

ORIGINAL ARTICLE

Does it pay to cooperate? The case of cooperatives in the Mexican manufacturing sector

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Abstract

Various economic theories suggest cooperatives are an inefficient organizational form, but empirical evidence remains elusive. In Europe, the data does not necessarily support this view. There, a cooperative-friendly environment and policy infrastructure may explain this outcome. So what happens to cooperatives' performance in a country where this type of organization is little known and public policies do not support them? To answer this question I used the Economic Censuses of Mexico to compare cooperatives and private firms in the country's manufacturing sector. Using a propensity score matching and the Oaxaca-Blinder decomposition, several findings emerge. First, joint-stock and individually owned firms do have a higher sales performance relative to cooperatives in Mexico. Second, as productive units mature and gain more experience, however, that sales gap declines. Within the different endowments that may explain these results, the population size of districts where productive units are located is a variable that appears on a recurring basis. Relative to private firms, cooperatives are located in smaller municipalities. Even though this may affect their sales, such location is the result of a strategy to safeguard the cooperative spirit.

1 | INTRODUCTION

In recent decades governments in Latin America have put into place many programs to reduce vulnerability, inequality, and informality. Deficiencies within these interventions to fully address these complex issues have resulted in mixed results. For example, problems that undermine the effectiveness of programs that seek to support micro entrepreneurs include the low scale of assets, the lack of commercial networks, and the limited knowledge of administration and marketing.

One alternative way to address these problems is through worker cooperatives. Scholars such as John Roemer (2019) show that cooperative behaviors produce efficient equilibriums and contexts where there is greater equality of opportunities and less income inequality. Conventional literature suggests, however, that these cooperative arrangements are unproductive because they exacerbate the problems of adverse selection and moral hazard. Does the data confirm such an assumption? Is the cooperative model viable?

Worker cooperatives distinguish themselves by their democratic governance, a non-tradable membership, and a payment structure based on members' mutual benefit, one not matched to individual effort. In this regard, economic theory suggests that worker cooperatives are more likely to face moral hazard and adverse selection. As a result cooperatives are perceived as an anomaly: an organization that either changes its way of working to become more mainstream—that is, a partnership—or it is doomed to disappear.

Some economic theory and empirical evidence suggest that such representation is questionable. As far as economic theory is concerned, multiple experiments confirm that individuals are less reluctant to cooperate than was traditionally considered (World Bank, 2015: 42). Experimental results suggest that there is a distribution in the willingness to cooperate to such an extent that the share of free-riders and people exhibiting unconditional reciprocity is small (Dawes & Thaler, 1988; Fehr & Fischbacher, 2005; Sobel, 2005, among others). With regard to the exacerbation of moral hazard problems and adverse selection, the evidence in Spain and Israel shows that the flexibility of the institutional design can actually protect cooperative organizations from such problems (Abramitzky, 2018; Arando, Gago, Jones, & Kato, 2011).

The data also offers evidence that contradicts the portrayal of cooperative design as an unsustainable arrangement. The International Co-operative Alliance (www.ica.coop) reports the existence of three million cooperatives—many of them more than 50 years old—with one billion members. In the case of Latin America, Brazilian cooperatives are responsible for 37% of agricultural production, and in Colombia they employ 12% of the population. In Europe, pharmaceutical cooperatives in Belgium have a market share of 20% and in Finland cooperatives are responsible for 74% of food production. In Spain, the Mondragon cooperative is one of the largest economic groups in the country.

In Europe, the empirical evidence also rejects the hypothesis that the cooperative design leads to poor economic outcomes (Arando et al., 2011; Fakhfakh, Pérotin, & Gago, 2012; Jones, 2007). This could to some extent be the result of the cooperative-friendly environment that prevails in many parts of that continent (Yunus & Nicholls, 2017). To isolate this effect, therefore, I will analyze cooperatives' productivity in Mexico's manufacturing sector. Here, cooperatives are immersed in an unfriendly environment: financial regulation inhibits their development and government programs that support business strengthening do not provide help to cooperatives.

Within the Mexican manufacturing sector there are, according to the last Economic Census of 2014, a little more than 500 worker cooperatives, 20,000 joint-stock companies, and half a million individually owned firms. I divided these productive units into two types: those registered both in the Censuses of 2009 and 2014 and those that only registered in the Census of 2014. The difference

between these two is that in the former group there are more experienced productive units. Next, I identified through a propensity matching score those companies and firms that, according to their six-digit subsector North American Industry Classification System (NAICS), their employment size, and sources of financing, were similar to cooperatives. With this procedure, two samples of cooperatives, companies, and individually owned firms were constructed.

The goal is twofold. First, to estimate the difference between the productivity of cooperatives vis-à-vis joint-stock firms and individually owned firms in the Mexican manufacturing sector. Second, to learn how much of these differentials can be explained by endowment differences and factor productivity. Answers to these questions are useful for a number of reasons: to examine if cooperatives report a lower productivity; to measure what would happen to cooperatives' productivity if they had the same endowments as private firms; to analyze if some cooperative strategies could help explain such gap; and to investigate if the problems cooperatives face change as they gain more experience. Regarding the scholarship, this might be the first article on Mexico—and maybe for all of Latin America—in which worker cooperatives, joint-stock firms, and individually owned firms of the manufacturing sector are considered.

Thus, this case study adds more evidence toward understanding the relative productivity of worker cooperatives through its four findings. First, joint-stock firms and individually owned firms have a higher sales performance relative to cooperatives. Second, if we only consider those productive units that appear in both Censuses, the 2014 data reports a lower sales gap. Third, while occasionally the number of hours worked or the size of assets could help explain the gap between cooperatives and companies, the market size appears more frequently as a possible explanation for these gaps. Fourth, if cooperatives had the same endowments as firms and companies, the gaps would be smaller. For example, using the 2009–14 sample, if cooperatives had the same endowments as individually owned firms the gap shrinks by half, to become 5%.

To show these results, the paper has four additional sections. The first deals with a review of the literature; the second describes the data and the legal framework that regulated cooperatives in Mexico; the third describes the empirical methodology and results; and the fourth is a discussion on the findings.

2 | THE NULL HYPOTHESIS AND THE ECONOMIC LITERATURE

The assumption that the cooperative model results in lower productivity is a result of the rules of governance, the scant use of incentives, and a non-tradable membership. These properties imply working conditions that can raise moral hazard problems, obstruct decision-making, and lead to poor use of administrative skills (Hansmann, 1990; Jensen & Meckling, 1979). Moreover, co-ownership in a context of a non-tradable membership can lead to a situation where the heterogeneity of intertemporal discount rates and risk aversion within members is difficult to solve (Kim & Ouimet, 2014). Finally, some of the goals that cooperatives pursue—their interest in the community and employment stability—may be against the maximization of productivity (Birchall, 2011 and Borzaga & Tortia, 2017).

Other factors, however, point to greater productivity on the part of cooperative arrangements. For example, sharing the surplus can generate an increase in productivity if partners understand the income statement of the cooperative (Blasi, Kruse, & Weltmann, 2015; Kruse, Freeman, & Blasi, 2010). In addition, workers' identification with the cooperative (Wilson & Peel, 1991), participation in the organization (Klein, 1987), and the social pressure among partners may give room for greater labor effort (Altman, 2006; Fitzroy & Kraft, 1987; Jones & Svejnar, 1985). In this regard,

some of the ideas behind agency theory, property rights, and implicit contracts would suggest that cooperatives might have a relatively higher productivity.

Considering arguments on both sides, this article examines whether the cooperative model is associated with lower productivity. Typically, there are two ways of measuring the effect of cooperative governance on such a variable.¹ The first consists of computing the impact of the distinctive activities carried out by the members of a cooperative (participation in the business plan, in the productive process and in management, in investment decisions, etc.) on sales revenue. In this respect, Chris Doucouliagos (1995) made a meta-analysis of the 43 most relevant empirical works and concluded that worker participation in the productive process has a positive impact on productivity, and is greater in cooperatives. Second, Saioa Arando et al. (2011) analyzed the impact of different forms of labor participation in two types of commercial enterprises within the Mondragon cooperative group. The main differences between the cooperative and the semi-cooperative were that in the latter the members do not have the right to participate in the annual general assembly nor can they be part of the board of directors. Taking into account employment changes, how old the establishments are, and their organizational form, Arando et al. (2011) found that cooperatives grew two percentage points above semi-cooperative ones. Further, based on one hundred research studies containing data from fifty-seven thousand companies around the world, Ernest H. O'Boyle, Patel, and Gonzalez-Mulé (2016) found a positive and statistically significant correlation between access to share ownership and a company's financial results.

Measuring the cooperative arrangement in this manner has two weaknesses, however. One is that in many private enterprises there are already various forms of participation (see Doucouliagos, 1995; Kruse et al., 2010), so that the use of dichotomous variables may be of little use when measuring the impact of participation in cooperatives (Jones, 2007). Further, while workers' participation may matter, it may be even more important to consider how much effort they put into such participation. This is very difficult to measure, however, and therefore it is rarely considered.

A second method of measuring how cooperative design affects productivity is to use dummy variables to signal when we are dealing with a cooperative. This methodology is easier, but also has problems. First, there is no explanation for why the organizational mode affects productivity. A second problem is that cooperatives are not necessarily homogeneous units. Such diversity is a result, for example, of whether nonmembers are allowed to work, the rules by which the surplus is distributed, and how investment decisions are taken.

Using both methodologies, Derek Jones (2007) used data from cooperatives and conventional companies operating in the construction sector in Italy in the 1980s. With the exception of the governance structure, productive units were relatively comparable in terms of employment and all had been in operation before this decade. Based on a sample of 51 conventional enterprises and 26 cooperatives, Jones estimated through ordinary least squares a translog function in which he sought to capture the effect that the cooperative organization has on value added. In addition to considering capital and labor inputs, it incorporates dummy variables to identify the nature of the firm (cooperative or private) and the different forms of worker participation. He did not find conclusive results since under certain specifications the impact of the organizational form takes

¹ A third methodology used to measure the inefficiency of firms consists on doing a data envelop analysis. For cooperatives, perhaps a good example is Sterner (1990) who studies the cement industry in Mexico. This industry is composed of fewer than ten firms, one of them being a cooperative. Since the first objective is to analyze what is the difference between cooperatives' performance vis-à-vis joint-stock and individually owned firms, my interest focuses on the differences across types of firms not on the differences across firms. Thus, this methodology is not the best suited to answer the questions raised in this paper.

different signs. Thus, for example, if he only included the dummy variable that signals if the firm is a cooperative, he found that the cooperative arrangement reduced sales value by 17%. However, when variables referring to worker participation are included, he found that the cooperative arrangement increased the sales value by almost 10%.

Seeking to enlarge the size and heterogeneity of the sample, Fathi Fakhfakh et al. (2012) compared the results of 7,000 French companies, of which 500 are cooperatives. Using a translog specification and a dichotomous variable to identify which firms are cooperatives, the authors found that in most industries this dichotomous variable does not have a statistically significant impact on value added. To examine whether the productivity differential responded to differences on yields, they assigned to each type of productive unit the estimated parameters of the other type and, using their own inputs, compared the resulting value added. In many cases, there was no significant difference, but when there is, they found that traditional enterprises—and particularly those with fewer than 20 workers—would produce on average up to 40% more if they had used the cooperative technology. In this regard, the evidence reported by Fakhfakh et al. (2012) rejects the claim that cooperatives have a lower productivity.

3 | THE DATA AND THE LEGAL STATUS OF COOPERATIVES IN MEXICO

To evaluate the impact that cooperative arrangements have on productivity I used the Economic Censuses of the National Institute of Statistics and Geography (INEGI) which are published every five years. This census contains a single set of questions for all firm types in Mexico regardless of size, legal form, or compliance with the law. Given the heterogeneity of firms and the monetary cost of surveying all, there are no questions regarding governance and mechanisms by which workers may participate in the decisions and activities of private firms and cooperatives. Thus, it is not possible to identify the differences between workers' participation within cooperatives and among private firms. In addition, information regarding the personal characteristics of owners, shareholders, or membership is not available. The absence of this information prevents a follow up to the methodology used by scholars such as Arando et al. (2011), or Doucouliagos (1995), O'Boyle et al. (2016).

According to the 2014 Economic Census, in the previous year there were 5.7 million productive units in the country, of which 5% were companies.² Of the total 280,000 enterprises, 5,000 were cooperatives and half of those were financial cooperatives. The 2,657 non-financial cooperatives were predominantly located in retail (845) and manufacturing sectors (532).³ Using the NAICS, Table 1 shows the number of cooperatives, joint-stock companies, and individually owned firms in the manufacturing sector in 2013. Further, this same table reports the percentage of firms that were registered both in the 2009 and 2014 Economic Censuses. For example, Table 1 reports that in 2013, there were 242 in NAICS 311 and only 34.3% of them existed prior to the year 2009.

The *Ley General de Sociedades Cooperativas* of 1994 regulates worker cooperatives in Mexico. According to this law, a cooperative is an organization whose membership share common

² They include joint-stock companies, civil associations, civil societies, cooperative societies, limited liability companies, and religious associations. The other 95% are individually owned firms; most of them, sole proprietorships.

³ The remaining were in the wholesale trade sector (205), accommodation services (190), health (140), professional and scientific services sector (130), real estate services sector (88), business support services (85), educational services (60), transport (42), leisure and cultural services (37), mass media information (23), construction (3), and other services (270).

TABLE 1 Distribution of productive units registered in the Mexican Manufacturing Sector of the 2014 Economic Census

Name of subsector	NAIC	Number of cooperatives	Number of joint stock companies	Number of individually owned firms
Food Manufacturing	311	242	2,932	164,039
Beverage and Tobacco Product Manufacturing	312	54	1,010	18,109
Textile Mills	313	5	233	14,415
Textile Product Mills	314	15	380	27,844
Apparel Manufacturing	315	43	1,122	26,273
Leather and Allied Product Manufacturing	316	13	641	9,384
Wood Product Manufacturing	321	21	430	21,413
Paper Manufacturing	322	4	455	3,298
Printing and Related Support Activities	323	9	2,412	16,944
Chemical Manufacturing	325	9	1,272	1,753
Nonmetallic Mineral Product Manufacturing	327	32	866	29,326
Fabricated Metal Product Manufacturing	332	19	3,587	64,584
Transportation Equipment Manufacturing	336	4	447	805
Furniture and Related Product Manufacturing	337	30	1,303	29,940
Miscellaneous Manufacturing	339	26	855	15,909
Other sectors with little cooperative presence	NA	6	2,584	3,392
Other sectors with no cooperative presence	NA	0	597	663
TOTAL		532	21,126	448,091

Source: Calculations based on data from the 2009 and 2014 Economic Censuses.

Notes:

^aThe percentage figure indicates the fraction of productive units registered in both the 2009 and 2014 Economic Censuses.

^bFor reasons of confidentiality, I include all the sub-sectors where there are three or less cooperatives in the category of "others with little participation of cooperatives."

interests and the principles of solidarity, self-help, and mutual aid, with the purpose of satisfying individual and collective needs through economic and social activities. Among the latter, the promotion of solidarity and cooperative education, as well as fostering an ecological culture, has an important place. This law set the minimum number of members a cooperative must have but does not impose a maximum number of outside workers that are allowed, and neither did it set a minimum number of hours that members need to work in the cooperative. Following Avner Ben-ner (1984), this could lead to a weakening of the cooperative spirit but at the same time could help increase members' well-being and allow cooperatives to bear the brunt of market economic fluctuations—as explained by Caballero (1978) and Bonin (1984).

Cooperatives must observe freedom of association, voluntary withdrawal of members, and a democratic administration in which the general assembly is a key decision-making body. The cooperatives' capital comes from the members' monetary contributions and from income earned by the cooperative that was not distributed. In addition, each member must contribute to finance the cooperative venture capital in such a manner that everyone must own at least 10% of the entire amount amassed. The cooperative must also have three funds. The first covers possible losses or replaces the working capital and is financed through the cooperative's annual surplus. The second fund provides resources to finance the retirement of a member or to provide help when a member is ill. The third provides resources to enrich the community where cooperatives are located.

With respect to income accrued by members, the *Ley General de Sociedades Cooperativas* states that the distribution of earnings among members must be according to the proportion of their involvement in the cooperatives' activities. In this regard, Dwight Israelseni (1980) shows that if cooperatives are operating in the area of decreasing average costs, incentives to work will be greater under this payment scheme relative to the traditional one in which every member is paid a fixed proportion of the group marginal productivity. Regarding dues, the income tax structure that was in place during the period 2006–14 allowed cooperatives as an entity and their individual members to defer paying income taxes until the year in which the corresponding taxable surplus was distributed. Cooperatives that followed this rule could only invest those resources in goods that generated more employment or more members. This exemption was eliminated in 2014 since it discriminated against private firms (Izquierdo, 2016). In relation to borrowing, the federal law does not allow savings and loan cooperatives to finance worker cooperatives. Thus, worker cooperatives can only resort to banks or other private financial firms, institutions that do not share the same social goals and in fact perceive worker cooperatives as an anomaly. Finally, since the beginning of the 21st century, the Mexican government had in place federal programs and financial institutions to help micro and small entrepreneurs and private enterprises to purchase productive assets and to access lending at a preferential rate. For example, in 2011 these programs allocated a budget of 1.5 billion American dollars and the State development bank in charge of lending to private firms in the manufacturing sector had a loan portfolio of 0.5 billion American dollars. None of these resources went to cooperatives.

4 | EMPIRICAL METHODOLOGY AND RESULTS

As stated, this article examines whether Mexican cooperatives—compared to joint-stock firms and individually owned firms—have a lower performance. Then, the objective is to analyze how much of this differential is due to differences in endowments. I used the Oaxaca–Blinder procedure and constructed two samples of cooperatives, joint-stock companies, and individually owned firms according to whether they only appear in the 2014 Economic Census (denoted as the

2014 sample) or if they were present in both the 2009 and 2014 Economic Censuses. Productive units in this latter sample—denoted as the 2009–14 sample—may be considered as having more experience and knowledge of the organizational processes.

I used a propensity score matching with the following discriminants: the six-digit North American Industry Classification System; the structure of financing; and the number of people who work in each productive unit.⁴ If within each type of non-cooperative firm there were more than one with the same score, I chose randomly which one would be included in the sample. Table 2 reports data obtained from the Census of 2014 describing the 2014 sample of joint-stock companies and individually owned firms whose score made them similar to cooperatives.⁵

To gauge the impact of the cooperative arrangement I estimate a production function that takes for dependent variable the logarithm of the income obtained from the sales earned by each productive unit in 2013.⁶ As explanatory variables, I include the logarithm of assets at the end of 2012 (denoted by *lassets*), the logarithm of the number of hours worked during the year 2013 (denoted by *lhours*), and a proxy of the market size measured by the logarithm of the municipal population (*lpop*) where each productive unit was placed. In addition to these variables, the quadratic value of the variables just mentioned (*lassets2* and *lhours2*), the multiplication of linear variables (*lassets*lhours*), and several other controls are also included.⁷

Since the variable *lhours* is contemporaneous with the dependent variable, it may happen that the former is determined by the desired level of sales. For this to be true, productive units must be able to change—at a low cost—the number of people employed or the number of hours that employees work. With regard to the first option, during 2013 the Mexican manufacturing sector grew at an annual rate of 0.5%. Further, in the five subsectors where most of the cooperatives are localized (311, 315, 327, 332, and 337) overall output declined but employment did not change. Thus, it is not very likely that employment responded to output growth. Moreover, considering the workers' legal protections against dismissal, including the grounds permitted for dismissal and procedures for such action, it is not obvious that employment could be easily adjusted when facing changes in production. The other possibility for endogeneity comes from asking employees to adjust how many hours they work. According to the World Bank (2010), however, Mexico's rigidity of hours index is relatively high, setting this country into the 52nd position out of 183 economies during the period 2008–10.⁸ Thus, adjusting hours is possible but costly. In addition,

⁴ The Census had no question regarding the amount loaned.

⁵ For the construction of the individually owned firms' sample that were observable in both censuses, the probabilistic model used in the propensity score matching did not reach—after ten iterations—convergence. To ensure the robustness of the results, I generated—through a propensity matching—50 random samples of joint-stock companies and individually owned enterprises that were comparable with cooperatives. Next, I followed a different matching process by which I built a sample of both types of private enterprises using as criteria that they were in exactly the same economic activity, its financing structure was similar, and the number of people working in the enterprises was similar to cooperatives. Once I had samples from these two matching procedures, I found that the estimation results were not statistically different. Given such outcome, in what follows I used the sample provided by the propensity score matching.

⁶ Three factors led to the choice of sales revenue over profits. First, I do not have too much information regarding production costs. Second, there is no question regarding how cooperatives pay their members. Third, since the payment to a cooperative member is somewhat similar to the distribution of profits in a corporation, the concept of profits is not similar for both types of productive units.

⁷ Age of the firm, number of establishments, the growth rate of state GDP where the firm is located, the distance from the capital municipality where the firm is located to the nearest capital city of a state, and a measure of competition.

⁸ The rigidity of hours index covers restrictions on weekend and night work, and requirements relating to working time and the work week taking into account legal provisions that refer specifically to small and medium-size companies in the

TABLE 2 Our sample statistics according to the 2014 Economic Census

	Total labor	Number of hours worked (in thousands)	Value of assets in 2012 (in thousands of pesos)	Income sales (in thousands of pesos)	Percentage of firms that use external financing and its sources
	Cooperatives (N = 531)				
Mean	7.5	15.7	1,476.1	1,127.1	
Median	5	9.0	162.3	180.0	Commercial banks
Maximum	84	166.3	328,134.2	175,173.0	Government
Standard deviation	9.6	21.6	15,935.6	7,852.0	Others
	Joint stock firms (N = 523)				
Mean	7.1	16.7	938.5	1,877.1	
Median	5	10.8	251.6	600.0	Commercial banks
Maximum	90	233.3	59,481.2	42,000.0	Government
Standard deviation	8.6	21.0	2,980.5	4,198.0	Others
	Individually owned firms (N = 450)				
Mean	5.1	11.9	841.4	827.0	
Median	4	8.6	162.9	296.0	Commercial banks
Maximum	35	100.2	22,839.0	21,437.0	Government
Standard deviation	4.3	12.1	3,194.5	1,751.3	Others

Source: Calculations based on data from the 2009 and 2014 Economic Censuses.

Note: The "other" source of funding includes loans from individuals, partners, and suppliers.

it would have been very costly to adjust them in 2013 given the forecasts for 2014, a year in which output went up in four of the five subsectors mentioned before.

Notwithstanding these obstacles for the variable *lhours* to be endogenous, it must be considered a possibility. In this regard, it would be ideal to use panel data since it would allow the use of change in sales as the dependent variable and the lagged value of *lhours* as the independent variable. However, Griliches and Mairesse (1995) suggest that in the case of production functions, this alternative method does not solve the problem and may even aggravate errors in the variables and produce biased estimators. Although this problem could be addressed by using a system of equations that incorporated lagging variables amongst the instruments, it is difficult to find good instruments since every five years economic censuses are produced along with a theory that validates their use. Considering these arguments and the possibility that the variable *lhours* is in fact endogenous, I examined the causes for the gap in productivity using an instrumental variable (IV) approach. Since this approach is a default methodology, I will not consider in my estimations the multiplicative variables mentioned above because the number of instruments would need to increase substantially and thereby the variance of errors as well.⁹

Several variables were considered as potential instruments: the growth of the producer price index at the six level digit of NAICS; the growth of the industrial activity at the state level at the six digit NAICS; the latter variable multiplied by the quality of contract enforcement; the number of working hours at the municipal level at the three digit NAICS; and firms' inventories in 2012. Considering the correlation and significance of each of these potential instruments with *lhours*, I chose firms' inventories in 2012 as the best candidate for an instrument and denoted by *lhoursinst*.

Since the instrument needs to be correlated with the assumed endogenous variable and must not be endogenously determined by the independent variable, I used several tests to examine the weakness and exogeneity of the instrument and whether the equation was properly identified. Table 3 reports the results of these tests. To analyze if the variable *lhours* is exogenous, I used the Durbin test and the Wu–Hausman test. While asymptotically they are equivalent, the Durbin test however is better suited when the instrument is somewhat weak (Staiger & Stock, 1997). In this regard, the results reject the exogeneity of *lhours*. Next, to analyze the properties of OLS versus IV parameters I used the Hausman test. According to the results shown, for the 2014 sample the hypothesis that the parameter estimates were similar using OLS and IV can be rejected. Further, to analyze the identification of the equation I used the Anderson's statistic. The hypothesis of under-identification could not be rejected for the sample of cooperatives and individually owned firms belonging to the 2009–14 sample. Finally, even though the instrument could be relevant in three of the four estimations, it may still be weak (Hall, Rudebusch, & Wilcox, 1996). To examine this property, I used the Cragg–Donald Wald statistic and the Stock–Yogo critical values. According to the results, the instrument is less likely to be weak for the sample of cooperatives and joint-stock firms registered in the 2014 Census.

Overall, these tests cannot reject the use of an IV approach when comparing cooperatives and joint-stock firms for the 2014 sample. In relation to cooperatives and individually owned firms belonging to this same sample, results are not clear regarding which method is best suited.

manufacturing industry in which continuous operation is economically necessary, as well as mandated days of annual leave with pay.

⁹ I also did OLS estimations for the quadratic equation and found—for different specifications and samples—that multiplicative variables were usually not significant from a statistical point of view.

TABLE 3 Measuring the power of the instrument

	Cooperatives and joint stock firms		Cooperatives and individually-owned firms	
	2014 Censuses	2009 and 2014 Censuses	2014 Censuses	2009 and 2014 Censuses
lassets	-0.191 (0.151)	0.077 (0.115)	-0.138 (0.156)	0.158* (0.088)
lhoursinst	2.833*** (0.609)	1.671*** (0.546)	2.833*** (0.609)	1.550*** (0.426)
coop	-0.845*** (0.214)	-0.717*** (0.244)	-0.331* (0.182)	-0.346* (0.186)
lpob	0.047 (0.064)	0.048 (0.086)	0.001 (0.064)	0.040 (0.068)
Constant	0.849 (0.871)	1.803* (0.945)	0.485 (0.747)	1.341* (0.717)
No. observations	833	263	882	271
Hausman (OLS-IV)	12.390 $p = 0.0147$	3.760 $p = 0.4394$	8.760 $p = 0.0673$	4.570 $p = 0.3347$

(Continues)

TABLE 3 (Continued)

	Cooperatives and joint stock firms		Cooperatives and individually-owned firms	
	2014 Census	2009 and 2014 Censuses	2014 Census	2009 and 2014 Censuses
Durbin (score)	63.640 $p = 0.0000$	8.722 $p = 0.0031$	43.127 $p = 0.0000$	8.767 $p = 0.0031$
Wu-Hausman	68.408 $p = 0.0000$	8.816 $p = 0.0033$	45.036 $p = 0.0000$	8.860 $p = 0.0032$
Underidentification test (Anderson canon. corr. LM statistic)	15.381 $p = 0.0001$	6.607 $p = 0.0102$	10.997 $p = 0.0009$	0.555 $p = 0.4563$
Weak identification test (Cragg-Donald Wald F statistic)	15.576	6.648	11.072	0.18
Stock-Yogo weak ID test critical values				
		10% maximal IV size		16.38
		15% maximal IV size		8.96
		20% maximal IV size		6.66
		25% maximal IV size		5.53

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

Source: Results based on data from the 2009 and 2014 Economic Censuses.

Thereby, I present results using an OLS and an IV approach. Finally, for those units drawn from the 2009 and 2014 sample, the tests indicate that the instrument is weak. Furthermore, Crown, Henk, and Vanness (2011) suggest that when the sample size is small the use of instruments may bring more costs than benefits: consistent but biased estimates. Considering these factors, for the sample of productive units registered in both the 2009 and 2014 Censuses I will use an OLS approach.

The first step when using the Oaxaca–Blinder approach is to estimate a function that takes for dependent variable the logarithm of the income obtained from the sales earned by the firm in 2013. As explanatory variables I considered the logarithm of assets at the end of 2012 (*lassets*); the number of hours worked during the year (*lhoursinst* or *lhours*) for the 2014 or 2009–14 sample; and a measure of the market size each productive unit faces (*lpop*). Once this equation is estimated for each type of productive unit within each sample, I am then able to do the Oaxaca–Blinder decomposition.

Before looking into the results of these decompositions, it is interesting to notice two trends. First, as reported in Tables 4 and 5, the performance gap between cooperatives and joint-stock companies is higher than the gap between cooperatives and individually owned firms. Greater access to markets, commercial networks, lower financial restrictions, and better management may explain this result. Second, these gaps decline when moving from the 2014 sample to the 2009–14 sample. Assuming this latter sample is made of more experienced and mature productive units, the reduction in the gap may suggest that the returns of a better organization brings a relatively higher yield for cooperatives.

Regarding the results of the decomposition, Table 4 reports that for the 2014 sample disparities in endowments and yields explain the difference between the performance gaps of cooperatives versus joint-stock firms. While all inputs grouped together may help explain such gap, individually *lhoursinst* is the only one that matters. This result suggests that members of cooperatives work fewer hours. Theory would say that this is a consequence of the governance structure of cooperatives. However, moving into the 2009–14 sample, the results of comparing joint-stock firms with cooperatives show something else. For this new sample, Table 5 shows that differences in assets and a smaller market size explain the gap between joint-stock firms and cooperatives. Thus, it appears that the relative problem faced by cooperatives to increase sales actually shifts as they have more experience, going from an organizational problem to a difficulty in acquiring more capital and bigger market size.

Regarding cooperatives and individually owned firms, estimates using OLS and IV for the 2014 sample are presented. Using the IV approach, differences on yields explains the gap. However, if the OLS approach is used the differences in endowments also explain the gap—with market size as the main reason. As Table 5 reports, this last result is also found in the 2009–14 sample.

As stated in Section 3, cooperatives face legal restrictions that put them in a disadvantaged position regarding their access to the financial sector. Further, relative to individually owned firms, cooperatives may also be at a disadvantage since they have little access to federal programs that offer subsidized loans to acquire inputs. Given this situation, Table 6 makes an evaluation of what would happen to the estimated sales of cooperatives if they had the same resources that companies and firms have. According to figures in this table, this experiment would reduce—for both samples—the gap between joint-stock firms and cooperatives by half. However, the remaining gap with joint-stock firms is still too large at 12%. Regarding the gap between individually owned firms and cooperatives, the experiment would also reduce the gap, in this case to 5%.

TABLE 4 Oaxaca–Blinder decomposition (2014 Census)

	Cooperatives = 0		Cooperatives = 1	
	Joint stock companies IV	Individually owned firms IV	Joint stock companies IV	Individually owned firms IV
		OLS		OLS
Total				
No cooperatives	6.859*** (0.191)	6.165*** (0.078)	6.859*** (0.191)	6.165*** (0.078)
Cooperatives	5.508*** (0.210)	5.508*** (0.081)	5.508*** (0.210)	5.508*** (0.081)
Difference	-1.350*** (0.284)	-0.656*** (0.113)	1.350*** (0.284)	0.656*** (0.113)
Endowments	-0.178 (0.291)	-0.181* (0.097)	0.640** (0.275)	0.246*** (0.094)
Yields	-0.710*** (0.237)	-0.410*** (0.088)	1.172*** (0.265)	0.474*** (0.084)
Interaction of endowments and yields	-0.462* (0.251)	-0.064 (0.062)	-0.462** (0.251)	-0.064 (0.062)
Endowments				
Assets	0.275* (0.157)	0.006 (0.030)	-0.021 (0.114)	0.001 (0.007)
Hours	-0.541** (0.269)	-0.108 (0.074)	0.536** (0.297)	0.317 (0.244)
Job	0.087 (0.182)	-0.080** (0.035)	0.125 (0.164)	0.084 (0.111)

(Continues)

TABLE 4 (Continued)

	Cooperatives = 0		Cooperatives = 1	
	Joint stock companies IV	Individually owned firms OLS	Joint stock companies IV	Individually owned firms OLS
Yields				
lassets	2.401 (1.766)	1.062 (1.544)	-2.146 (1.578)	-0.573 ^{***} (0.214)
lhours	-0.063 (2.846)	-0.311 (3.124)	0.057 (2.612)	0.674 ^{***} (0.150)
lpob	1.478 (1.711)	1.872 (1.601)	-1.265 (1.465)	-0.911 ^{**} (0.503)
Constant	-4.526 [*] (1.782)	-2.876 [*] (1.482)	4.526 [*] (1.782)	1.285 ^{***} (0.548)
Interaction				
lassets	-0.254 (0.193)	0.006 (0.029)	-0.254 (0.193)	0.003 (0.014)
lhours	0.005 (0.233)	0.015 (0.157)	0.005 (0.233)	0.035 (0.025)
lpob	-0.212 (0.246)	-0.190 (0.164)	-0.212 (0.246)	-0.103 ^{**} (0.057)
				0.003 (0.014)
				0.035 (0.025)
				-0.103 (0.057)
				0.006 (0.029)
				0.015 (0.157)
				-0.190 (0.164)
				2.876 [*] (1.482)
				1.285 ^{***} (0.548)

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

Source: Results based on data from the 2009 and 2014 Economic Censuses.

TABLE 5 Oaxaca–Blinder Decomposition with OLS (2009 and 2014 Censuses)

	Cooperatives = 0		Cooperatives = 1	
	Joint stock companies	Individually owned firms	Joint stock companies	Individually owned firms
Total				
No cooperatives	6.840 ^{***} (0.127)	6.309 ^{***} (0.126)	6.840 ^{***} (0.127)	6.309 ^{***} (0.126)
Cooperatives	5.752 ^{***} (0.135)	5.752 ^{***} (0.135)	5.752 ^{***} (0.135)	5.752 ^{***} (0.135)
Difference	-1.087 ^{***} (0.185)	-0.557 ^{***} (0.184)	1.087 ^{***} (0.185)	0.557 ^{***} (0.184)
Endowments	-0.319 [*] (0.178)	-0.146 (0.165)	0.580 ^{***} (0.170)	0.241 [*] (0.144)
Yields	-0.507 ^{***} (0.177)	-0.315 ^{**} (0.149)	0.768 ^{***} (0.176)	0.410 ^{***} (0.143)
Interaction of endowments and yields	-0.260 (0.169)	-0.094 (0.110)	-0.260 (0.169)	-0.094 (0.110)
Endowments				
lassets	-0.075 [*] (0.041)	0.022 (0.049)	0.176 ^{**} (0.078)	-0.031 (0.069)
lhours	-0.124 (0.126)	-0.111 (0.132)	0.074 (0.076)	0.058 (0.070)
lpob	-0.119 (0.106)	-0.058 (0.052)	0.329 ^{***} (0.118)	0.214 ^{**} (0.082)
Yields				
lassets	1.111 ^{**} (0.457)	0.494 (0.398)	-1.011 ^{**} (0.416)	-0.503 (0.405)
lhours	-0.805 ^{***} (0.270)	-1.051 ^{***} (0.271)	0.755 ^{***} (0.254)	0.999 ^{***} (0.259)
lpob	1.540 (1.144)	1.674 [*] (0.969)	-1.330 (0.988)	-1.518 ^{**} (0.878)
Constant	-2.35 ^{**} (1.135)	-1.433 (0.944)	2.354 ^{**} (1.135)	1.433 (0.944)
Interaction				
lassets	-0.100 (0.058)	0.009 (0.021)	-0.100 [*] (0.058)	0.009 (0.021)
lhours	0.049 (0.053)	0.052 (0.063)	0.049 (0.053)	0.052 (0.063)
lpob	-0.209 (0.157)	-0.155 ^{**} (0.094)	-0.209 (0.157)	-0.155 [*] (0.094)

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

Source: Results based on data from the 2009 and 2014 Economic Censuses.

TABLE 6 Percentage change in log of estimated sales under different scenarios

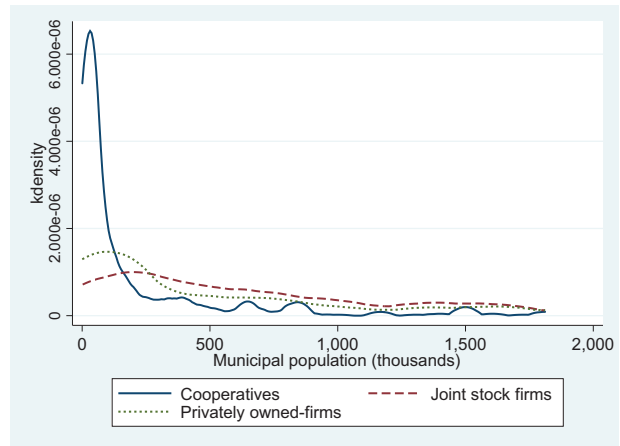
Estimation:	2014 Census		2009 and 2014 Censuses	
	Joint stock companies IV	Individually owned firms OLS	Joint stock companies OLS	Individually owned firms OLS
Using inputs from cooperatives and own yields	-2.6%	-3.0*	-4.7*	-2.3%
Using cooperatives yields and own inputs	-10.4%***	-4.1%	-7.4%***	-5.0%**
Cooperatives with inputs of non-cooperatives	11.6%**	7.3%	10.1%***	4.2%*
Cooperatives with yields of non-cooperatives	21.3%***	7.7%**	13.4%	7.1%***

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

Source: Results based on data from 2009 and 2014 Economic Censuses and results of Tables 4 and 5.

FIGURE 1 Population Size of Municipalities where Productive Units are Located [Colour figure can be viewed at wileyonlinelibrary.com]

Source: Figure elaborated by the author with data from the 2014 Economic Census.



5 | DISCUSSION

The economic literature claims that firms based on cooperation and with a non-tradable membership tend to raise the problems of adverse selection, moral hazard, and poor decision-making. In this context, the commonly outlined hypothesis is that worker cooperatives are less productive than other organizational arrangements. In addition, Mexican cooperatives may also be less productive than individually owned enterprises because the regulatory framework and public policies excludes them from the special treatment that is given to the latter. Thus, for example, it is not legal for financial cooperatives to offer loans to worker cooperatives. Furthermore, public policy goals geared toward business modernization puts cooperatives at a disadvantage because it focuses on individually owned enterprises. The empirical estimations should include these interventions. However, the absence of data and the endogeneity of regulatory policies to corporate pressures make it very difficult to measure the bias they generate on factor demand and on sales (De Bettignies & Robinson, 2015).

This case study shows that Mexican worker cooperatives do have a lower performance. Although it depends with what type of firm and which sample is used when analysing cooperatives, in all comparisons endowments matter because of differences in hours worked, market size, and productive assets. Regarding hours worked, conventional economic theory could explain this differential with joint-stock firms because of the governance rules that cooperatives have. For more mature and experienced productive units, however, such limitation is not binding—as results for the 2009–14 sample show. Productive assets, differences in financial regulations, and access to federal programs that foster business modernization could help explain why cooperatives have a lower productivity. Finally, within the different endowments that may explain these gaps, market size is the only one that appears on a recurring basis independently of the sample used and with what type of firm the cooperative is being compared with. In this regard, the smaller market size of cooperatives—as Graph 1 shows—explains half of the gap between individually owned firms and cooperatives for the 2009–14 sample while for joint-stock firms it explains one-third of the gap.

The international experience shows that to raise community awareness—as well as solving problems of local employment—cooperatives usually are established in relatively small and/or isolated municipalities. This may be the cost of safeguarding the cooperative spirit and/or providing a source of income to people who otherwise would have left their communities. Facing this

potential trade-off between market size and empathy for the small community model, a relatively common strategy for cooperatives around the developed world has been to open up establishments and/or building networks with other cooperatives (Abramitzky, 2018; Whyte & Whyte, 1991). This has not yet happened in Mexico.

According to Levy (2010), business and labor informality is mostly located in individually owned firms with less than ten workers. Given the relatively small size of the gap between these private firms and cooperatives, policies to strengthen the latter could help increase formality at a low cost. To this end, the Mexican government should modify some policies and regulations that discriminate against cooperatives. Following this road, the trade-off between equity and efficiency may be less steep.

ACKNOWLEDGMENTS

I thank Rodrigo Carrillo for outstanding research assistance, Mariana Pereira for her suggestions, and the Microdata Laboratory of the National Institute of Statistics and Geography of Mexico (INEGI) for making available the data. The recommendations made by the referees are greatly appreciated.

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REFERENCES

- Abramitzky, R. (2018). *The mystery of the kibbutz: Egalitarian principles in a capitalist world*. Princeton: Princeton University Press.
- Altman, M. (2006). Workers cooperatives as an alternative competitive organizational form. In Kalmi Panu & Klindinst Mark (Eds.), *Participation in the age of globalization and information* (Vol. 9, pp. 221–243). Bingley: Emerald Group Publishing.
- Arando, S., Gago, M., Jones, D., & Kato, T. (2011). *Efficiency in employee-owned enterprises: An econometric case study of Mondragon* (Discussion Paper No. 5711). Bonn: IZA.
- Ben-ner, A. (1984). On the stability of the cooperative type of organization. *Journal of Comparative Economics*, 8, 247–260. [https://doi.org/10.1016/0147-5967\(84\)90055-6](https://doi.org/10.1016/0147-5967(84)90055-6)
- Birchall, J. (2011). A member-owned business. Approach to the classification of co-operatives and mutuals. *Journal of Co-Operative Studies*, 44, 4–15.
- Blasi, J. R., Kruse, D. L., & Weltmann, D. (2015). Does employee ownership affect attitudes and behaviors? The role of selection, status, and size of stake. In Antti Kauhanen (Ed.), *Advances in the economic analysis of participatory & labor-managed firms* (pp. 249–275). Bingley: Emerald Group Publishing. Retrieved from <https://doi.org/10.1108/S0885-333920150000016016>
- Bonin. (1984). Membership and employment in an egalitarian cooperative. *Economica*, 51, 295–305. Retrieved from <https://doi.org/10.2307/2554547>
- Borzaga, C., & Tortia, E. (2017). Co-operation as a co-ordination mechanism: A new approach to the economics of cooperative enterprises. In J. Michie, J. R. Blasi, & C. Borzaga (Eds.), *The Oxford handbook of mutual, co-operative, and co-owned business*. Oxford: Oxford University Press.
- Caballero. (1978). Los eventuales en las cooperativas costeñas peruanas: Un modelo analítico. *Economía*, 1, 202–238.
- Crown, W. H., Henk, H. J., & Vanness, D. J. (2011). Some cautions on the use of instrumental variables estimators in outcomes research: How bias in instrumental variables estimators is affected by instrument strength, instrument contamination, and sample size. *Value in Health*, 14, 1078–1084.
- Dawes, R., & Thaler, R. (1988). Cooperation. *Journal of Economic Perspectives*, 2, 187–197.
- De Bettignies, J., & Robinson, D. (2015). When is social responsibility socially desirable? (Working Paper No. 21364) Cambridge, MA: National Bureau for Economic Research.
- Doucouliafos, C. (1995). Worker participation and productivity in labor-managed and participatory capitalist firms: A meta-analysis. *ILR Review*, 49, 58–77. Retrieved from <https://doi.org/10.1177/001979399504900104>

- Fakhfakh, F., Pérotin, V., & Gago, M. (2012). Productivity, capital and labor in labor-managed and conventional firms. *ILR Review*, 65, 847–879.
- Fehr, E., & Fischbacher, U. (2005). The economics of strong reciprocity. In H. Gintis, S. Bowles, R. Boyd, & E. Fehr (Eds.), *Moral sentiments and material interests: The foundations of cooperation in economic life*. Cambridge, MA: MIT Press.
- FitzRoy, F. R., & Kraft, K. (1987). Cooperation, productivity, and profit sharing. *Quarterly Journal of Economics*, 102, 23–35. Retrieved from <https://doi.org/10.2307/1884678>
- Griliches, Z., & Mairesse, J. (1995). *Production functions: The search for identification* (Working Paper No. 5067). Cambridge, MA: NBER.
- Hall, A. R., Rudebusch, G. D., & Wilcox, D. W. (1996). Judging instrument relevance in instrumental variables estimation. *International Economic Review*, 37, 283–298.
- Hansmann, H. (1990). The viability of worker ownership: An economic perspective on the political structure of the firm. In O. E. Williamson, B. Gustafsson, O. E. Williamson, B. Gustafsson, & M. Aoki (Eds.), *The firm as a nexus of treaties* (pp. 162–194). London: Sage.
- Israelsen, D. L. (1980). Collectives, communes, and incentives. *Journal of Comparative Economics*, 4, 99–124. [https://doi.org/10.1016/0147-5967\(80\)90024-4](https://doi.org/10.1016/0147-5967(80)90024-4)
- Izquierdo, M. (2016). Workers cooperatives in Mexico and tax reforms. *Boletín de la Asociación Internacional de Derecho Corporativo*, No. 50/2016, pp. 103–126.
- Jensen, M., & Meckling, W. (1979). Rights and production functions: An application to labor managed firms and codetermination. *Journal of Business*, 52, 496–506.
- Jones, D. C. (2007). The productive efficiency of Italian producer cooperatives: Evidence from conventional and cooperative firms. In *Cooperative firms in global markets* (Vol. 10, pp. 3–28). Biingley: Emerald Group Publishing. Retrieved from [https://doi.org/10.1016/S0885-3339\(06\)10001-0](https://doi.org/10.1016/S0885-3339(06)10001-0)
- Jones, D. C., & Svejnar, J. (1985). Participation, profit sharing, worker ownership and efficiency in Italian producer cooperatives. *Economica*, 52, 449–465. Retrieved from <https://doi.org/10.2307/2553878>
- Kim, E. H., & Ouimet, P. (2014). Broad-based employee stock ownership: Motives and outcomes. *Journal of Finance*, 69, 1273–1319. Retrieved from <https://doi.org/10.1111/jofi.12150>
- Klein, K. (1987). Employee stock ownership and employee attitudes: A test of three models. *Journal of Applied Psychology*, 72, 319–332.
- Kruse, D. L., Freeman, R. B., & Blasi, J. R. (2010). *Shared capitalism at work: Employee ownership, profit and gain sharing, and broad-based stock options*. Chicago: University of Chicago Press.
- Levy, S. (2018). *Esfuerzos mal recompensados: La elusiva búsqueda de la prosperidad en México*: Banco Interamericano de Desarrollo. Retrieved from <https://flagships.iadb.org/es/esfuerzos-mal-recompensados>
- O'Boyle, E. H., Patel, P. C., & Gonzalez-Mulé, E. (2016). Employee ownership and firm performance: A meta-analysis. *Human Resource Management Journal*, 26, 425–448. Retrieved from <https://doi.org/10.1111/1748-8583.12115>
- Roemer, J. (2019). A theory of cooperation in games with an application to market socialism. *Review of Social Economy*, 77(1). Retrieved from <https://doi.org/10.1080/00346764.2018.1555647>
- Sobel, J. (2005). Interdependent preferences and reciprocity. *Journal of Economic Literature*, 43, 392–436. Retrieved from <https://doi.org/10.1257/0022051054661530>
- Staiger, D. O., & Stock, J. H. (1997). Instrumental variables regression with weak instruments. *Econometrica*, 65, 557–586.
- Sterner, Thomas (1990). Energy efficiency and capital embodied technical change: The case of Mexican cement manufacturing. *Energy Journal*, 11, 155–167.
- Whyte, W. F., & Whyte, K. K. (1991). *Making Mondragon: The growth and dynamics of the worker cooperative complex*. Ithaca, NY: Cornell University Press.
- Wilson, N., & Peel, M. J. (1991). The impact on absenteeism and quits of profit sharing and other forms of employee participation. *ILR Review*, 44, 454–468. Retrieved from <https://doi.org/10.1177/001979399104400304>
- World Bank (2010). *Doing business 2010: Mexico—Comparing regulation in 183 economies*. Washington, DC: World Bank.
- World Bank (2015). *World development report: Mind, society, and behavior*. Washington, DC: World Bank. <https://doi.org/10.1596/978-1-4648-0342-0>

Yunus, D. M., & Nicholls, A. (2017). Social business entrepreneurs are the solution. In *Social entrepreneurship: New models of sustainable social change*. Oxford: Oxford University Press.

How to cite this article: Cotler P. Does it pay to cooperate? The case of cooperatives in the Mexican manufacturing sector. *Ann Public Coop Econ.* 2020;91:497–517.
<https://doi.org/10.1111/apce.12281>