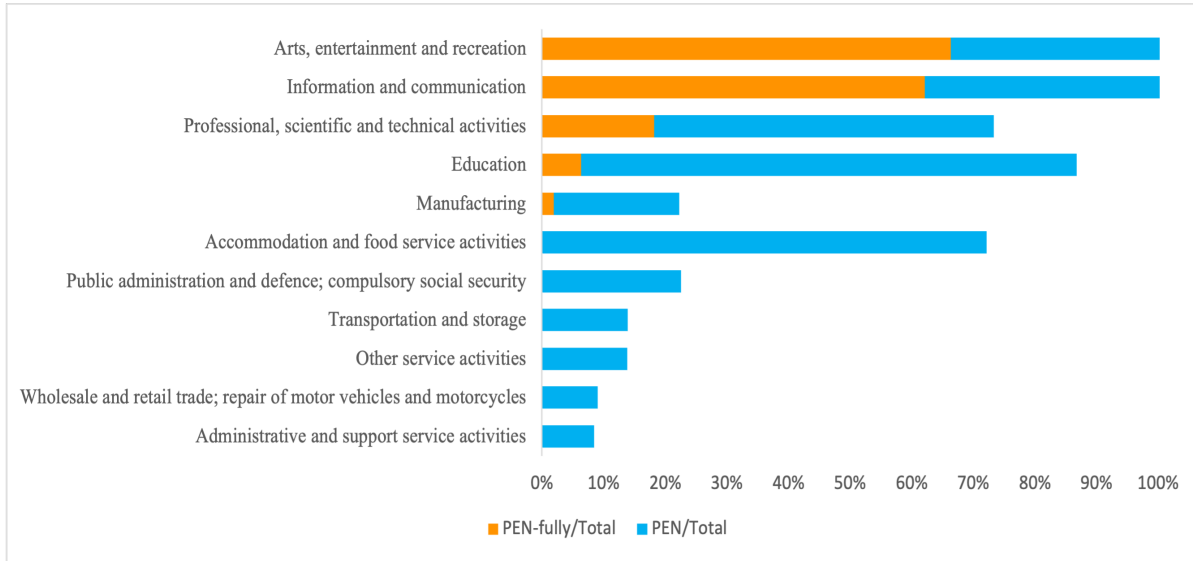
⁷ According to the International Standard Industrial Classification of All Economic Activities, Revision 4 (ISIC Rev. 4), economic activities are classified into 21 sections (A–U), which are further divided into 88 divisions (2-digit codes), 238 groups (3-digit codes), and 419 classes (4-digit codes).

⁸ The Colombian pension system requires individuals to contribute for a minimum number of weeks to qualify for pension benefits. Under current legislation, the minimum requirement is 1,000 weeks.

⁹ Industrial sections A, B, D, E, F, K, L, Q, T, and U contain no PEN-classified activities.

definition account for approximately 38 percent of formal firms and 40 percent of formal employment. In contrast, the subset of “PEN-fully” industries—those most closely aligned with the policy’s targeted activities—represents a much smaller fraction of the economy, accounting for roughly 4.4 percent of firms and 2.5 percent of employment in the pre-policy period.

Figure 2. Share of Economic Activities (2016–2022)



Source: Author’s calculations based on administrative payroll tax data from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

Taken together, these patterns indicate that the policy operates within sectors that are economically meaningful but not dominant in the aggregate economy, and that treatment intensity varies considerably across activities.

Table 1 presents descriptive statistics for the main outcomes in treated industries (103 PEN and 34 PEN-fully codes) and control industries within industrial sections that contain at least one PEN industry (264 codes), before and after the implementation of PEN.¹⁰ While PEN and PEN-fully industries differ in scale, consistent with their relative importance in the formal economy, pre-policy differences remain relatively stable across groups. Trends in unconditional means show broadly similar pre-policy dynamics across treated and control industries and suggest that, following the implementation of the policy, outcomes in PEN-fully industries begin to grow more rapidly, partially closing the gap with broader PEN sectors and diverging from control industries.¹¹

¹⁰ All variables are expressed in logs; Appendix C shows that this transformation reduces strong right-skewness in the raw distributions. See Appendix B, Table 5, for descriptive statistics in levels.

¹¹ See Appendix B, Figure 12.

While purely descriptive, these patterns are consistent with the hypothesis that the policy may have contributed to an expansion of economic activity in the most intensively treated sectors, and provide preliminary support for the identification strategy, which relies on comparing trends across industries with different levels of exposure to the policy.

Table 1. Descriptive Statistics Across Treatment and Control Groups

	PEN		PEN-fully		Controls	
	(1) Pre	(2) Post	(3) Pre	(4) Post	(5) Pre	(6) Post
<i>Firm outcomes</i>						
Businesses (log)	7.756 (1.529)	7.898 (1.519)	7.424 (1.311)	7.631 (1.298)	7.035 (1.729)	7.153 (1.746)
Firms (log)	6.572 (1.531)	6.641 (1.519)	5.983 (1.305)	6.101 (1.278)	6.262 (1.579)	6.311 (1.608)
Sole proprietorships (log)	7.232 (1.623)	7.414 (1.605)	7.076 (1.386)	7.319 (1.361)	6.166 (1.973)	6.371 (1.943)
<i>Labor market outcomes</i>						
Workers (log)	9.765 (1.749)	9.860 (1.729)	8.974 (1.484)	9.119 (1.465)	9.507 (1.759)	9.594 (1.767)
Self-employed (log)	7.386 (1.658)	7.589 (1.649)	7.151 (1.404)	7.459 (1.402)	6.407 (1.917)	6.623 (1.885)
Employees (log)	9.563 (1.877)	9.645 (1.842)	8.599 (1.721)	8.735 (1.653)	9.403 (1.797)	9.486 (1.796)
<i>Labor conditions</i>						
Wage (mean, log)	14.00 (0.334)	14.09 (0.323)	14.08 (0.306)	14.18 (0.292)	14.06 (0.403)	14.17 (0.382)
Pension contributions (days)	23.97 (3.189)	23.20 (3.292)	23.85 (2.654)	23.18 (2.691)	24.62 (3.039)	23.88 (3.092)
Observations	1155	630	374	204	2904	1584

Source: Author's calculations based on administrative payroll tax records from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

Notes: This table reports descriptive statistics for formal labor market outcomes across treated (PEN and PEN-fully) and control industries, before and after the implementation of the PEN. Means are reported with standard deviations in parentheses. The pre-period corresponds to the years prior to policy implementation, while the post-period includes years after implementation. All monetary variables are expressed in logarithms where indicated.

4. Methodology

The analysis is conducted at two levels: aggregate and regional. As discussed in the background section, PEN was a national policy, meaning treatment assignment was not based on geography. This makes it natural to first examine aggregate effects by collapsing the data at the 4-digit ISIC level as the unit of observation. To account for potential regional heterogeneity, a second level of analysis incorporates geographic variation by defining the unit of observation as the interaction

between 4-digit ISIC codes and *Departamentos*, with population weights included to capture differences in regional scale.

4.1. Generalized Differences-in-Differences

Given the comprehensive coverage of the formal economy, the outcomes of interest are grouped into three categories: business outcomes (firms and sole proprietorships), labor market outcomes (employees and self-employed), and labor market conditions (wages and pension contributions). The baseline empirical strategy compares outcomes in PEN industries to those in non-PEN industries, controlling for unobserved characteristics that are fixed within each industrial code. Time and location fixed effects are included to account for common shocks and regional heterogeneity. To reduce noise, the data are aggregated at the quarterly level.

The difference-in-differences (DiD) specification is given by:

$$y_{idq} = \beta_1(PEN_i \times POST_q) + \delta_i + \lambda_d + \gamma_q + \varepsilon_{idq} \quad (1)$$

where the unit of analysis is industry i in *Departamento* d in quarter q . The term δ_i denotes industry fixed effects, capturing time-invariant differences across sectors; λ_d denotes *Departamento* fixed effects; and γ_q denotes quarter fixed effects, capturing common time shocks and seasonality.

A potential concern is that the allocation of support under the Orange Economy policy was not random. Industries classified as “creative” may differ from other sectors in ways that are correlated with their growth potential or exposure to formalization trends. Importantly, the policy was introduced as part of a broader political and strategic agenda, rather than as a targeted response to short-term performance differences across sectors. Moreover, the classification of creative industries largely follows pre-existing international frameworks, which are not tailored to recent Colombian sectoral performance. While this reduces concerns that treatment assignment was driven solely by pre-existing growth trends, it does not fully eliminate the possibility that treated industries differ from others along dimensions that may affect their evolution over time.

The empirical strategy addresses this concern by exploiting within-industry variation over time, comparing changes in outcomes between treated and untreated industries before and after policy implementation. The identifying assumption is that, absent the policy, treated and control industries

would have followed parallel trends. The plausibility of this assumption is assessed using event-study designs and alternative estimators that relax strict parallel trends.

4.2. Event Study Design

To assess the validity of the parallel trends assumption, I estimate the following event study specification:

$$y_{idq} = \sum_{\tau=-11}^6 \beta_{\tau} PEN_{i\tau} + \delta_i + \lambda_d + \gamma_q + \varepsilon_{idq} \quad (2)$$

where $PEN_{i\tau}$ is an indicator for each period τ relative to October 2018, the start of policy implementation. The specification includes 11 quarters before and 6 quarters after the policy, with $\tau = -1$ omitted as the reference period. Industry, *Departamento*, and quarter fixed effects are included throughout.

Standard errors are clustered at the 4-digit industry level to account for serial correlation within industries over time. The coefficients of interest, β_{τ} , should be statistically indistinguishable from zero in pre-treatment periods if the parallel trends assumption holds. Divergence between treated and control industries after the policy provides evidence consistent with a causal interpretation.

To address concerns about potential confounding trends that may persist even when pre-trends appear flat (Roth 2022), I follow Dobkin et al. (2018) and Freyaldenhoven, et al. (2021a,b) and re-estimate the event study allowing for a linear event-time trend and imposing smoothness restrictions. This approach helps assess whether the observed dynamics can be explained by unobserved confounders.

4.3. Synthetic Control Analysis

To complement the DiD analysis and address the potential concerns about identification mentioned above, I implement a synthetic control approach. Following (Freedman 2017), I apply synthetic control methods with multiple treated units, building on (Abadie and Gardeazabal 2003; Abadie et al. 2010; Abadie and L'Hour 2021).

This approach constructs a comparison group as a weighted combination of untreated industries, selected to match the pre-treatment characteristics of treated industries. The analysis focuses on the aggregate specification (excluding location), where both treated and control units are defined at the

4-digit ISIC level. I implement three estimators corresponding to recent advances in synthetic difference-in-differences (SDID) methods (Arkhangelsky et al. 2021; Clarke et al. 2023).

Conceptually, DiD relies on the parallel trends assumption, requiring that treated and control units would have followed similar trends in the absence of treatment. Synthetic Control (SC) relaxes this assumption by constructing a weighted control group that closely matches pre-treatment outcomes but may be sensitive to extrapolation. SDID combines both approaches by applying SC weights within a DiD framework, improving robustness when parallel trends are imperfect and allowing for multiple treated units. I compare DiD, SC, and SDID estimates to assess the robustness of the results across alternative identification strategies.

5. Results

5.1. Differences-in-Differences and Event Study Analysis

Table 2 presents the main estimation results of equation (1) for the period 2016–2020. Columns (1) and (2) report specifications without geographic variation, while columns (3) and (4) incorporate regional variation at the *Departamento* level. The baseline specification includes quarter and 4-digit ISIC fixed effects, whereas the location-based specification replaces these with panel fixed effects defined at the 4-digit ISIC code by *Departamento* level. In all cases, standard errors are clustered at the ISIC code level, which corresponds to the level of policy implementation.

The results reveal a consistent pattern across specifications. Panel A shows positive and statistically significant effects on firm outcomes, particularly for industries classified as fully creative (*PEN-fully*), with increases of approximately 7 percent in firms and businesses. Panel B indicates more limited and heterogeneous effects on labor market quantities. While the baseline specification yields no statistically significant effects, incorporating regional variation uncovers positive impacts on employment, especially for employees of around 9 percent, alongside reductions in self-employment in some specifications.¹² Panel C shows no robust evidence of effects on labor conditions, as measured by wages and pension contributions, suggesting that the policy primarily

¹² Appendix E presents results including data from the second quarter of 2020 onward. While the main findings remain, the estimates are affected by COVID-19, with positive effects concentrated in industries less dependent on physical interaction.

operates through firm creation and employment expansion rather than changes in compensation or contribution intensity.¹³

To assess whether these results reflect causal effects rather than underlying trends, I perform an event study analysis. For businesses in PEN-*fully* industries (Figure 3, panel a), the estimated positive effect appears to be driven by a pre-existing linear event-time trend. Before accounting for this trend, systematic differences between treated and control industries are evident, as indicated by confidence intervals that largely exclude zero. However, once the time-trend correction is applied, these differences disappear, along with the initially observed positive effect, as shown in the robustness section. In contrast, no pre-existing trend is detected for firms. The estimated coefficients in the pre-treatment period are not statistically different from zero at conventional levels, and the positive effect emerges only after policy implementation (Figure 3, panel b). This pattern supports the validity of the parallel trends assumption and strengthens the causal interpretation of the results for firm outcomes.

Table 2. Effects of PEN on the Formal Labor Market

	Excluding Location		Including Location	
	(1) PEN	(2) PEN- <i>fully</i>	(3) PEN	(4) PEN- <i>fully</i>
<i>Panel A. Firm outcomes</i>				
Businesses (log)	0.0243 (0.0149)	0.0886*** (0.0211)	0.0113 (0.0115)	0.0676*** (0.0163)
Firms (log)	0.0206 (0.0153)	0.0697** (0.0273)	0.0245 (0.0155)	0.0770*** (0.0280)
Sole proprietorships (log)	-0.0223 (0.0181)	0.0381 (0.0251)	-0.0298** (0.0133)	0.0118 (0.0176)
Workers (log)	0.0080 (0.0205)	0.0580 (0.0393)	0.0055 (0.0166)	0.0630** (0.0272)
Self-employed (log)	-0.0131 (0.0284)	0.0918 (0.0614)	-0.0367** (0.0163)	0.0055 (0.0219)
Employees (log)	-0.0010 (0.0250)	0.0523 (0.0525)	0.0231 (0.0216)	0.0901** (0.0413)
Wage (log)	-0.0124 (0.0101)	-0.0046 (0.0172)	-0.0061 (0.0069)	-0.0016 (0.0096)
Pensions (days)	-0.0365	0.0664	0.0899	0.225*

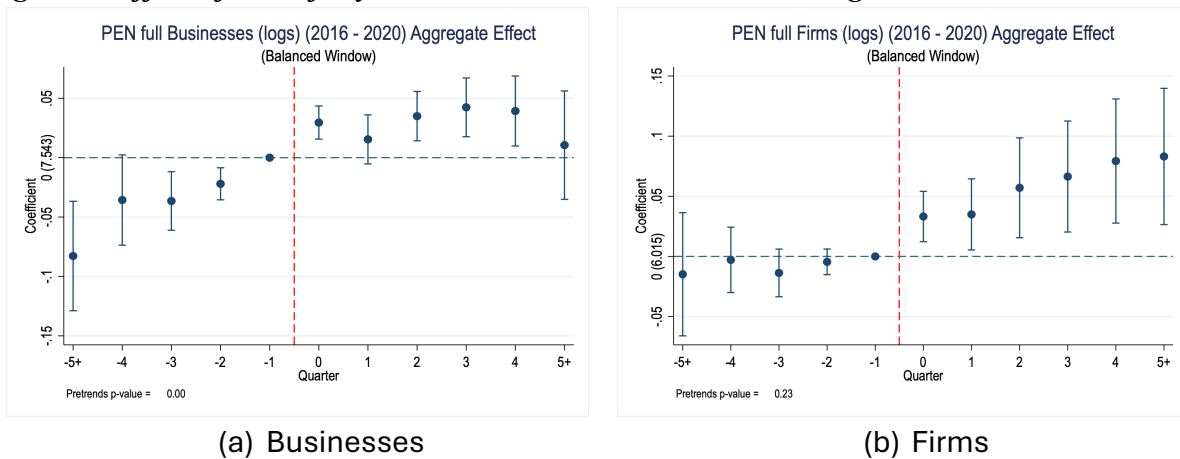
¹³ To ensure that the results are not driven by the choice of fixed effects, Appendix D presents alternative specifications incorporating different levels of ISIC aggregation and time controls. These exercises confirm that both the magnitude and statistical significance of the main results remain stable across specifications.

	Excluding Location		Including Location	
	(0.1730)	(0.2900)	(0.0954)	(0.1190)
Observations	6,273	5,066	149,893	117,813

Source: Author’s calculations based on administrative payroll tax records from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

Notes: Columns (1) and (2) report specifications excluding location, while columns (3) and (4) include location through department-level variation. PEN defines the treated group including all 103 eligible industrial codes. PEN-fully restricts the treated group to industries classified as fully creative and excludes partially creative activities. Specifications excluding location include time and ISIC fixed effects. Specifications including location include time, region (department), and ISIC fixed effects. Standard errors in parentheses are clustered at the ISIC code level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 3. Effect of PEN-fully on Businesses and Firms, Excluding Location

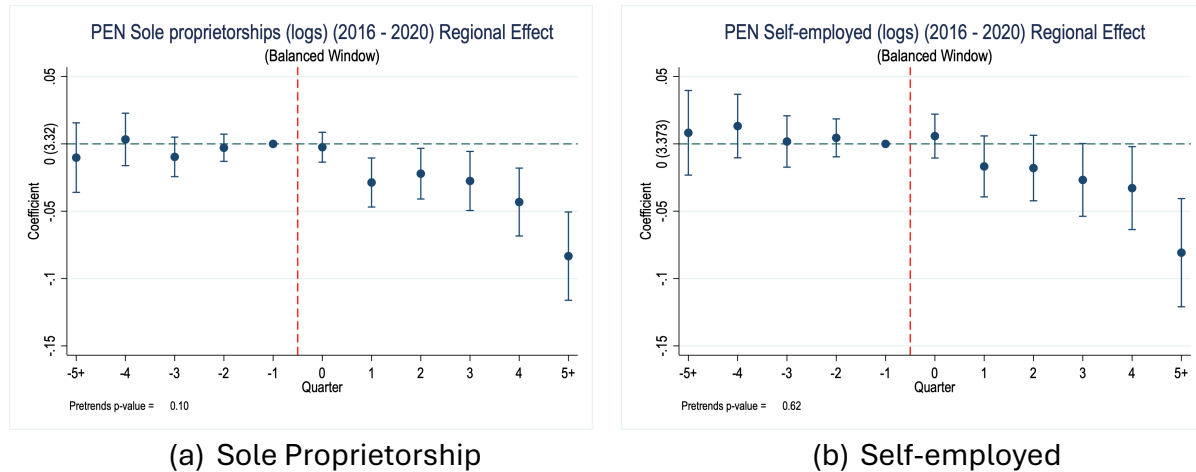


Source: Author’s calculations based on UGPP administrative payroll data.

Notes: Event study estimates are obtained using the xtevent framework (Freyaldenhoven et al. 2021a). Specifications include 4-digit industry fixed effects, with standard errors clustered at the same level. Coefficients are normalized to the pre-treatment period. When indicated, location fixed effects are included.

The event study analysis for PEN industries shows that the negative effects on sole proprietorships and self-employment (Figure 4, panels (a) and (b), respectively) both emerge after policy implementation, with no statistically significant differences between treated and control industries in the pre-treatment period. A plausible explanation is that PEN provided incentives for the creation of more structured firms, which require hiring multiple employees to qualify for benefits. As a result, the number of sole proprietorships and self-employed workers declines within PEN industries, consistent with a shift toward more formalized business structures.

Figure 4. Effect of PEN on Sole Proprietorship and Self-employment, Including Location



Source: Author’s calculations based on UGPP administrative payroll data.

Notes: Event study estimates are obtained using the xtevent framework (Freyaldenhoven et al. 2021a). Specifications include 4-digit industry fixed effects, with standard errors clustered at the same level. Coefficients are normalized to the pre-treatment period. When indicated, location fixed effects are included.

Results for PEN-fully industries are consistent across specifications with and without geographic variation. The positive effect on businesses is again driven by a pre-existing linear trend, while the parallel trends assumption holds for firms. The results also suggest a positive effect on workers, primarily employees, following policy implementation. In contrast, the positive estimates for pension contributions do not appear to be driven by the policy, and no robust effects are observed for wages.

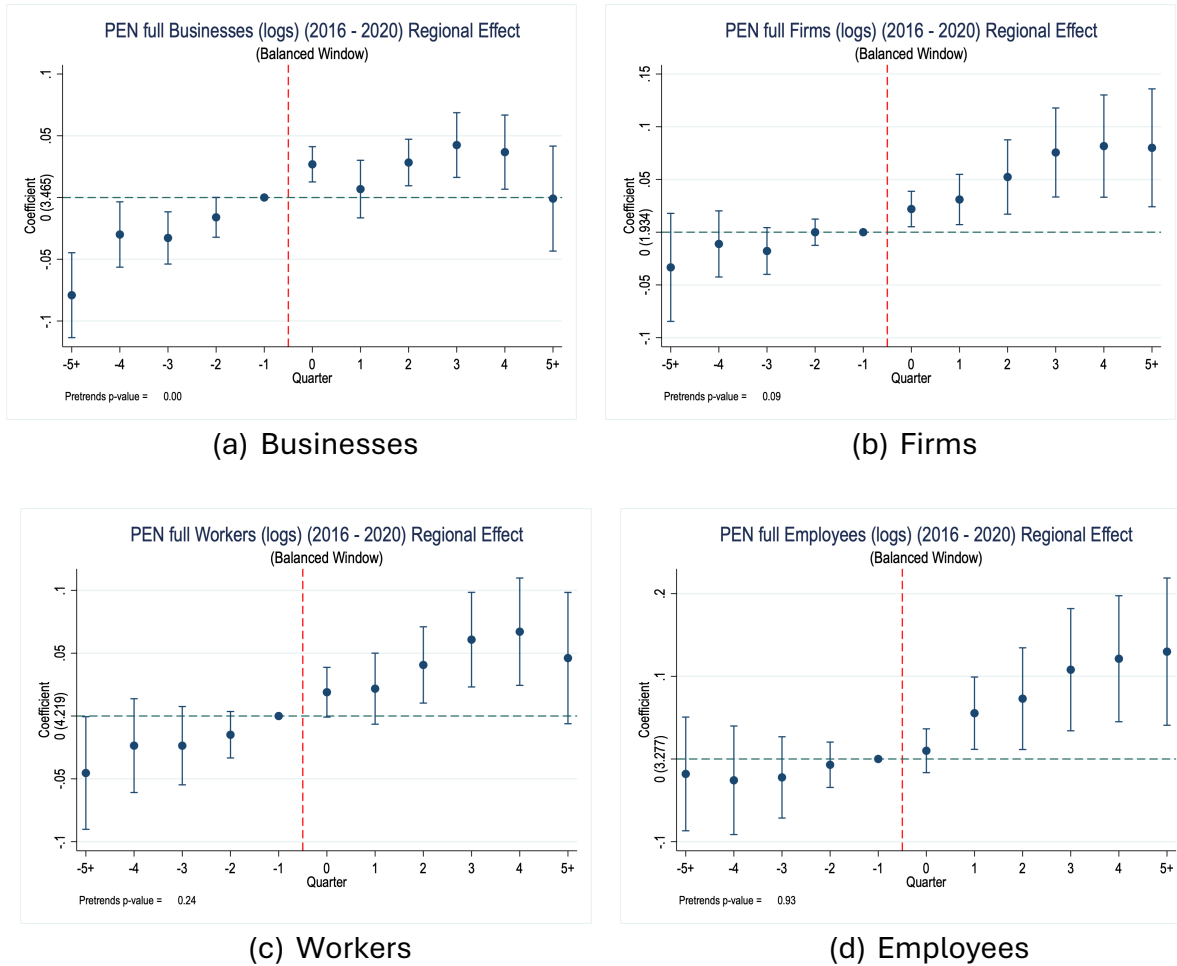
This pattern is consistent with adjustment along extensive margins in the short run. Firm creation and employment respond directly to the incentives provided by the policy, whereas labor conditions, such as wages and pension contributions, depend on longer-term consolidation of economic activity and are therefore less responsive in the short term.

To provide a sense of magnitude, the estimated coefficient of 0.07 for firms in PEN-fully industries implies an increase of approximately 7 percent relative to pre-policy levels. Aggregating across treated industries using the average pre-policy baseline, this corresponds to roughly 2,400 additional firms in a representative post-policy quarter. Because the outcome is measured as a quarterly stock at the industry level, this figure should be interpreted as an increase in the number of active firms rather than the number of newly created firms directly attributable to the program.

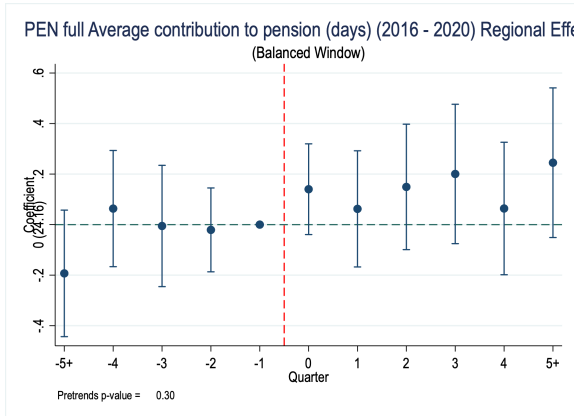
Similarly, the estimated coefficient of approximately 0.09 for employment implies a 9 percent increase in the number of employees in treated industries, corresponding to roughly 50,000 additional employees in a representative post-policy quarter. As with firm outcomes, this reflects

an increase in the stock of formal employment and captures both direct and indirect effects, including spillovers and formalization. While sizable within targeted sectors, these effects remain modest at the aggregate level, consistent with the scope of a sector-specific industrial policy: meaningful short-term impacts that require sustained implementation to generate broader structural change.¹⁴

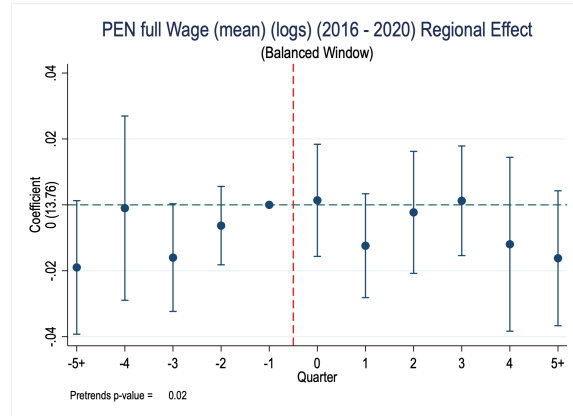
Figure 5. Effect of PEN-fully on the Formal Economy, Including Location



¹⁴ In the pre-policy period, PEN-fully industries account for approximately 4.4 percent of formal firms and 2.5 percent of formal employment. The estimated increments correspond to approximately 0.3 percent of total firms and 0.2 percent of total formal employment in the economy, based on UGPP data.



(e) Pensions' Contributions



(f) Wages

Source: Author's calculations based on UGPP administrative payroll data.

Notes: Event study estimates are obtained using the xtevent framework (Freyaldenhoven et al. 2021a). Specifications include 4-digit industry fixed effects, with standard errors clustered at the same level. Coefficients are normalized to the pre-treatment period. When indicated, location fixed effects are included.

5.2. Heterogeneity Analysis

Differences in the economic structure of industries within CCIs motivate the exploration of heterogeneous effects across sectors. While this analysis is constrained by the relatively small number of industry codes within each area, potentially affecting precision and the detection of pre-trends, it provides useful insights into the complexity underlying the broad definition of PEN. Figure 6 examines heterogeneous effects on the formal economy across three areas: Arts and Heritage (A1), Creative Industries and New Media (A2), and Cultural Industries (A3).

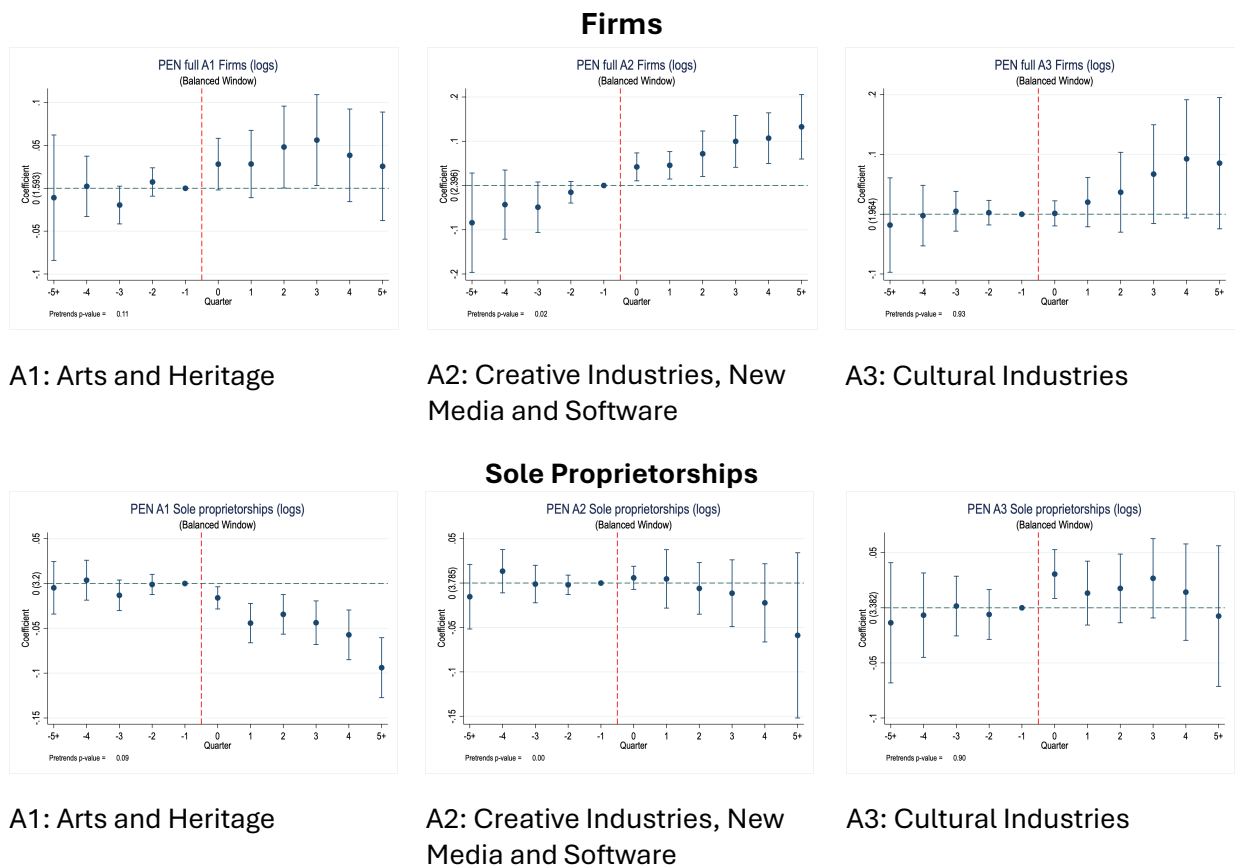
A first key finding is that policy effects are not uniform across sectors. For firms, A2 exhibits a clear and sustained post-treatment increase, suggesting that PEN may have facilitated firm creation or formalization in more technology-oriented and scalable activities. This contrasts with A1 (Arts and Heritage), where effects are smaller and more volatile, and A3 (Cultural Industries), where positive effects appear more gradual and less precisely estimated. It is important to note that pre-existing trends in A2 may indicate that these industries were already on an expansion path prior to the policy, which could have been reinforced by PEN.

A distinct pattern emerges for employment outcomes. Although all three areas exhibit positive dynamics, employment growth appears to be driven primarily by Arts and Heritage (A1), consistent with the more labor-intensive nature of these activities. In contrast, results for sole proprietorships and self-employment show flat or declining trends across all segments, particularly in A1. This divergence between firm-based employment and self-employment is consistent with a reallocation

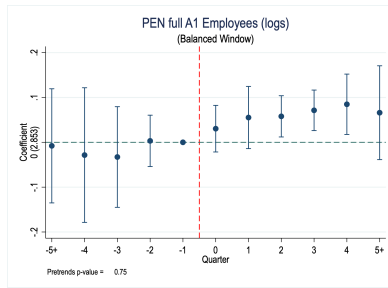
mechanism, whereby the policy may have encouraged a shift from individual or informal activities toward more structured, firm-based employment.

Overall, the heterogeneity analysis suggests that the impact of PEN on firm creation is concentrated in more dynamic and scalable segments of the creative economy, with more limited effects in traditional or structurally constrained activities. Employment increases are observed across all areas, albeit with varying intensity, and are stronger in more labor-intensive segments. These patterns are consistent with a scenario in which the policy supports firm growth in high-potential sectors while facilitating broader formalization and employment expansion.

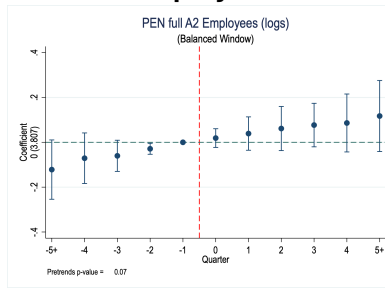
Figure 6. Effect of PEN-fully Across the Formal Economy by Orange Areas, Including Location



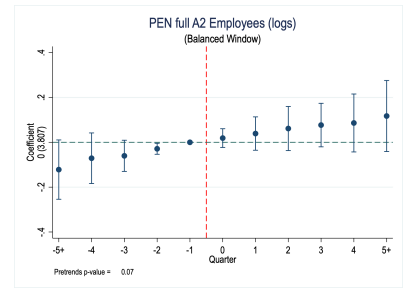
Employees



A1: Arts and Heritage

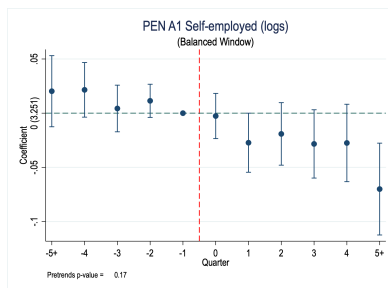


A2: Creative Industries, New Media and Software

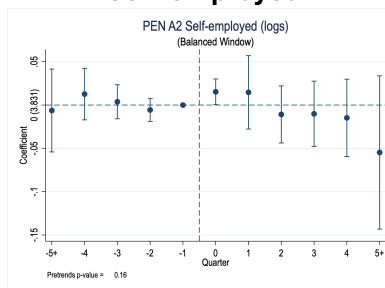


A3: Cultural Industries

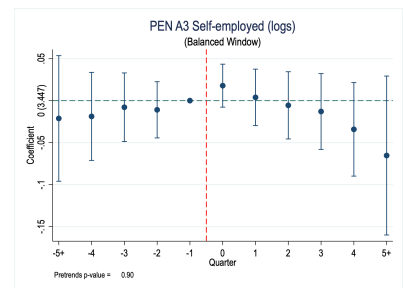
Self-employed



A1: Arts and Heritage



A2: Creative Industries, New Media and Software



A3: Cultural Industries

Source: Author's calculations based on UGPP administrative payroll data.

Notes: Event study estimates are obtained using the `xtevent` framework (Freyaldenhoven et al. 2021a). Specifications include 4-digit industry fixed effects, with standard errors clustered at the same level. Coefficients are normalized to the pre-treatment period. When indicated, location fixed effects are included.

5.3. Robustness

5.3.1. [Linear Trends and Potential Confounders](#)

Given concerns that unobserved confounders may drive the results even when pre-trends appear flat (Roth 2022), I implement a *least wiggly path of confounds* (LWPC) analysis to assess whether the observed dynamics can be attributed to an underlying confound (Freyaldenhoven et al., 2021a,b). Estimations are conducted using both the full sample period and a balanced window to evaluate the sensitivity of results to the inclusion of early periods.

The LWPC represents the minimum polynomial order required to pass through the confidence region and can be interpreted as the most plausible confound trajectory consistent with the absence of a policy effect. Higher-order (more “wiggly”) paths are less likely to reflect realistic economic processes, whereas smoother trajectories, such as linear trends, are more plausible. When the

estimated confound path is smooth, the observed treatment effect may be driven by an underlying trend rather than the policy itself.

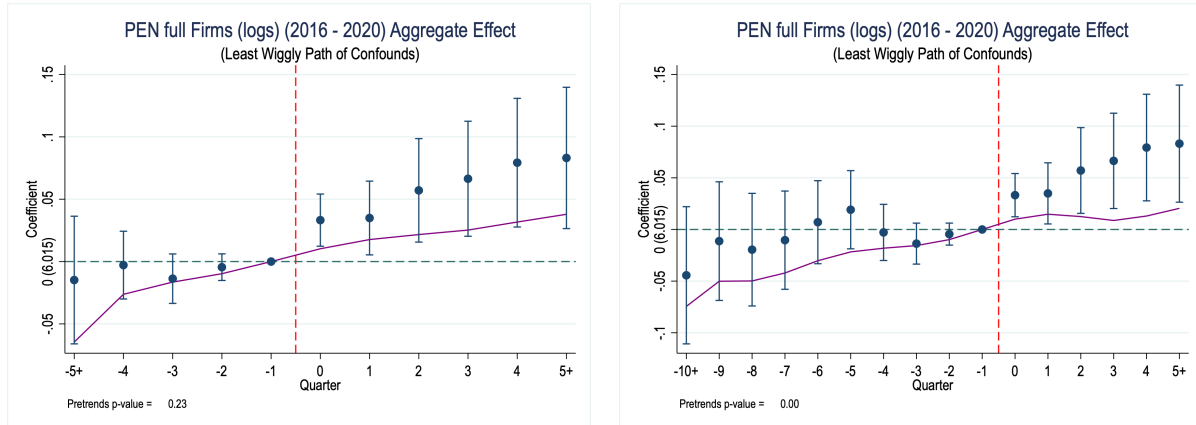
Figures 7 and 8 present the results of this analysis. Panel (a) shows estimates for the balanced window including the LWPC, while panel (b) presents results for the full period. Linear trends are corrected where appropriate following Dobkin et al. (2018). For firm outcomes, Figure 7 shows that the LWPC is not smooth, exhibiting a polynomial order greater than three. The positive effect persists across specifications, with no evidence of pre-existing trends. This suggests that a linear trend correction is not appropriate and reinforces the interpretation that the observed increase in firm creation is attributable to PEN.

For PEN industries, the negative effects on sole proprietorships and self-employment also emerge only after policy implementation, with no statistically significant differences in the pre-treatment period. In both cases, the LWPC is not smooth, supporting the validity of these findings. These patterns are consistent with a reallocation mechanism in which the policy incentivizes the creation of more structured firms that require hiring multiple employees, leading to a decline in individual economic activity.

Finally, the results indicate a positive effect on employees in PEN-*fully* industries following policy implementation. The LWPC again exhibits a high-order polynomial (Figure 8, panel (d)), suggesting that the observed dynamics are unlikely to be driven by a smooth confounding process.¹⁵

¹⁵ In the balanced window specification, the LWPC appears flat, indicating that the full estimation window is more informative for identifying the confound path.

Figure 7. Path of Potential Confounders on the Effect of PEN-fully on Firms, Excluding Location



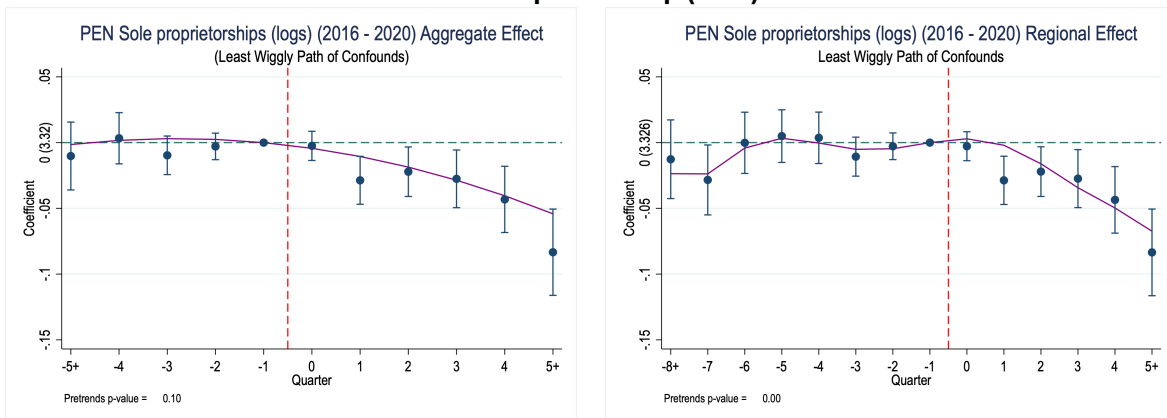
(a) Balanced window and LWPC

(b) Whole period and LWPC

Source: Author's calculations based on UGPP administrative payroll data.

Notes: Event study estimates are obtained using the xtevent framework (Freyaldenhoven et al. 2021a). Specifications include 4-digit industry fixed effects, with standard errors clustered at the same level. Coefficients are normalized to the pre-treatment period. When indicated, location fixed effects are included.

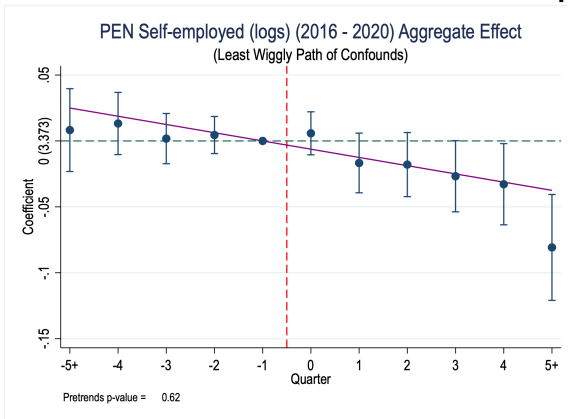
Figure 8. Path of Potential Confounders on the Effect of PEN on Sole Proprietorship and Self-employment, and PEN-fully on Employment, Including Location
Sole Proprietorship (PEN)



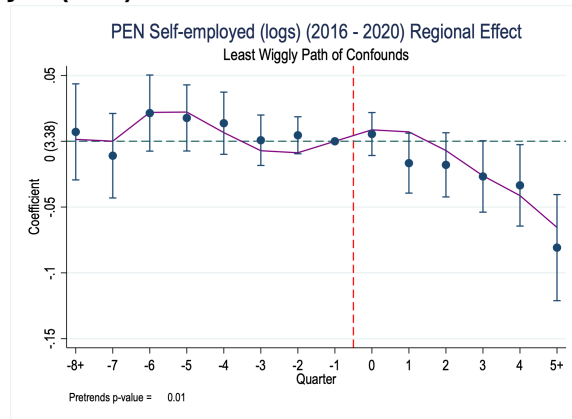
(a) Balanced window LWPC

(b) Whole period and LWPC

Self-employed (PEN)

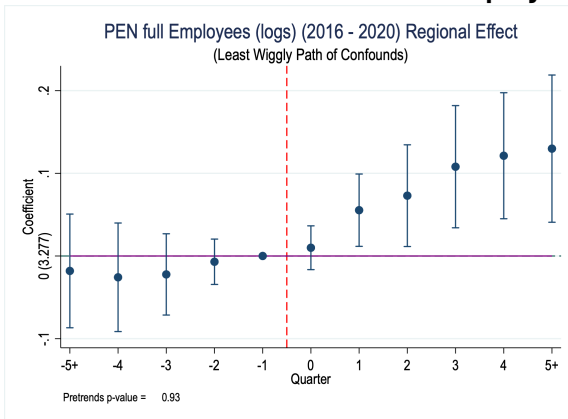


(c) Balanced window and LWPC

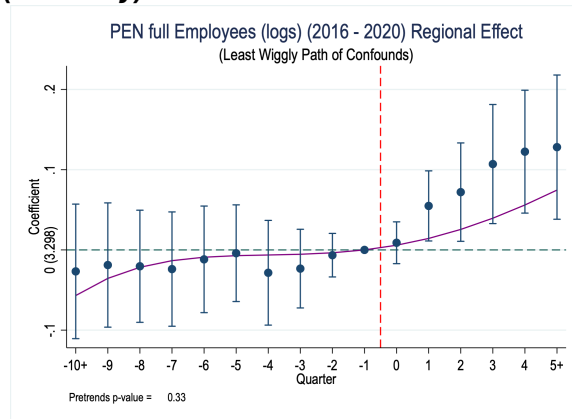


(d) Whole period and LWPC

Employees (PEN-fully)



(e) Balanced window and LWPC



(f) Whole period and LWPC

Source: Author's calculations based on UGPP administrative payroll data.

Notes: Event study estimates are obtained using the xtevent framework (Freyaldenhoven et al. 2021a). Specifications include 4-digit industry fixed effects, with standard errors clustered at the same level. Coefficients are normalized to the pre-treatment period. When indicated, location fixed effects are included.

5.3.2. [Synthetic Control Analysis for Aggregated Results](#)

As an additional robustness check, I implement synthetic control methods with multiple treated units (Abadie and L'Hour 2021). Treated units correspond to the 34 PEN-fully industries, while the donor pool consists of untreated industries within sections that contain at least one PEN industry, excluding partially treated sectors. This yields a donor pool of 264 industries.

Table 3 and Figure 9 present estimates from the Synthetic Difference-in-Differences (SDID) approach, alongside standard Difference-in-Differences (DiD) and Synthetic Control (SC) estimates. The SDID framework combines features of both DiD and SC by constructing unit-specific weights that improve pre-treatment fit while retaining a difference-in-differences structure, providing a more credible counterfactual when parallel trends may be imperfect.

The SDID results broadly reinforce the main findings. First, for firm outcomes, SDID yields a positive and statistically significant effect on the number of firms (0.0478, $p < 0.01$), consistent with both DiD and SC estimates. This supports the interpretation that PEN contributed to firm creation or formalization within targeted sectors. In contrast, the effect on sole proprietorships is small and not statistically significant, indicating limited changes in individual business activity in the aggregate specification.

Second, for employment outcomes, SDID estimates show a positive and significant effect on employees (0.0551, $p < 0.01$), suggesting an expansion in formal labor demand. This effect is less precisely estimated in DiD and SC, indicating that improved pre-treatment matching enhances identification. Self-employment also shows a modest positive effect (0.0675, $p < 0.05$), though the magnitude remains small.

Third, for labor conditions, the evidence is mixed. SDID estimates indicate a negative and statistically significant effect on wages (-0.0289 , $p < 0.05$), while pension contributions are negative but not statistically distinguishable from zero. The negative wage effect is consistent with SC estimates and may reflect compositional changes in the workforce, such as the entry of lower-wage workers, rather than declines in wages for incumbent workers.

Figure 9 illustrates these dynamics. SDID trajectories exhibit improved pre-treatment alignment relative to DiD, supporting the credibility of the counterfactual. Post-treatment, treated industries gradually diverge from their synthetic counterparts in firm and employment outcomes, while wage dynamics show weaker or slightly negative divergence.

Table 3. Synthetic Difference-in-Differences Analysis of PEN Across the Formal Economy, Excluding Location

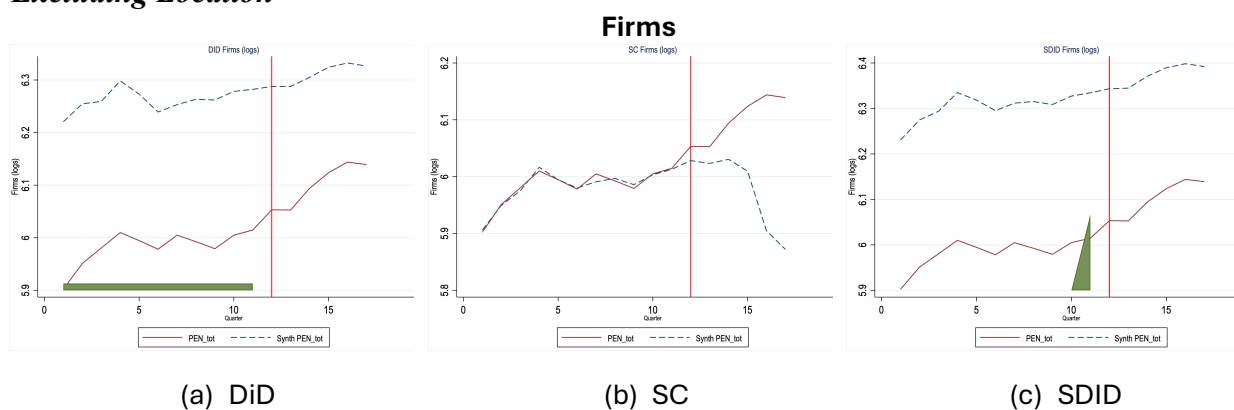
	(1) DID	(2) SC	(3) SDID
<i>Firm outcomes</i>			
Firms	0.0697*** (3.23)	0.123*** (4.01)	0.0478*** (3.60)
Sole proprietorships	0.0381 (1.18)	0.105 (1.63)	0.00239 (0.11)
Employees	0.0523 (1.23)	0.114 (1.50)	0.0551*** (2.60)
Self-employed	0.0918* (1.96)	0.0879 (1.35)	0.0675** (2.12)

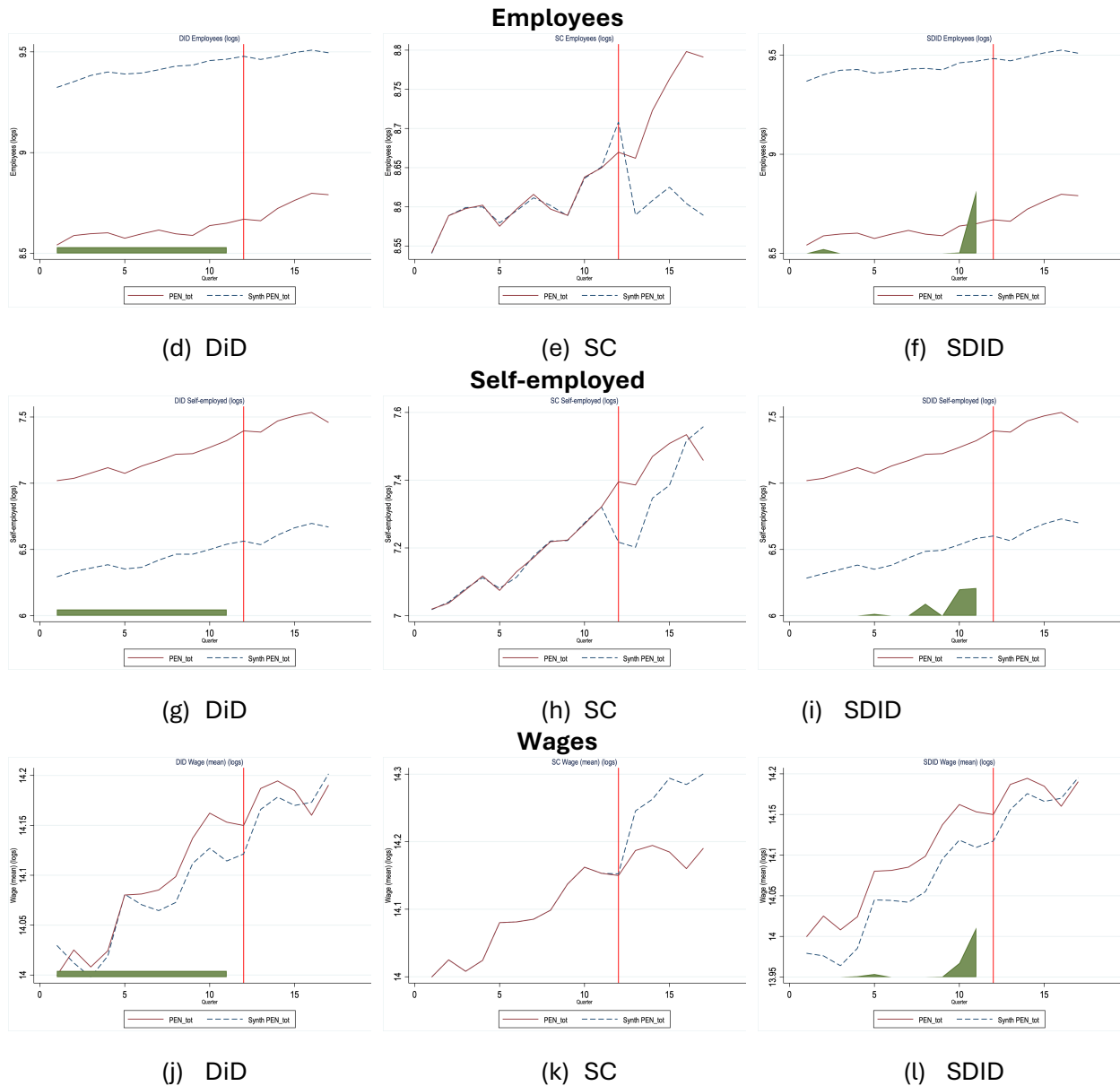
Wages	-0.00464 (0.23)	-0.0789*** (3.11)	-0.0289** (2.04)
Pension contributions	0.0664 (0.27)	-0.349 (1.16)	-0.241 (1.07)
Observations	5,066	5,066	5,066

Note: This table reports estimated average treatment effects of the Orange Economy Policy across formal labor market outcomes. Column (1) presents DID estimates, column (2) SC estimates, and column (3) SDID estimates. The estimation sample is restricted excluding partially creative codes. Test statistics are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Overall, the SDID results strengthen the interpretation that PEN increased firm creation and formal employment, with limited evidence of improvements in labor conditions. The combination of positive effects on firms and employees, alongside weaker or negative wage responses, is consistent with adjustment along the extensive margin of the labor market. Importantly, the SDID estimates do not overturn the baseline findings but rather refine them. The positive effects on firms and employment remain consistent across approaches, while improved pre-treatment matching increases precision without altering the underlying pattern. At the same time, the absence of robust effects on wages is confirmed across specifications. Taken together, these results provide additional support for a mechanism in which the PEN policy facilitates firm entry and formal employment expansion, with limited short-run effects on labor market quality.

Figure 9. Synthetic Difference-in-Differences Analysis of PEN Across The Formal Economy, Excluding Location





Source: Author's calculations based on UGPP administrative payroll data.

6. Limitations

This study is subject to several limitations.

First, data availability constrains the scope of the analysis. A comprehensive assessment of PEN would ideally incorporate both the informal sector and the broader cultural and creative output of the economy. While PEN was implemented as a national policy, identification in this paper relies on its eligibility design based on detailed industrial classifications. In contrast, data on informal activity are only available from national surveys, where industrial activity is aggregated at the 2-digit level and is not consistently representative at finer levels of disaggregation. A similar

limitation arises when considering the contribution of CCIs to GDP. Satellite accounts for creative and cultural industries do not provide information at the 4-digit level, and changes in the classification of CCIs over time may introduce measurement error that could be confounded with policy effects.

Second, heterogeneity across industries poses additional challenges. The set of 103 industrial codes used to define treated sectors encompasses activities that differ substantially in their productive structure, market orientation, and degree of formalization. Although the heterogeneity analysis attempts to account for this variation, it is constrained by the same data limitations. In particular, constructing indicators for more narrowly defined subgroups reduces the number of treated observations, which may introduce additional noise and affect the precision of estimates, including the detection of pre-trends. As a result, the analysis cannot be conducted at a more granular level.

Third, the interpretation of estimates requires caution. Because individual program participation is not observed, the analysis estimates intention-to-treat effects at the sector level. The estimates therefore capture the overall impact of policy exposure, including both direct effects on beneficiaries and indirect effects through spillovers, general equilibrium adjustments, and formalization. They should not be interpreted as the causal effect of receiving a specific program benefit. Instead, the results reflect how outcomes changed in PEN-targeted sectors relative to non-targeted sectors following the policy.

Finally, the results should be interpreted in terms of sectoral rather than aggregate effects. The estimated impacts, particularly for employment, capture changes within treated sectors relative to other industries and do not necessarily reflect net job creation at the economy-wide level. To the extent that the policy induces reallocation of labor across sectors, increases in employment within treated industries may be partially offset by reductions elsewhere. Accordingly, the results are best understood as sectoral equilibrium effects rather than aggregate employment gains.

7. Discussion

PEN was not a conventional firm or job creation program. Rather, it was an economic development strategy aimed at positioning Colombia in global markets for goods and services based on intellectual property. Its design explicitly acknowledged key challenges emphasized in the literature, including the difficulty of operationalizing existing definitions of creative industries for policy purposes, the substantial heterogeneity in firm structure, and the high degree of informality

within the sector. To address these constraints, the policy combined multiple instruments, including access to credit, institutional coordination, tax and non-tax incentives, and the creation of networks and platforms to facilitate market development. Importantly, PEN also sought to increase the visibility of the sector and its perceived relevance for economic development.

Despite these efforts, cultural and creative industries (CCIs) represent a relatively small share of GDP and, as shown in this paper, of the formal economy. This raises a natural question: why prioritize this sector as an engine of development? Skeptics have pointed to its limited scale as evidence that the policy is unlikely to generate meaningful effects. However, a growing body of literature highlights the potential of CCIs to foster a more inclusive form of development, extending beyond traditional measures of economic performance.

A related issue concerns the time horizon required for industrial policies to generate structural change. The implementation of PEN was relatively short-lived, with less than eighteen months of operation before being disrupted by the COVID-19 pandemic and subsequently discontinued following a change in administration. This limited exposure period constrains the extent to which longer-term effects can be observed and suggests that the estimates in this paper capture only the early stages of adjustment.

An additional concern is whether the observed effects on firms reflect genuine economic activity or merely an increase in formal registration. This distinction is particularly relevant, as administrative data based on business registries may capture entry without corresponding production. However, the data used in this study come from the UGPP, which records firms that actively contribute to social security. As such, the results are more likely to reflect changes in formal economic activity rather than purely administrative responses.

Finally, the nature of the effects merits consideration. Some of the observed responses may reflect strategic behavior, particularly if firms outside the intended scope of the policy gained access to its benefits. Evidence of this can be seen in the restriction of tax incentives to a subset of eligible activity codes. At the same time, the policy explicitly distinguished between fully and partially creative industries, allowing for a more nuanced assessment of responses across sectors with different degrees of exposure. This distinction provides a useful lens through which to interpret the results and to assess the extent to which observed effects align with the intended targets of the policy.

Taken together, the findings of this paper and the preceding discussion offer insights for the design and implementation of industrial policy beyond traditional sectors. While the estimated effects are modest at the aggregate level, they point to the capacity of targeted policies to stimulate formal economic activity in sectors often overlooked in standard development strategies. In this sense, the results suggest that structural transformation may emerge not only through the expansion of traditional sectors such as manufacturing, but also through the formalization and scaling of activities based on knowledge, creativity, and intellectual property. This perspective is particularly relevant for Latin America and other middle-income economies, where the search for new engines of growth increasingly involves sectors characterized by high heterogeneity, informality, and intangible production. Although the short implementation horizon of PEN limits the scope for observing long-term structural change, the results suggest that policies targeting cultural and creative industries can play a complementary role in broader development strategies aimed at diversification and inclusion.

8. Conclusion

PEN was the flagship economic policy of the Colombian government between 2018 and 2022, aiming to position Cultural and Creative Industries (CCIs) as a cornerstone of the country's development strategy and to establish Colombia as a competitive participant in global markets for goods and services based on intellectual property. By combining tax and non-tax incentives with an institutional framework to foster market opportunities, PEN embodied an ambitious vision: that creativity, cultural production, and intellectual property could become strategic drivers of growth and social integration.

This paper assesses PEN's short-term effects on the formal labor market. The results show that the policy generated meaningful gains: a 7% increase in firm creation and a 9% increase in employment within targeted industries, accompanied by declines in sole proprietorships and self-employment. These findings suggest that PEN incentivized a reallocation of economic activity toward more structured, firm-based models with greater capacity to generate formal jobs. Such patterns are consistent with the expectation that entry and hiring respond relatively quickly to targeted incentives, while wages and pension contributions reflect longer-term consolidation that requires time and stability to materialize.

The evidence thus highlights both the promise and the limits of PEN. On the one hand, it demonstrates that CCIs can respond to industrial policy through measurable changes in firm organization and formal employment. On the other hand, its potential to transform the broader Colombian economy was constrained by the sector's relatively small base, the disruption caused by COVID-19, and, importantly, the lack of policy continuity following the change in administration. As with many industrial policies, large-scale structural transformation is unlikely to occur within a short time horizon and instead requires sustained investment, institutional continuity, and a stable policy environment.

The discontinuation of PEN reflects a broader challenge in Colombia: sustaining long-term development strategies across political cycles. The experience of PEN nonetheless provides valuable lessons: it suggests that creative industries, though unconventional targets of industrial policy, can be leveraged as strategic assets when supported by coherent design and implementation.

Ultimately, PEN can be understood as a proof of concept rather than a completed transformation. The policy shows that industrial interventions can reshape the organization of economic activity, promoting formalization, firm creation, and employment, even in sectors not traditionally associated with development strategies. At the same time, it underscores that such changes are partial and require continuity, stability, and time to evolve into lasting structural transformation.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author used ChatGPT-5.2 in order to correct grammatical mistakes and improve overall readability. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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Appendix A: Policy Implementation Details

Table 4. ISIC Rev. 4 Classification and Eligibility Assignment under the Orange Economy Policy (PEN)

Orange Areas	Orange Sectors	Type of Inclusion
Arts and heritage	Regulation	Partial: 8412, 8413, 9412, 9499
	PEN Manufacturing	Partial: 1103, 1312, 1313, 1391, 1392, 1393, 1399, 1410, 1420, 1430, 1512, 1521, 1522, 1640, 1690, 2310, 2393, 2396, 2591, 2599, 3110, 4771, 4772
	Performing arts	Full: 9002, 9003, 9006, 9007, 9008
	Visual arts	Full: 7420, 9005
	Cultural and creative education	Partial: 8511, 8512, 8513, 8521, 8522, 8523, 8530, 8541, 8542, 8543, 8544, 8551
	Cultural heritage	Full: 9101, 9102, 9103, 9321 Partial: 7210, 7220
	Cultural tourism	Partial: 4911, 4921, 5021, 5511, 5512, 5513, 5514, 5519, 5520, 5611, 5612, 5613, 5619, 5630, 7911, 7990
Creative industries, new media and software	Design	Full: 3220, 3240, 7410 Partial: 3210, 7110
	Digital media and software	Full: 5820, 6201, 6312 Partial: 4741, 6202, 6311
	Advertising	Full: 7310
Cultural industries	News agency activities and other information service activities n.e.c.	Full: 6391, 6399
	Audio-visuals	Full: 5911, 5912, 5913, 5914, 6020, 9004 Partial: 4769, 6110, 6130
	Publishing	Full: 5811, 5813, 5819, 9001 Partial: 1811, 1812, 4761, 7490
	Phonographic	Full: 1820, 5920, 6010

Source: Author's production based on information provided by the National Department of Statistics (DANE).

Figure 10. Example of PEN Classification (ISIC Rev 4)

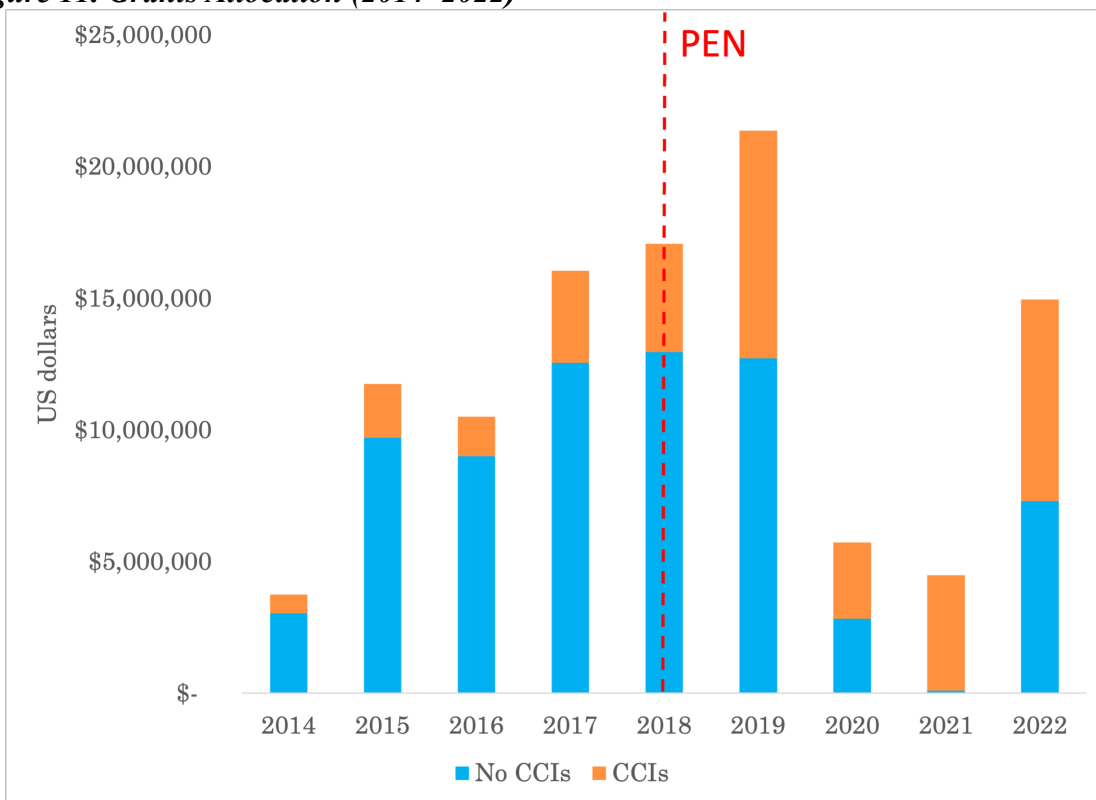
International Standardized Industrial Classification of All Economic Activities (ISIC) Rev4

Section M
Professional, scientific and technical activities

Division	Group	Class	Description
Division 69			Legal and accounting activities
	691	6910	Legal activities
	692	6920	Accounting, bookkeeping and auditing activities; tax consultancy
No PEN	Division 70		Activities of head offices; management consultancy activities
	701	7010	Activities of head offices
	702	7020	Management consultancy activities
	Division 71		Architectural and engineering activities; technical testing and analysis
PEN-partial	711	7110	Architectural and engineering activities and related technical consultancy
	712	7120	Technical testing and analysis
	Division 72		Scientific research and development
	721	7210	Research and experimental development on natural sciences and engineering
	722	7220	Research and experimental development on social sciences and humanities
	Division 73		Advertising and market research
PEN-total	731	7310	Advertising
	732	7320	Market research and public opinion polling
	Division 74		Other professional, scientific and technical activities
	741	7410	Specialized design activities
	742	7420	Photographic activities
	749	7490	Other professional, scientific and technical activities n.e.c.

Source: Author’s production based on information provided by the National Department of Statistics (DANE).

Figure 11. Grants Allocation (2014–2022)



Source: Author’s calculations based on information provided by the National Training Service (SENA).

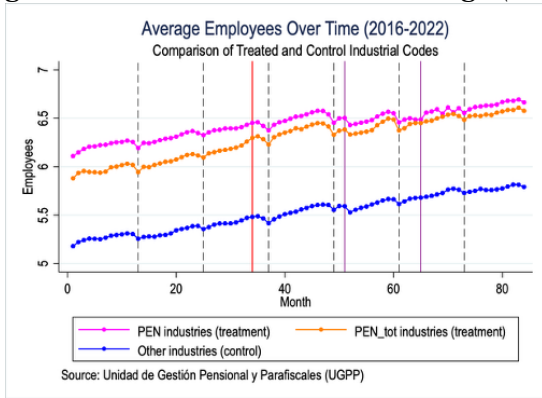
Appendix B: Descriptive Statistics

Table 5. Descriptive Statistics Across Treatment and Control Groups (Levels)

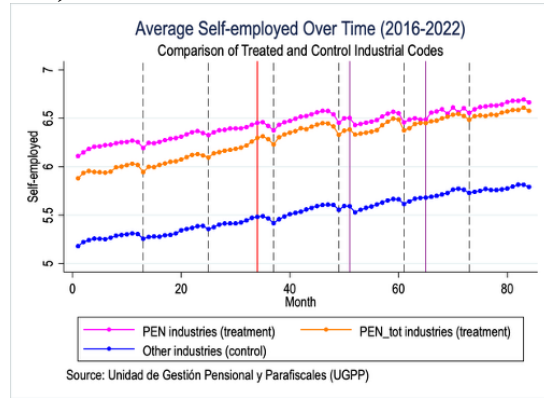
	PEN		PEN-fully		Controls	
	(1)	(2)	(3)	(4)	(5)	(6)
	Pre	Post	Pre	Post	Pre	Post
Panel A. Firm outcomes						
Businesses	29,602 (246,755)	32,651 (268,959)	4,904 (12,053)	5,786 (13,665)	11,086 (78,792)	11,658 (76,231)
Firms	2,824 (9,778)	2,856 (8,933)	1,013 (1,796)	1,088 (1,893)	1,843 (5,377)	1,917 (4,880)
Sole proprietorships	26,778 (237,658)	29,795 (260,866)	3,892 (10,731)	4,698 (12,556)	9,243 (73,936)	9,741 (71,995)
Panel B. Labor market outcomes						
Workers	113,585 (573,982)	121,006 (606,395)	21,031 (29,701)	24,338 (36,351)	60,804 (202,137)	64,281 (202,612)
Self-employed	27,814 (238,101)	31,021 (260,285)	4,112 (10,511)	5,345 (12,721)	9,428 (72,664)	10,050 (71,241)
Employees	85,771 (342,693)	89,985 (353,165)	16,919 (23,768)	18,993 (29,170)	51,376 (142,548)	54,231 (144,073)
Panel C. Labor conditions						
Wage (mean)	1,273,715 (484,876)	1,390,856 (504,303)	1,362,040 (425,719)	1,500,965 (461,227)	1,405,813 (730,925)	1,545,603 (759,823)
Pension contributions (days)	23.97 (3.19)	23.20 (3.29)	23.85 (2.65)	23.18 (2.69)	24.62 (3.04)	23.88 (3.09)
Observations	1,155	630	374	204	2,904	1,584

Notes: This table reports descriptive statistics in levels for formal labor market outcomes across treated (PEN and PEN-fully) and control industries, before and after the implementation of the Orange Economy Policy. Means are reported with standard deviations in parentheses. The pre-period corresponds to the years prior to policy implementation, while the post-period includes years after implementation. Source: Author's calculations based on administrative payroll tax records from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

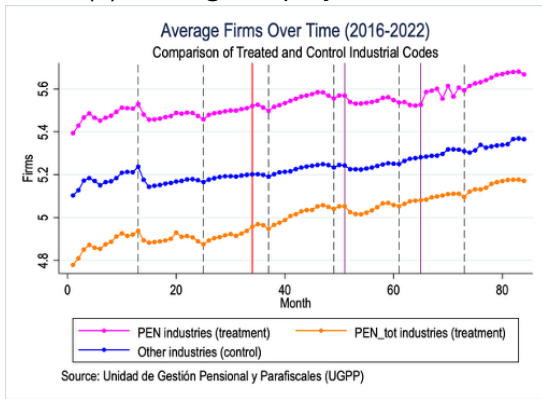
Figure 12. Outcome Variables Average (2016–2022)



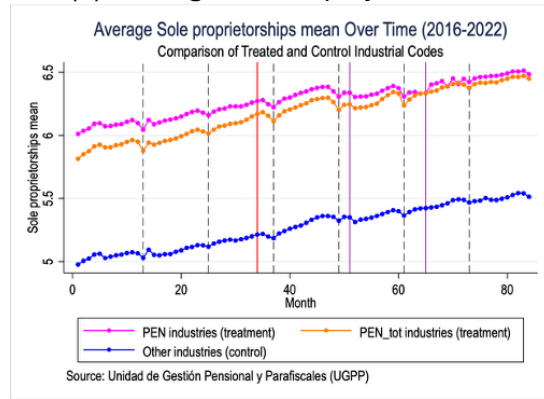
(a) Average Employees Over Time



(b) Average Self-Employed Over Time



(c) Average Firms Over Time



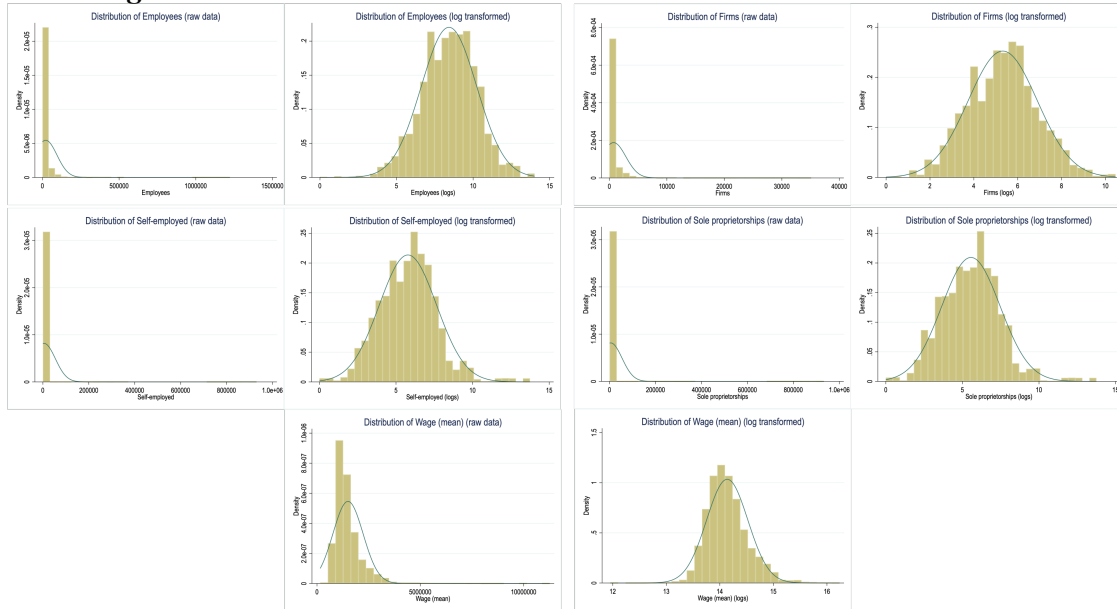
(d) Average Sole-Proprietorships Over Time

Source: Author's calculations based on UGPP administrative payroll data.

Note: Dashed lines indicate December of each year, the red line marks policy implementation, and the purple line represents the COVID-19 period.

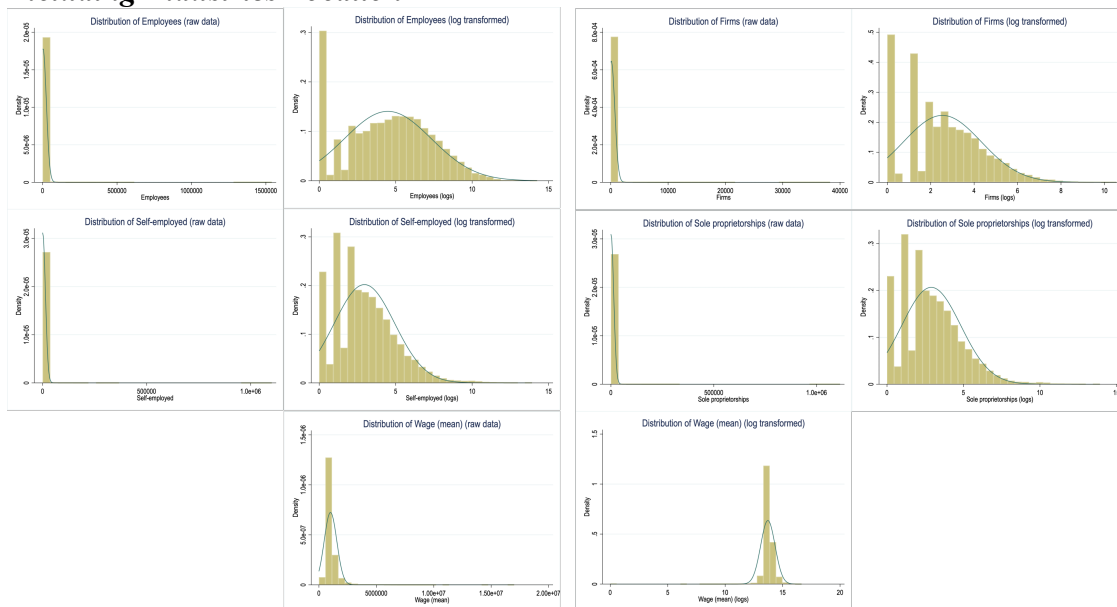
Appendix C: Outcome Variables Distribution and Log Transformation

Figure 13. Outcome Variables Histogram in Levels and Logarithmic Transformations Excluding Industries Location



Source: Author's calculations based on UGPP administrative payroll data.

Figure 14. Outcome Variables Histogram in Levels and Logarithmic Transformations Including Industries Location



Source: Author's calculations based on UGPP administrative payroll data.

Appendix D: Alternative Specifications

Table 6. Aggregate Effect of PEN on Firms (Logs), Robustness to Alternative Specifications (2016–2020)

	(1)	(2)	(3)	(4)	(5)
PEN	0.0206	0.0206	0.0206	0.0206	0.0206
	(0.0153)	(0.0153)	(0.0154)	(0.0155)	(0.0155)
Observations	6,273	6,273	6,273	6,273	6,273
R^2	0.009	0.296	0.501	0.729	0.997
PEN-fully	0.0697**	0.0697**	0.0697**	0.0697**	0.0697**
	(0.0273)	(0.0273)	(0.0273)	(0.0275)	(0.0277)
Observations	5,066	5,066	5,066	5,066	5,066
R^2	0.003	0.309	0.528	0.717	0.997
Time FE	✓	✓	✓	✓	✓
Section FE		✓	✓	✓	✓
Division FE			✓	✓	✓
Group FE				✓	✓
Class FE					✓

Source: Author's calculations based on administrative payroll tax records from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

Notes: Standard errors in parentheses. According to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4), economic activities are classified into 21 sections (A–U), 88 divisions (2-digit), 238 groups (3-digit), and 419 classes (4-digit). All estimates use clustered errors at the ISIC class level only; columns (1)–(5) progressively add time and increasingly disaggregated ISIC fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7. Regional Effects of PEN on Firms (log), Robustness to Alternative Specifications (2016–2020)

	(1)	(2)	(3)	(4)	(5)	(6)
PEN	0.0267	0.0296*	0.0289*	0.0280*	0.0263*	0.0245
	(0.0167)	(0.0162)	(0.0158)	(0.0157)	(0.0155)	(0.0155)
Observations	149,893	149,893	149,893	149,893	149,893	149,893
R^2	0.000	0.353	0.488	0.582	0.717	0.870
PEN-fully	0.0740**	0.0821***	0.0822***	0.0815***	0.0811***	0.0770***

	(1)	(2)	(3)	(4)	(5)	(6)
	(0.0303)	(0.0296)	(0.0292)	(0.0289)	(0.0284)	(0.0280)
Observations	117,813	117,813	117,813	117,813	117,813	117,813
R^2	0.010	0.367	0.500	0.596	0.706	0.866
Time FE	✓	✓	✓	✓	✓	✓
Place FE		✓	✓	✓	✓	✓
Section FE			✓	✓	✓	✓
Division FE				✓	✓	✓
Group FE					✓	✓
Class FE						✓

Source: Author's calculations based on administrative payroll tax records from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

Notes: All specifications are weighted by population. Standard errors are clustered at the ISIC class level. According to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4), economic activities are classified into 21 sections (A–U), 88 divisions (2-digit), 238 groups (3-digit), and 419 classes (4-digit). Columns progressively add time, place, and increasingly disaggregated ISIC fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8. Regional Effects of PEN on Sole Proprietorship (log), Robustness to Alternative Specifications (2016–2020)

	(1)	(2)	(3)	(4)	(5)	(6)
PEN	-0.0296*	-0.0270*	-0.0279**	-0.0267**	-0.0293**	-0.0298**
	(0.0157)	(0.0146)	(0.0135)	(0.0134)	(0.0134)	(0.0133)
Observations	149,893	149,893	149,893	149,893	149,893	149,893
R^2	0.023	0.267	0.523	0.613	0.721	0.881
PEN-fully	0.00814	0.0152	0.0152	0.0134	0.0119	0.0118
	(0.0224)	(0.0200)	(0.0178)	(0.0187)	(0.0181)	(0.0176)
Observations	117,813	117,813	117,813	117,813	117,813	117,813
R^2	0.009	0.240	0.507	0.607	0.691	0.875
Time FE	✓	✓	✓	✓	✓	✓
Place FE		✓	✓	✓	✓	✓
Section FE			✓	✓	✓	✓

	(1)	(2)	(3)	(4)	(5)	(6)
Division FE				✓	✓	✓
Group FE					✓	✓
Class FE						✓

Source: Author's calculations based on administrative payroll tax records from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

Notes: All specifications are weighted by population. Standard errors are clustered at the ISIC class level. According to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4), economic activities are classified into 21 sections (A–U), 88 divisions (2-digit), 238 groups (3-digit), and 419 classes (4-digit). Columns progressively add time, place, and increasingly disaggregated ISIC fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9. Regional Effects of PEN on Employees (log), Robustness to Alternative Specifications (2016–2020)

	(1)	(2)	(3)	(4)	(5)	(6)
PEN	0.0251	0.0297	0.0301	0.0282	0.0262	0.0231
	(0.0246)	(0.0233)	(0.0226)	(0.0222)	(0.0218)	(0.0216)
Observations	149,893	149,893	149,893	149,893	149,893	149,893
R^2	0.000	0.337	0.424	0.530	0.637	0.777
PEN-fully	0.0876*	0.0998**	0.1000**	0.100**	0.0996**	0.0901**
	(0.0454)	(0.0432)	(0.0425)	(0.0420)	(0.0414)	(0.0413)
Observations	117,813	117,813	117,813	117,813	117,813	117,813
R^2	0.020	0.359	0.427	0.541	0.635	0.768
Time FE	✓	✓	✓	✓	✓	✓
Place FE		✓	✓	✓	✓	✓
Section FE			✓	✓	✓	✓
Division FE				✓	✓	✓
Group FE					✓	✓
Class FE						✓

Source: Author's calculations based on administrative payroll tax records from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

Notes: All specifications are weighted by population. Standard errors are clustered at the ISIC class level. According to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4), economic activities are classified into 21 sections (A–U), 88 divisions (2-digit), 238 groups (3-digit), and 419 classes (4-digit). Columns progressively add time, place, and increasingly disaggregated ISIC fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10. Regional Effects of PEN on Self-Employed (log), Robustness to Alternative Specifications (2016–2020)

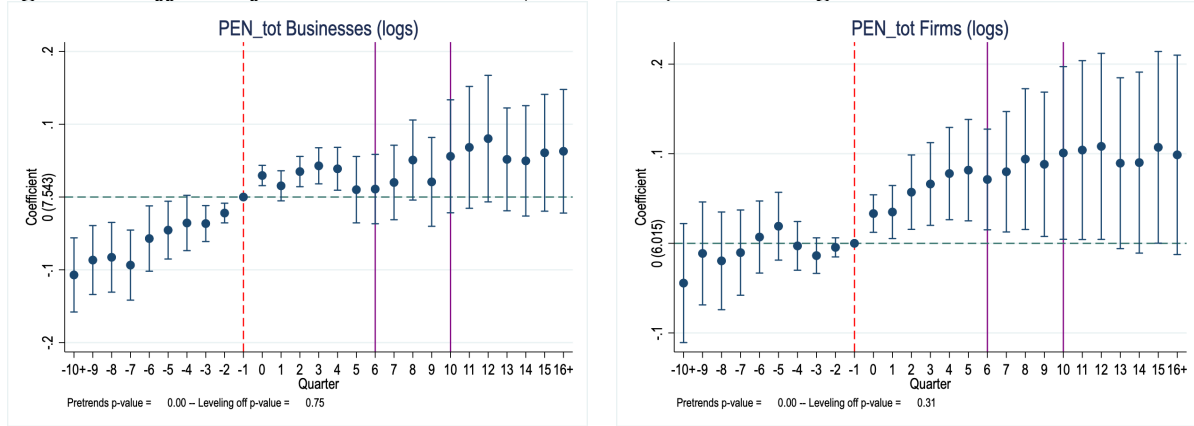
	(1)	(2)	(3)	(4)	(5)	(6)
PEN	-0.0374** (0.0187)	-0.0345* (0.0176)	-0.0353** (0.0165)	-0.0339** (0.0163)	-0.0366** (0.0163)	-0.0367** (0.0163)
Observations	149,893	149,893	149,893	149,893	149,893	149,893
R^2	0.019	0.283	0.522	0.601	0.703	0.861
PEN-fully	0.000517 (0.0258)	0.00832 (0.0239)	0.00836 (0.0221)	0.00691 (0.0228)	0.00567 (0.0223)	0.00550 (0.0219)
Observations	117,813	117,813	117,813	117,813	117,813	117,813
R^2	0.007	0.262	0.507	0.595	0.673	0.853
Time FE	✓	✓	✓	✓	✓	✓
Place FE		✓	✓	✓	✓	✓
Section FE			✓	✓	✓	✓
Division FE				✓	✓	✓
Group FE					✓	✓
Class FE						✓

Source: Author's calculations based on administrative payroll tax records from the Unidad de Gestión Pensional y Contribuciones Parafiscales de la Protección Social (UGPP).

Notes: All specifications are weighted by population. Standard errors are clustered at the ISIC class level. According to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4), economic activities are classified into 21 sections (A–U), 88 divisions (2-digit), 238 groups (3-digit), and 419 classes (4-digit). Columns progressively add time, place, and increasingly disaggregated ISIC fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix E: Results Including the COVID-19 Period

Figure 15. Effects of PEN and PEN-tot (2016-2022), Excluding Location



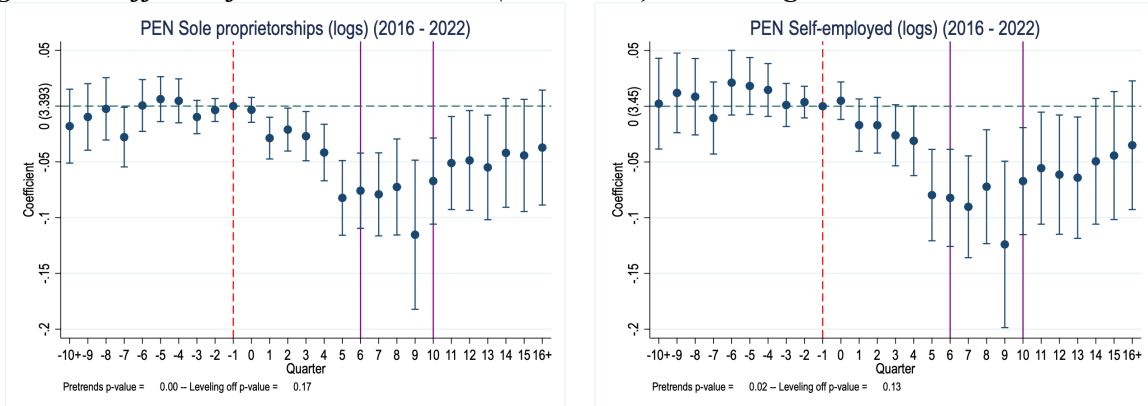
(a) Businesses

(b) Firms

Source: Author's calculations based on UGPP administrative payroll data.

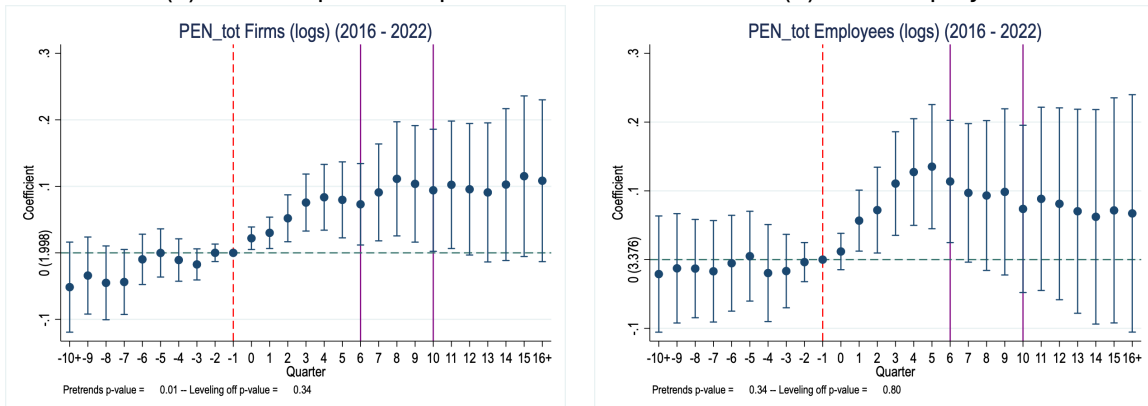
Notes: Event study estimates are obtained using the xtevent framework (Freyaldenhoven et al. 2021a). Specifications include 4-digit industry fixed effects, with standard errors clustered at the same level. Coefficients are normalized to the pre-treatment period. When indicated, location fixed effects are included.

Figure 16. Effects of PEN and PEN-tot (2016-2022), Including Location



(a) Sole Proprietorship

(b) Self-employed



(a) Firms

(b) Employees

Source: Author's calculations based on UGPP administrative payroll data.

Notes: Event study estimates are obtained using the xtevent framework (Freyaldenhoven et al. 2021a). Specifications include 4-digit industry fixed effects, with standard errors clustered at the same level. Coefficients are normalized to the pre-treatment period. When indicated, location fixed effects are included.