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Unleashing Waste-Pickers' Potential: Supporting Recycling Cooperatives in

Santiago de Chile

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Abstract

The informal economy currently provides two out of three jobs worldwide, with waste-picking activities providing employment for millions of the poorest of society. Moreover, waste-picking could provide a sustainable solution for solving the waste management crisis that affects the 3 billion people lacking access to waste services. Governmental policies toward waste-pickers in particular, and the informal economy in general, have been fundamentally based on four policy approaches: (1) dualist and voluntarist, which proposes repressive policies against waste-picker activity and the expansion of formal solid waste management systems; (2) structuralist, which argues for weak supporting policies aimed at reinforcing waste-picker associations; (3) legalist, which promotes the competition of waste-picking with other recycling alternatives without government intervention; and (4) co-production, which supports waste-picking with local policies as a means of enhancing waste-pickers' productivity. Both qualitative, and particularly quantitative evidence testing the impact of these four approaches is scarce. In this paper, we attempt to fill this gap in the literature by operationalizing concepts, building a waste-picker sustainable performance index, and estimating the impacts of these four competing policy approaches. An exploratory sequential design method is used to analyze data: first, a thematic analysis to examine 40 in-depth interviews, and then multiple linear regressions to analyze a census survey of 100 waste-pickers in four cooperatives in Santiago de Chile. Our empirical results suggest a positive association between the level of government support and waste-pickers' sustainable performance. Consequently, further positive government intervention, particularly in supporting a stronger structural organization for the waste-picker recycling system, is advocated as the primary policy recommendation of this paper.

Keywords

Waste Pickers, Co-Production, Santiago, Recycling, Waste Management, Informal Economy

1. Introduction

The World Bank (2012) estimates that 1.3 billion tons of waste is generated worldwide every year – resulting in 205 billion dollars of collection costs. Achieving an Integrated and Sustainable Waste Management (ISWM) system (comprised of maximizing reduction, reuse, recycling and minimizing disposal) thus represents a great challenge for developing countries both financially and administratively. Indeed, thirty-five years after the first city recycling system was implemented in the United States (Miller 2000), three billion people in developing countries still live in cities where waste is not even collected (UNEP 2015). These figures are not improving, as developing countries also face the phenomenon of urbanization, which is likely to increase the budgetary, environmental and sanitization crises that result from an inadequate solid waste management¹ system (Beall 1997, p.1; United Nations Habitat 2010).

In this landscape of a solid waste management “crisis”, the informal sector – particularly waste-pickers – seem to provide part of the solution. For instance, waste-picking accounts for 70% of the waste recycled in Santiago de Chile², thus recycling 10.1% of all waste produced and saving 12 million dollars each year (CONAMA 2005). Even higher rates are achieved in Cairo, where waste-pickers handle one-third of all city waste, and recycle around 80% of the waste collected (Salah-Fahmi 2005, p.158). In this sense, waste-picking provides a spontaneous solution that is labor intensive, compared with the high-cost, capital-intensive alternatives of establishing an ISWM system in developing countries (Ackerman 2005). Furthermore, Medina (2007, 2010) and Wilson et al. (2006) stress that waste-picking plays a significant role in sustainable development, as it increases the amount of waste collected, reused, and recycled, resulting in pollution prevention as well as an extension of the useful life of landfills (see also Geng & Cote 2002; Troschinetz & Mihelcic 2009). Waste-picking may have further relevance in achieving other objectives such as economic growth, as it reduces raw material costs for local enterprises. Finally, it also contributes to social objectives by providing jobs and a significant income for more than 15 million poor people in developing countries (Medina 2007, 2010; Ahmed & Ali 2004; Chaturvedi 1998).

Various schools of thoughts have proposed contrasting policies in their approach toward waste-pickers. Dualist, voluntarist and structuralist arguments regarding the urban informal economy are generally reflected in their negative perception of waste-picking activities: dualists suggest that waste-picking is the consequence of a lack of growth and keeps people in poverty (Geertz 1963; Lomnitz 1977; Huysman 1994; Santos 1979); voluntarists consider waste-picking to be a symptom of underdevelopment, as the lack of sufficient law enforcement allows certain workers to avoid paying taxes while opting in only to the social protection programs that suit them (Maloney 2004, p.1165; Perry et al. 2007, p.2); while structuralists such as Birkbeck (1978; 1979) and Roberts (1989) see in this activity a source of capitalist exploitation. Contrary to these views, legalists have recognized in waste-picking a means of achieving sustainable development (Medina 2007; de Soto 1989). Here, legalization and deregulation serve as the paths toward reaching efficiency in a free-market framework with minimal government intervention. Finally, theories of co-production suggest that waste-picking may be the best available alternative as a means of providing an ISWM system in developing countries (Fergutz et al. 2011, p.597; see also Josie & Moore 2004; Ostrom 1996). Co-production interventions are being supported and implemented with increasing frequency in Latin America and Asia (Besen et al. 2007; Dias 2016; Medeiros & Macêdo 2006; Fergutz et al. 2011).

Although these schools of thought have a long history, few empirical studies have attempted to evaluate the impacts of their competing policy recommendations. The primary contribution of our paper is thus to provide what we believe is the first attempt to bridge the gap between theory and policy impacts. Our analytic sample consists of the entire population of four Greater Santiago waste-picking cooperatives, each of whom are affected by various municipal policies.

2. Literature review

The debate surrounding the urban informal economy provides a theoretical framework with which we can

understand the logic behind the competing policy approaches towards waste-pickers. Consequently, it provides a useful entry point for the aims of this study. Chen et al. (2004) identify four main schools of thought (see also WIEGO 2014a, 2014b): dualist, structuralist, legalist and voluntarist. To this four-fold theoretical framework, we add the more recent development of co-production theory. Although there are debates within each of these schools and certain policies and strategies do not always fit neatly within these theoretical categories³, this classification allows for an understanding of the fundamental elements of current waste-picker debate, its policy implications, and allows us to operationalize concepts and test policy impacts.

Table 1: The Informal Economy and Waste-Pickers: Five Competing Approaches

<i>School of thought</i>	<i>General Authors</i>	<i>Waste-Picker Authors</i>	<i>Conception of Waste-Pickers</i>	<i>Economic Relationship</i>	<i>Policy Implication</i>
Dualist	Boeke (1942) Lewis (1954) Geertz (1963) Harris & Todaro (1970) ILO 1972	Lomnitz (1975) ⁴	Hidden unemployment	Counter-cyclical (expands when economy contracts)	Repression and expansion of formal economy: Elimination
Voluntarist	Bosch et al. (2012) Fiess et al. (2010) Maloney (2004)	-	Workers making rational choice	Counter-cyclical (expands as unemployment expands) and pro-cyclical (with demand for specific informal sector growth)	"Carrots" for private enterprises, "sticks" for the informal economy: Elimination
Structuralist	Moser 1978 Portes et al. (1989) Centeno & Portes 2006 Tokman 1978	Birkbeck (1978,1979) ⁵	Exploited cheap labor	Pro-cyclical (expands when economy expands)	Weak support policies and changing the system: Soft support
Legalist	De Soto (1990, 2000)	Medina (2007) ⁶	Micro-entrepreneurs	Counter-cyclical (survival activity) and pro-cyclical (micro-entrepreneurs)	No government intervention: Neglect
Co-production	Ostrom (1996) Joshi & Moore (2004)	Sicular (1992) ⁷ Fergutz et al. (2011) ⁸ Wilson et al. 2006 ⁹ Dias 2016 ¹⁰	Micro-entrepreneurs in need of governmental support.	Counter-cyclical (survival activity) and pro-cyclical (micro-entrepreneurs)	Government strongly sustains micro-entrepreneurial progress: Strong support

Adapted from Chen et al. (2004), and WIEGO (2014a;2014b) and authors' classifications.

Note: Although there is not always a perfect match between general schools of thought regarding the informal economy and waste-picker authors, we provide in endnotes 4 to 7 a justification for our classification of key waste-picker authors within each particular school of thought, indicating caveats where necessary.

The Dualist School contends that there are few direct economic links between waste-picking and other formal economic sectors (Santos 1979). From this perspective, waste-picking emerges as the result of a lack of economic growth and availability of formal employment in developing countries. It is perceived as a ‘last resort’ or marginal survival activity in the absence of other formal work, with a low productivity potential (Geertz 1963). This dualist conception is widespread among academics and policymakers (Lomnitz 1977; Souza 1980). To expand the formal economy in the context of waste management, organizations such as the World Bank have promoted the privatization of municipal solid waste management systems (Beall 1997, p.6). Salah-Fahmi (2005), in Egypt, and Beall (1997, p.6), in Pakistan, report how waste-pickers have been displaced and excluded from formal municipal solid waste management following this process of privatization. As a survival activity, dualists have argued that the number of people working as waste-pickers is counter-cyclical to economic strength: it expands in times of economic crisis as the need for survival activities becomes more pronounced, and shrinks with economic expansion as people tend toward formal employment. Such counter-cyclical reactions have been observed in analyses of waste-picking activities in the 1994 Mexican and 2001 Argentinean economic crises, when economic turndown was followed by a dramatic increase in waste-picking activity (Schamber & Suárez 2007). Dualist policies toward waste-pickers are based around repression and the creation of formal jobs in waste management to reduce the number of people working as waste-pickers (Furedy et al. 1984; González et al. 1993; Keynes 1974; Navarrete 2010; Salah-Fahmi 2005; Schamber & Suárez 2002, 2007)

Voluntarists conceive the formal and informal labor markets as a continuum, where workers make rational decisions to maximize their utility (Maloney 2004). Informal self-employment, including the types of activities performed by waste-pickers, arises when the monetary and non-monetary benefits become more appealing in informal activities than in the formal sector (Maloney 2004, p.1162). Although the Voluntarist School explicitly underlines informal workers as being entrepreneurs, voluntarists remain skeptical of their role in promoting development: the combination of low-skilled workers and undercapitalization means that most small informal enterprises face low productivity and high rates of failure, thus perpetuating the poverty cycle. Moreover, the

popularity of informality is regarded as a symptom of underdevelopment, since the lack of adequate law enforcement allows some workers to pick and choose particular social protection programs, for example a specific health or pension scheme, enabling them to reduce their total payments (Maloney 2004, p.1165; Perry et al. 2007, p.2). Voluntarists mainly interpret the informal economy as being counter-cyclical to economic dynamics (given the lack of labor market flexibility) (Fiess et al. 2010, p.211), but consider that occasional situations will lead to the development of a pro-cyclical relationship (for example, when a growth shock within a sector with a high number of informal enterprises increases the demand for ‘micro-entrepreneur’ products) (Bosch et al. 2012, p.655). Studies using aggregated data show the plausibility of this voluntary movement into informality in Argentina, Brazil, Chile, and Mexico (Maloney 2004) while Fiess et al. (2010, pp.220-221) show that during economic expansion in Mexico (1987-1991) and Colombia (1991-1996), the informal economy grew in both size and by average salary. Regarding policy implications, following from their view of informal entrepreneurship as ultimately entrenching poverty, voluntarists recommend that government interventions should be utilitarian: making the formal sector more attractive than the informal by increasing and/or decreasing their utility respectively (Maloney 2004; Perry et al. 2007; Williams & Lansky 2013, p.369). In this sense, voluntarist policy recommendations very much follow the same trajectory as those of dualists, an approach of carrot (pro-formal economy growth) and stick (repression of informal entrepreneurs). Thus, to operationalize policies in our analysis, we treat dualists and voluntarists as a single school of thought¹¹.

For structuralists, waste-picking forms an integral part of the capitalist system (Tokman 1978; Portes et al. 1989), providing the link between recyclable materials and their demand from formal enterprises (Birkbeck 1978, 1979). By having access to low-cost recyclable materials, enterprises are able to reduce input costs, ultimately increasing their profit – a relationship that structuralists perceive as exploitative (Birkbeck 1979). This reduces production costs in two ways: first, due to the monopsony and oligopsony of large recycling industries and the intermediaries buying from waste-pickers, the prices of recycled materials are dramatically reduced – the profits of the buyer increase at the cost of the seller (Birkbeck 1978, 1979). Second, large formal industries use a ‘hierarchy of intermediaries’ or warehouses to shift the labor responsibility of large enterprises further down in the network onto smaller enterprises, who in turn pass in on to self-employed waste-pickers. This permits large

enterprises to avoid contractual relationships and the payment of labor benefits to waste-pickers, in spite of them being fundamentally linked to their core activity and income. Alongside Birkbeck's (1979) study in Cali (Colombia) the strong link between formal enterprise demand and waste-picker supply has been similarly demonstrated in Pakistan (Beall 1997, p.127), India (Chaturvedi 1998), Argentina and Mexico (Medina 2007). Given the dependency of waste-pickers on recycling companies, structuralist theory proposes waste-picking to be pro-cyclical to economic impacts: it grows along with economic expansion, as the demand for recyclable materials from local industries increases. Structuralist policies promote waste-picker associations and unions, in order to reinforce waste-pickers' power to negotiate better prices and working conditions (Birkbeck 1979; Schamber & Suárez 2007). With this increased negotiating power, waste-pickers will potentially secure access to a larger amount of recyclable materials and negotiate better prices with enterprises and middlemen, increasing their profits (Birkbeck 1978; 1979).

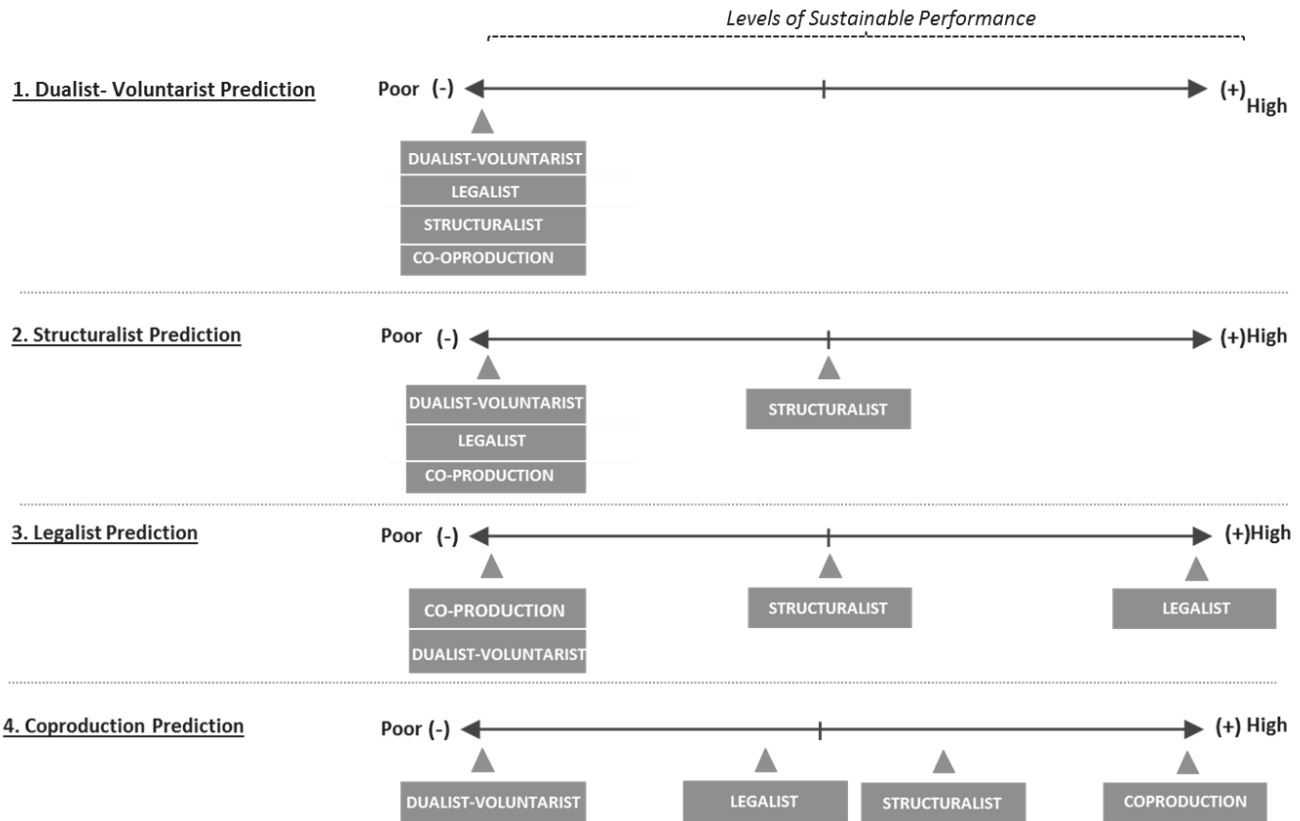
Legalists perceive waste-pickers as micro-entrepreneurs (Medina 2007). From this perspective, waste-picking is strongly connected with the formal industry in two ways. First, industrial waste-picking provides local industry with cheap substitutes for raw materials, reducing production costs, and accordingly, enhancing profits and competitiveness within the industry. Second, the formal market of raw materials determines the types of substitute materials that are in demand and the prices paid to waste-pickers. Consequently, waste-picking plays a positive structural role by boosting the competitiveness of local industries. Legalists argue that waste-picking is counter-cyclical to economic growth (Medina 2007). In periods of crisis, local currencies tend to devalue, raising the prices of imported raw material, and in turn increasing the demand for cheaper substitutes provided by waste-pickers. From a legalist perspective, waste-picking is highly efficient, but due to excessive regulation and the continued criminalization of the activity, waste-pickers are not able to reach their full economic potential. Legalist waste-picker policies were strongly promoted in the early 2000s in Latin America – particularly in Peru, where waste-picking has been legalized and government intervention drawn back (Aparcana 2017; Aparcana & Salhofer 2013). Decreased government involvement is a rather common policy in developing countries more broadly, reflecting an attitude of neglect towards the activity (Medina 2000, 2005a, 2005b).

Finally, an increasing number of academics call for the recognition of the role of the informal economy as a provider of public services that fills the gap left by the formal economy in developing countries (Meagher 2013). Joshi and Moore (2004) argue that the monopolistic provision of the state and the modern public management strategy of privatization have failed to provide public goods and services in developing countries due to failures of logistics (low payment capacity and the high cost of providing public services for poor populations who are geographically widespread) and governance (incapacity to provide effective core public services and achieve a sustainable financing system). In both cases, the problems are rooted in the traditional ‘supply-led engineers’ approach based on expensive capital investments, high operational costs and high standards for developing countries that have high availability of labor, low governance capacity and limited investment capacity (Allen et al. 2006; Ostrom 1996). Ostrom (1996) maintains that ‘co-production’ arrangements, in which citizens and the state in a long-term partnership pool resources to provide public goods and services, offer an alternative solution for the delivery of basic services in developing countries. For Mitlin (2008), co-production can act as a political strategy for often powerless informal workers to engage with powerful state institutions. This allows them to obtain practical gains and avoid dispossession through more proactive negotiation – settling on agreements and moving policies forward – rather than being faced with confrontation and opposition. However, other authors warn that this unbalanced economic and power relationship of a state-informal partnership does not necessarily produce an automatic synergic integration, but in fact oftentimes risks an outcome of corruption and exclusion, with the most marginal waste-pickers being particularly vulnerable (Anderson & Pacheco 2006; Chen 2006; Hart 2006). According to Chen (2006), there is thus face a double-edged policy challenge of not only promoting co-production partnerships, but most importantly ensuring that these partnerships deliver an equitable distribution of benefits to waste-pickers by investing in their material progress, technical upgrading and building waste-picker organizations’ capabilities (see also Wilson et al. 2006; Fergutz et al. 2011; Meagher 2013)¹². However, if conducted appropriately, public sector support is proposed to be a necessary component to unlocking waste-pickers’ potential, in turn maximizing their productivity, economic gains and the positive environmental impacts of the activity (Dias 2016; Fergutz et al. 2011, p.597; see also Bhaskar & Chikarmne 2012, pp.615-616; Wilson et

al. 2006). Co-production policy recommendations promote the inclusion of waste-pickers in solid waste management through strong state support for waste-picker unions, the legalization of the activity and, most interestingly, a strong involvement in promoting their capitalization and an efficient grassroots system of waste recycling. It is worth mentioning at this point that, although some critiques have associated co-production policies with neoliberal theories¹³, we identify it as a standalone policy approach¹⁴ since, unlike other policy approaches, the role of municipalities differs radically, striving toward positive and supportive involvement to enhance waste-pickers' productivity.

Although the aforementioned theories have been widely discussed, there is a lack of empirical evidence regarding the results of their many and varied policy recommendations. We thus test the impact of these policy recommendations on the sustainable performance of waste-pickers, i.e. on maximizing their economic, social, and environmental benefits and minimizing the negative externalities¹⁵ of the activity, based on the indicators defined in Table 1. The expected results derived from these four theories are as follows (see Figure 1): 1) If dualist-voluntarist hypotheses are correct, regardless of the applicable local policies, all waste-picker cooperatives should perform poorly, since waste-picking is a survival and low-productivity activity; 2) If structuralist hypotheses are correct, all cooperatives should perform poorly excluding those cooperatives affected by structuralist policy, which should show stronger performance. This is due to these cooperatives having the capacity to negotiate; 3) If legalist hypotheses are correct, there should be a negative correlation between cooperative performance indicators and government intervention, i.e. as intervention increases, sustainable performance decreases; 4) If co-production hypotheses are correct, there should be a positive correlation between levels of government support and performance indicators of the various waste-picker cooperatives, i.e. as supportive intervention increases, sustainable performance increases; 5) Finally, if no presented theories are correct, the indicators should not follow any of these patterns. These are the main hypotheses tested in this paper.

Figure 1: Predicted Policy Impact on Waste-Pickers' Sustainable Performance



Note: The figure illustrates how different schools of thought predict waste-pickers’ performance operating under different policy environments. The first column represents the relevant schools of thought, the boxes represent different policy environments and the horizontal axes represent the expected sustainable performance of waste-pickers from each theoretical perspective.

3. Data and methodology

In order to undertake this study, our research uses a mixed strategy of qualitative and quantitative research techniques (Greene et al. 1989, p.256; Johnson et al. 2007, p.123). Mixed methods are used here as a triangulation methodology, allowing the expression of ‘multiple ways of seeing...hearing [and] making sense of the social world’ (Greene 2007, p.20).

In particular, this research utilizes an explanatory sequential design or ESD (Creswell & Plano-Clark 2011, p.68) to provide a deep understanding of local policymaking, first by building on existing and emergent theory coming from qualitative analyses, and then by evaluating the relevance of competing theoretical hypotheses by quantitatively testing the relevance of competing explanations (Moser 1991; Morgan 1998). The ESD is used in a

two-stage strategy: in the first step, we use a qualitative approach where verbal data are collected and analyzed. From this qualitative analysis, conclusions are drawn about different visions, motivations, explanations and logic behind municipal policy impacts (Creswell et al. 2003; Greene et al. 1989). In the second step, quantitative data are collected and analyzed to test the plausibility and/or generalizability of qualitative findings to a larger population.

Qualitative research is used to map the current policies in place and understand the possible mechanisms driving local policy impact. Criterion-purposive samples of waste-picker cooperatives in Greater Santiago de Chile were taken to represent the diversity of municipal policy approaches towards waste-picking. Each selected municipality represents one of the four approaches: dualist policies (DP) in Santiago Centro¹⁶, legalist policies (LP) in Maipú¹⁷, structuralist policies (SP) in Cerrillos¹⁸ and co-production policies (CP) in La Reina¹⁹. Qualitative data collection was carried out in these four municipalities, where the views of 40 participants were collected. Semi-structured interviews were undertaken with the heads of the solid waste management departments of selected municipalities, with the heads of waste-picker cooperatives, and in four group discussions with waste-pickers from four different cooperatives. These interviews explored two themes: first, understanding waste-picking itself by considering the economic, logical and social issues behind the activity; and second, studying the consequential impact of municipal policies on waste-pickers. Inductive thematic analysis was used to explore qualitative data, and the results were contextualized within the wider waste-picker literature. This then led to the generation of a testable hypothesis regarding policy impacts on waste-pickers' performance, which is explored using quantitative techniques.

A quantitative analysis then followed, with the aim of testing the veracity and magnitude of the initial hypothesis. While a qualitative analysis allows us to understand the mechanisms at play regarding policies and their impact on waste-pickers' sustainable performance, it tells us little about the magnitude of the impact of these policies on waste-picking. Primary data collection was the only possible means of obtaining quantitative data on waste-pickers at a detailed level to test qualitatively generated hypotheses, as no alternative sources were

available, and so within each municipality a waste-picker cooperative was selected to take part in a census. A survey was designed to collect data from all 100 waste-pickers in the four analyzed cooperatives.

Drawing from the literature and interviews, 11 indicators of waste-pickers' sustainable performance were built (Table 2). These indicators measure waste-pickers' performance in four dimensions: economic efficiency, social equity, environmental protection, and negative externalities²⁰. The collected data are analyzed using two methods. First, pairs of policies are compared to assess whether there are significant differences between them for any of the 11 indicators²¹. This is performed using an analysis of variance, testing for equality of means, followed by a multiple comparison method with Bonferroni corrections for levels of significance²². In the second method, the impacts of specific policies (a description of each municipal policy is provided in Table 3) are analyzed with 11 Ordinary Least Square (OLS) models (a list of independent and dependent variables is contained in Tables 2 and 4)²³. These models show the relationship between 11 sustainability indicators (Y) and 12 municipal policies (*loc.policies*) controlling for five socio-economic conditions of waste-pickers (*soc-econ*) and three municipal area characteristics where waste-pickers operate (*municipal area*)²⁴, as shown in the equation:

$$Y_{(\text{indicators})} = \beta_0 + \beta_1 \text{loc.policies} + \beta_2 \text{soc-econ} + \beta_3 \text{municipal area} + \epsilon \quad (1)$$

As each municipality contains a different number of waste-pickers, this regression provides a weight of observation for the number of people in each association to obtain the correct point estimate of each coefficient. Education has been excluded as a control variable, as almost all waste-pickers have very low levels of education. A full description of policies currently implemented in Greater Santiago is provided in Table 2.

Table 2: Waste-Pickers' Sustainable Performance Indicators

<i>Response Variables</i>	<i>Authors</i>	<i>n.</i>	<i>Indicators</i>
<i>Economic efficiency</i>	<i>Post & Baud (2003) Wilson et al. (2006) Medina (2007)</i>		
<i>Individual productivity</i>	<i>Medina (2007)</i>	<i>1</i>	<i>Earnings per hour worked</i>
<i>Impact on productivity of local industry</i>	<i>Medina (2007)</i>	<i>2</i>	<i>Kilograms recycled per hour</i>
<i>Social equity</i>	<i>Wilson et al. (2006) Medina (2007)</i>		
<i>Poverty reduction</i>	<i>Chaturvedi (1998); Medina (2007); Post & Baud (2003)</i>	<i>3</i>	<i>Income as multiple above/below minimum salary</i>
<i>Internal income equality</i>	<i>Chaturvedi (1998)</i>	<i>4</i>	<i>Income dispersion within the cooperative</i>
<i>Environmental protection</i>	<i>Medina (2007) Post & Baud (2003)</i>		
<i>Energy saving and prevention of waste entering landfill</i>	<i>Medina (2007)</i>	<i>5</i>	<i>Tons recycled per worker per month</i>
<i>Prevention of toxic material entering landfill</i>	<i>Medina (2007)</i>	<i>6</i>	<i>Tons of toxic materials recycled per worker per month</i>
<i>Diversity of material recycled</i>	<i>Medina (2007)</i>	<i>7</i>	<i>Number of different materials collected per worker</i>
<i>Negative externalities</i>	<i>Proposed by the authors</i>		
<i>Physical health</i>	<i>Nguyen et al. (2003) Post & Baud (2003)</i>	<i>8</i>	<i>Number of work-related accidents suffered within six months</i>
<i>Child labor</i>	<i>Chaturvedi (1998)</i>	<i>9</i>	<i>Frequency of waste-pickers accompanied by a child (a)</i>
<i>Waste dispersion</i>	<i>Chaturvedi (1998)</i>	<i>10</i>	<i>Frequency of cleaning up after waste collection (b)</i>
<i>Working conditions</i>	<i>Medeiros & Macêdo (2006)</i>	<i>11</i>	<i>Length of working week</i>

a) On a scale of perception from 1 to 6, where 1 represents 'I never go to collect waste with my child/children' and 6 represents 'I always go to collect waste with my child/children'.

b) On a scale of perception from 1 to 6, where 1 represents 'I always clean up after collecting/sorting waste' and 6 represents 'I never clean up after collecting/sorting waste'.

Table 3: Description of Current Policies in Greater Santiago de Chile

<i>N</i>	<i>Policy</i>	<i>Description</i>
Capital Enhancement		
1	Access to credits	Waste-pickers are given a municipal permit to operate. This municipal permit is accepted in the banking system as proof of the existence of their enterprise and allows access to micro-enterprise credit schemes.
2	Donation of tools and machinery	Waste-pickers are provided tools by the municipality to improve safety (gloves, reflective jackets, enclosed shoes) and/or to improve productivity (can crusher or cardboard baler machine. Machinery is provide to waste-pickers to improve productivity (plastic crushers).
3	Provision of vehicles	Waste-pickers are provided with a tricycle or motorized vehicle to collect recyclable and reusable materials.
4	Provision of a recycling center	Waste-picker cooperatives are provided with a recycling center consisting of land, parking and a covered roof, in which they can sort and store recyclable materials.
Organizational Enhancement		
5	Institutionalization of waste-pickers	Waste-pickers receive a municipal identification card and uniforms. When accompanied by a municipal officer, they can visit their collection neighborhood door-to-door, introducing themselves as the local urban recycler.
6	Coordination with waste truck	Waste-pickers have access to the collection schedules and areas for the municipal waste truck. On the day of collection, waste-pickers can collect items from the street before the truck arrives.
7	Waste-picker monopoly	Each waste-picker is assigned a neighborhood where they are the only collector of recyclable and reusable materials.
8	Regularization of schedules	Waste-pickers have a fixed collection schedule, which is made known to the neighbors.
9	Promoting waste separation	Neighbors segregate recyclable waste by type before passing it on to waste-pickers.
Negative Externality Reduction		
10	Restrictions on work in landfills	Municipal and police controls to inhibit waste-picker collection on official landfills and informal micro-landfills.
11	Place to leave children	Waste-pickers are given access to childcare services, either through their social network or to the public childcare system. Those who have been provided a municipal permit (see Policy 1) declare it to be more effective in securing access to the public childcare system, since it is considered a proof of employment.

Table 4: Types of Local Policies Implemented by Borough (independent variables)

<i>Explanatory Variables</i>	<i>La Reina (Co-Production)</i>	<i>Cerrillos (Structuralist)</i>	<i>Maipú (Legalist)</i>	<i>Santiago (Dualist)</i>
A. Individual Socio-Economic Conditions (control variables)				
1 <i>Income</i>	<i>Monthly waste-picker income per month in Chilean pesos</i>			
2 <i>Work-week</i>	<i>Number of hours worked per week</i>			
3 <i>Age</i>	<i>In years</i>			
4 <i>Gender</i>	<i>Male / female</i>			
5 <i>Experience</i>	<i>Number of years spent in the activity</i>			
B. Municipal Socio-Economic Conditions (control variables)				
6 <i>Poverty</i>	<i>Municipal poverty rate</i>			
7 <i>Inhabitant income</i>	<i>Average inhabitant income in the municipal area</i>			
8 <i>Waste production</i>	<i>Average kilograms of waste produced by a household in a municipal area</i>			
C. Supportive Local Policies (explanatory variables)				
1 <i>Access to credits</i>	<i>Yes(2010)</i>	<i>no</i>	<i>no</i>	<i>no</i>
2 <i>Donation of tools and machinery</i>	<i>Yes (2009)</i>	<i>no</i>	<i>no</i>	<i>no</i>
3 <i>Donation of vehicles</i>	<i>Yes (2009)</i>	<i>no</i>	<i>no</i>	<i>no</i>
4 <i>Provision of a recycling center</i>	<i>Yes (2010)</i>	<i>no</i>	<i>no</i>	<i>no</i>
5 <i>Institutionalization of waste-pickers</i>	<i>Yes(2009)</i>	<i>no</i>	<i>no</i>	<i>no</i>
6 <i>Coordination with waste truck</i>	<i>Yes (2009)</i>	<i>Yes (2009)</i>	<i>no</i>	<i>no</i>
7 <i>Waste-picker monopoly</i>	<i>Yes (2008)</i>	<i>no</i>	<i>no</i>	<i>no</i>
8 <i>Regularization of schedules</i>	<i>Yes (2008)</i>	<i>no</i>	<i>no</i>	<i>no</i>
9 <i>Promoting waste separation</i>	<i>Yes (2008)</i>	<i>no</i>	<i>no</i>	<i>no</i>
10 <i>Restrictions on work in landfills</i>	<i>Yes (2006)</i>	<i>no</i>	<i>no</i>	<i>no</i>
11 <i>Place to leave children</i>	<i>Yes(2010)</i>	<i>no</i>	<i>no</i>	<i>no</i>

Greater Santiago de Chile is composed of 37 boroughs, which fully administrate their own local solid waste management systems. Waste-picking accounts for 70% of the waste recycled in the region, ultimately recycling 10.1% of the total waste produced (CONAMA 2005). An estimated 6,000 waste-pickers, working both in cooperatives and independently, collect materials for recycling (by selling to middlemen who then sell it on as raw material for local industries) or for reuse (by selling odds and ends in informal street markets), removing 810 tons of waste from landfill every day (CONAMA 2005). Waste-picking activities play an undeniable and vital role in achieving ISWM in Greater Santiago.

4. Analysis of the results

This section is structured in two parts. First, variation in sustainable performance among cooperatives is estimated, assessing the accuracy of the recommendations of the four policy approaches. The second section discusses the impact of specific local policies on sustainable indicators.

4.1 Waste-pickers' sustainable performance: the relevance of local policy framework

Here we estimate waste-pickers' sustainable performance, first through an analysis of variance, testing for equality of means, followed by multiple comparisons of statistical differences in cooperatives' sustainable performance, using Bonferroni corrections.

The results from the tests are presented in Table 5. Tests 1-2 concern the economic efficiency of different cooperatives. Here, economic efficiency refers to income per hour worked (indicator 1) and kilograms of recyclable materials collected per hour worked (indicator 2). In tests 3-4, social equity indicators are analyzed using the monthly waste-picker salary divided by the minimum salary in Chile in 2010 (indicator 3) and the Gini coefficient of each cooperative (indicator 4). In tests 5-7, environmental protection performance is assessed by the amount of kilograms collected, of both recyclable and reusable materials, per waste-picker per hour worked (indicator 5), the quantity of toxic materials collected per worker per month (indicator 6) and the number of different types of recyclable materials collected by each waste-picker (indicator 7). Finally, in tests 8-11, negative externality variables are compared. Indicator 8 analyzes the number of accidents suffered by a waste-picker in a six month period, indicator 9 is a perception indicator referring to how often they bring their children to work, indicator 10 indicates their perception of how often they organize waste after opening trash bags or bins, and indicator 11 analyzes the length of waste-pickers' working week compared with the legal working week length. For all the perception indicators where 1 represents never and 6 represents always, scores were standardized.

Table 5: Multiple Testing of Differences in Cooperative Performance

<i>Indicators</i>	<i>Earnings/ Hour Worked</i>		<i>Kilos/ Hour Worked (Recyclables)</i>		<i>Multiple of Minimum Salary</i>		<i>Income Equity (Cooperative)</i>		<i>Kilos/ Hour Worked (Recyclables and Reusable)</i>		<i>Kilos/ Month (Toxic Materials)</i>	
	<i>1</i>		<i>2</i>		<i>3</i>		<i>4</i>		<i>5</i>		<i>6</i>	
ANOVA F-test	0.0002	***	0.064	*	0.0001	***	-		0.0295	**	0.0001	***
CP vs. SP	0.0010	***	0.4580		0.0010	***	-		0.4610		0.0010	***
CP vs. LP	0.0010	***	1.0000		0.0010	***	-		1.0000		0.0010	***
CP vs. DP	0.0010	***	0.0920	*	0.0010	***	-		0.0910	*	0.0010	***
SP vs. LP	1.0000		1.0000		0.1810		-		0.6200		1.0000	
SP vs. DP	1.0000		1.0000		1.0000		-		1.0000		1.0000	
LP vs. DP	1.0000		0.2760		0.0870	*	-		0.0880	*	1.0000	
AVERAGE												
CP	2437	a	28.6		1.8		0.17**b		28.6		278.6	
SP	1099	a	16.8		0.8		0.26**b		16.9		99.1	
LP	1127	a	21.7		1.1		0.33**b		24.6		81.1	
DP	1077	a	10.7		0.7		0.30**b		10.7		68.2	

Note 1: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (Bonferroni corrections)

Note 2: a: Chilean Pesos (USD 1 = CLP 510); b: Gini coefficients.

Note 3: Co-production Policies (CP), Structuralist Policies (SP), Legalist Policies (LP), Dualist Policies (DP).

Table 5: (continuation)

<i>Indicators</i>	<i>Types of Materials Collected</i>		<i>Number of Accidents</i>		<i>Frequency of Children at Work</i>		<i>Waste Dispersion</i>		<i>Workday Length</i>	
	<i>7</i>		<i>8</i>		<i>9</i>		<i>10</i>		<i>11</i>	
ANOVA F-test	0.0001	***	0.0001	***	0.167		0.0686		0.0007	***
CP vs. SP	0.4470		0.3200		1.0000		1.0000		1.0000	
CP vs. LP	0.0010	***	0.0590	*	0.5210		1.0000		0.0430	**
CP vs. DP	0.0010	***	1.0000		1.0000		1.0000		1.0000	
SP vs. LP	0.0010	***	0.0010	***	0.6700		0.3850		0.0020	***
SP vs. DP	0.0130	**	0.0190	**	1.0000		1.0000		1.0000	
LP vs. DP	1.0000		0.0740	*	0.4560		0.0750		0.0130	**
AVERAGE										
CP	10.7		2.7		2.9		5.6		0.8	
SP	9.3		1.5		2.4		5.4		0.8	
LP	7.2		4.4		1.7		5.9		1.3	
DP	7.3		3.1		2.7		5.1		0.8	

Note 1: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (Bonferroni corrections)

Note 2: a: Chilean Pesos (USD 1 = CLP 510); b: Gini coefficients.

Note 3: Co-production Policies (CP), Structuralist Policies (SP), Legalist Policies (LP), Dualist Policies (DP).

Several implications can be extracted from the results of the empirical analysis. First, regarding economic efficiency, the data suggest that only high levels of local government support (CP) can allow waste-pickers to reach high levels of economic performance. The cooperative under CP performs significantly better in indicator 1, having a higher level of productivity. Similarly, the cooperative under CP collects a larger quantity of recyclable materials, and is statistically different from the cooperative working under DP. The cooperatives under SP and LP seem to perform similarly in both economic indicators.

This is exemplified in the comments of Olivia (27), a public officer in La Reina (CP municipality), who explains how their support program organizes and capitalizes on waste-pickers, increasing their productivity, while Mauricio (41), a waste-picker in Maipú (LP municipality), describes how an approach of tolerance can create problems of collection redundancy that reduce their quantities collected per hour:

O: (Waste-pickers) work in the program...two days a week. With this they collect 250,000 pesos [USD 403] of recyclable materials in a day. (They have) a monopoly over routes, places to store... they earn around 400,000 pesos [USD 645] (per month) from the program. So even though at the moment we recover only 1% of total waste (locally), this is enough to move 25 people out of poverty.

M: We have had pretty bad economic results lately... The truck only passes twice a week, and it's very early in the morning...so people only take out (their trash) at night on these two days... You are not the only one collecting in your area, so even if you wake up early, around five or six in the morning, sometimes everything is (already) gone. Some people stay out all night collecting.

For our social equity indicators, the data again show a positive relationship between social performance and levels of local government support. Regarding poverty reduction (indicator 3), only the cooperative under CP promotes high levels of social mobility, bringing all its members above the poverty line and beyond minimum wages to a middle-class salary (indicator 3). Furthermore, the CP cooperative promotes higher levels of income equality among its members (indicator 4), reaching a low Gini inequality index (0.17). Regarding Gini coefficients, the cooperative under SP (0.26) performs better than those under LP (0.33) or DP (0.30). Sofia (54), a waste-picker in La Reina, describes how organization and support allow waste-pickers to bypass middlemen and share the resulting increased profits, while Esteban (52), a leader of the National Movement for Chilean Recyclers (MNRCH) comments on repression and disorganization in Santiago diverting waste-pickers away from more profitable areas and materials:

S: We are able to sell directly to large enterprises, because (when working) together we can obtain large quantities (of recyclable materials). We pay the standard price paid by middlemen to each waste-picker, and we sell (this material) to large enterprises for a

profit – for instance, 5 pesos [USD 0.01] per kilo for paper. The big difference here is that waste-pickers are owners, so on top of the income that we make selling recyclables, we (also) share the cooperative's profits equally among members, or decide to invest – for instance, in tricycles so that everyone can bring more material. So, when more material is brought in, we can share a larger pot of profits.

E: In Santiago, there are (policies of) repression and control. So, since the municipal police stop (waste-pickers) to demand permits, they avoid going to more central areas (where more recyclable material is produced)... And investigative police are required to know the origin of metals (such as copper, aluminum and scrap), so some waste-pickers have decided to stop collecting these metals (even though they command higher prices).

The empirical results also suggest that local government support enhances environmental protection. Regarding quantity collected per worker (indicator 5), waste-pickers under CP and LP perform significantly better than those under SP and DP, with waste-pickers under DP performing significantly worse. In relation to toxic materials (indicator 6), waste-pickers working under CP recycle almost three times as much toxic material as any other cooperative. Finally, waste-pickers with higher levels of support, under CP and SP, recycle a larger number of types of materials (indicator 7). Ultimately, the results suggest a significant positive relation between levels of municipal support and waste-pickers' sustainable performance, which supports the hypothesis drawn from co-production theory. The contrasting comments of Claudio (39), Head of the Environmental Department of La Reina, and Agustin (45) Head of the Environmental Department of Santiago, exemplify this:

C: I think that waste-pickers are a solution to waste management...because everything that they collect saves the municipality in transport and waste disposal costs. With our policies, in the recycling center we collect around 120 to 130 tons per month, and in winter around 90 tons. That is around 1,320 tons per year that doesn't go into landfill.

A: The only thing that we do (regarding waste-pickers) is to apply the municipal regulations... This is to fix and police a schedule of collection, which is why you only see (waste-pickers) at night...and to apply sanitary regulations, so they don't spread waste around... It seems that cardboard here isn't profitable, as (waste-pickers) don't collect it in the volumes required by large enterprises... We have cardboard in our waste stream in large quantities. The trucks are full, and this make the service more expensive, since I need to transport more waste to the landfill.

In relation to negative externalities, the connection between local government support and waste-picker performance still seems positive, albeit weaker. First, regarding the prevention of work-related accidents (indicator 8), there seems to be some positive association with local government support, as waste-pickers under SP and CP have significantly fewer workplace accidents than those under LP and DP. The issue of child work (indicator 9) seems not to significantly vary along with levels of local government intervention. It does appear however that governmental control over waste-pickers makes a difference for waste dispersion (indicator 10), as

those under DP disperse significantly less waste than those under LP. In relation to the workday length (indicator 11), it appears that this decreases along with local government support, with waste-pickers under CP and SP working an average of 80 percent of the legal workday length. Of note, the short workday of the cooperative under DP seems to be the result of policies that artificially restrict schedules of collection for waste-pickers. The co-production hypothesis is confirmed in two out of four indicators (reduction of accidents and reduction of workday length). Francisca (48) and Roberto (54), waste-pickers in La Reina and Maipú respectively, explain their contrasting workdays, shedding some light on the potential for different policy environments to influence our affected indicators:

F: A waste-picker doesn't stop working until...they have reached their quota. If you see that in your tricycle...you have around 7,000 to 8,000 pesos' worth [USD 11.27-12.88], you start to go back (home)... We are coordinated with the waste truck so you start early with the truck and follow that route... You arrive here around 11:30 am, so (our workday) is not so long... It is also the vehicle – I started collecting with a bag, then the municipality helped me to get a (motorized) vehicle, so I make more money, have to sacrifice less and don't need to roam around for hours to find a good spot for waste.

C: I collect with a hand-pushed cart...but it is too heavy. With a (non-motorized) tricycle you can go fast, a thousand times faster! You cover an area in much less time. I work from Monday to Sunday for between six and eight hours, from 7 a.m. to 2 p.m.... and then I go back home to sort and clean (the material) and then (I go) to sell... I finish at around 5 p.m.... Why haven't I bought a tricycle?... Because I struggle to make enough to eat. I can't afford one.

Overall, the results from our empirical analysis of externalities largely support the hypothesis given by co-production theory, suggesting that local government support has a positive impact on waste-pickers' sustainable performance.

4.2 Policy impact of municipal policies: evaluation

Having now established that municipal support does make a positive difference to waste-picker performance, the objective of this section is to evaluate the specific impacts of each supporting policy on enhancing waste-pickers' sustainable performance and reducing negative externalities. As explained earlier, drawing from the results of our survey, we run Equation 1 where the outcome of interest is one of the 11 sustainable performance indicators in Table 2. Our explanatory variables in this set of regressions are the twelve supporting policies implemented by municipalities (see Table 3). We also include several individual socio-

economic and municipal controls (Table 4). The fully saturated model – the one with all controls – is our preferred specification; therefore the analysis is done using this estimation, and with a significance level of 10%. For intellectual transparency, Tables 7 through 9 also report all coefficients in the regression, and the way that the coefficients change when more controls are added. The explanations for mechanisms driving policy impact are drawn from thematic analyses of interviews with stakeholders. Illustrative quotes are reported along with regression results. The results of the statistical analyses are summarized in Table 5. In OLS models 1-2, the impact of policies on economic efficiency (indicators 1 and 2) has been tested. In OLS models 3-4, the impact of supporting policies on social equity performance (indicators 3 and 4) is tested. In OLS models 5-7, we assess environmental protection performance (indicators 5, 6 and 7). Finally, in OLS models 8-11, negative externality variables (indicators 8, 9, 10 and 11) are introduced (see Tables 6 and 7). Qualitative analysis is then used to understand the mechanisms at play behind the statistically significant impacts of local policy intervention.

Individual productivity: earnings per hour worked (indicator 1)

Regarding economic efficiency, the data suggest that a higher level of local government support leads to stronger economic performance for waste-pickers. First, productivity per hour of work (indicator 1, Table 6) sees an increase that results from a number of supporting policies – the upgrading of waste-pickers to motorized vehicles increases their productivity by CLP 654 (USD 1.28) per hour, the institutionalization of waste-pickers by CLP 1,260 (USD 2.47) per hour, granting a monopoly over an urban area by CLP 834 (USD 1.63) per hour, and the regularization of waste-picker collection schedules by CLP 152 (USD 0.30) per hour.

When vehicles are provided to waste-pickers, the entire collection process is sped up and they are able to carry more material with each trip, as well as larger reusable items, resulting in higher returns per hour of work.

Claudia (48), a waste-picker from La Reina, expands on this:

C: I was able to grow, increasing the number of things that I collected... (I started with) a shopping trolley...next, I had a tricycle, which was a wonderful step. But I was still struggling to work all the way up in Pocuro, since I recycle in Providencia [a downhill area]. So I used to get exhausted, but it was still an improvement. When I got the pick-up van, I was so happy...now I can go anywhere...wherever people (providing materials) call for me. I can carry big things that I could not before...tables, kitchens.

All organizational policies are the result of neighbors becoming more willing to collaborate with waste-pickers by providing miscellaneous items for collection. In turn, waste-pickers are able to access recyclable and reusable materials of a higher quality and in higher quantity in a shorter period of time, thus increasing earnings per hour. Sofia (46), a waste-picker leader in La Reina (CP municipality), elaborates on how having a single waste-picker working in each area strengthens the relationship between waste-pickers and local households:

S: Each waste-picker has their particular borough where they collect and they must respect that area. Neighbors are enrolled (in a recycling program) and the municipality assigns a local waste-picker... We rely on neighbors' cooperation because (our earnings) depend on what they provide... (In each area) we have a strong relationship with the neighbors, they know us...they hold on to 'cachureos' [odds and ends] and provide separated (recycling) material for us.

The regularization of waste-pickers' collection schedules means that, in the long run, neighbors are able to get to know waste-pickers personally, again influencing the inherent trust in their relationship. As explained by Esteban (52), a leader of the MNRCH:

E: Here in this street...a waste-picker comes every other day...always following the same schedule...We have worked in this office for 4 to 5 years...it's always been the same guy... Now, we know him... People (in this street) recognize him and gather 'cachureos' and (recyclable) material for him.

Similarly, the institutionalization of waste-pickers influences this relationship built on trust and collaboration. With this policy, waste-pickers are able to access high income-gated communities, thus expanding their collection area. Sofia (46), in another intervention, noted:

S: (It is important) to have an identification card or our (official) jackets...to show to the locals, because if we walk through the street in uniform...they will actively ask us... 'What do you recycle?'...and they give us 'cachureos' or (recyclable) material... They prefer (giving) to a waste-picker in uniform rather than one without. (Gated communities) can have private guards...who now say hello to us...they know that we come from the municipality and they open their doors to us.

Table 6: Summary of the Impacts of Municipal Policies on the Sustainable Performance of Waste-Pickers

<i>Response Variable</i>	<i>Positively Impacting Policy</i>	<i>Negatively Impacting Policy</i>	<i>Magnitude</i>	<i>Type of policy</i>	<i>Overall Impact (a)</i>
A. Economic Efficiency					
Indicator 1: <i>Earnings per hour worked</i>	<i>Provision of motorized vehicles</i>		654.2*	<i>Capital</i>	<i>B</i>
	<i>Institutionalization of waste-pickers</i>		1,260***	<i>Organization</i>	<i>A</i>
	<i>Waste-picker monopoly</i>		833.8***	<i>Organization</i>	<i>A</i>
	<i>Regularization of schedules</i>		152.3**	<i>Organization</i>	<i>A</i>
Indicator 2: <i>Quantity collected per hour (recyclable material only)</i>	<i>Access to credits</i>		6.481**	<i>Capital</i>	<i>A</i>
	<i>Donation of tools and machinery</i>		2.380**	<i>Capital</i>	<i>A</i>
	<i>Institutionalization of waste-pickers</i>		15.96***	<i>Organization</i>	<i>A</i>
	<i>Coordination with waste truck</i>		3.056***	<i>Organization</i>	<i>A</i>
	<i>Place to leave children (social network)</i>		6.885**	<i>Neg. Externality</i>	<i>A</i>
B. Social Equity					
Indicator 3: <i>Income relative to minimum wage</i>	<i>Provision of motorized vehicles</i>		0.440**	<i>Capital</i>	<i>B</i>
	<i>Institutionalization of waste-pickers</i>		0.929***	<i>Organization</i>	<i>A</i>
Indicator 4: <i>Gini coefficient within cooperatives</i>	<i>Access to recycling center</i>		-0.0441***	<i>Capital</i>	<i>A</i>
	<i>Institutionalization of waste-pickers</i>		-0.127***	<i>Organization</i>	<i>A</i>
	<i>Coordination with waste truck</i>		0.00267*	<i>Organization</i>	<i>A</i>
	<i>Promoting waste separation</i>		-0.00403***	<i>Organization</i>	<i>A</i>
C. Environmental Protection					
Indicator 5: <i>Quantity collected per hour (recyclable and reusable material)</i>	<i>Donation of Tools and Machinery</i>		2.550*	<i>Capital</i>	<i>A</i>
	<i>Institutionalization of waste-pickers</i>		12.36**	<i>Organization</i>	
	<i>Coordination with waste truck</i>		3.402***	<i>Organization</i>	<i>A</i>
	<i>Place to leave children (social network)</i>		8.703**	<i>Neg. Externality</i>	<i>A</i>
	<i>Place to leave children (school/nursery)</i>		7.532*	<i>Neg. Externality</i>	<i>A</i>
Indicator 6: <i>Kilograms of toxic material collected per month</i>	<i>Access to credits</i>		83.55**	<i>Capital</i>	<i>A</i>
	<i>Institutionalization of waste-pickers</i>		167.2**	<i>Organization</i>	<i>A</i>
Indicator 7: <i>Diversity of materials collected</i>	<i>Institutionalization of waste-pickers</i>		3.912***	<i>Organization</i>	<i>A</i>

Notes: a) Overall Impact A denotes municipal policies that have only a positive impact across indicators; B refers to municipal policies that have both positive and negative impacts across indicators; C denotes policies that have only negative impacts across indicators.

b) Where 1 signifies 'I never go with my child/children to collect waste' and 6 signifies 'I always go with my child/children to collect waste'

c) Where 1 signifies 'I always clean up after collecting/sorting waste' and 6 signifies 'I never clean up after collecting/sorting waste'

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$: Robust standard errors in parentheses

Table 6: (continuation)

<i>Response Variable</i>	<i>Positively Impacting Policy</i>	<i>Negatively Impacting Policy</i>	<i>Magnitude</i>		<i>Overall Impact (a)</i>
D. Negative Externalities					
Indicator 8: <i>Frequency of workplace accidents</i>	<i>Regularization of schedules</i>		-0.340**	<i>Organization</i>	<i>A</i>
		<i>Storage in an informal plot</i>	2.102**	<i>Capital</i>	<i>C</i>
Indicator 9: <i>Child work (b)</i>	<i>Place to leave children (social network)</i>		-1.813***	<i>Neg. Externalities</i>	<i>A</i>
	<i>Place to leave children (school/nursery)</i>		-1.117**	<i>Neg. Externalities</i>	<i>A</i>
		<i>Provision of motorized vehicles</i>	0.879*	<i>Capital</i>	<i>B</i>
Indicator 10: <i>Waste dispersion (c)</i>	-	-	-		-
Indicator 11: <i>Number of hours worked in a week</i>	<i>Donation of tools and machinery</i>	-	0.0931*	<i>Capital</i>	<i>A</i>

Notes: a) Overall Impact A denotes municipal policies that have only a positive impact across indicators; B refers to municipal policies that have both positive and negative impacts across indicators; C denotes policies that have only negative impacts across indicators.

b) Where 1 signifies 'I never go with my child/children to collect waste' and 6 signifies 'I always go with my child/children to collect waste'

c) Where 1 signifies 'I always clean up after collecting/sorting waste' and 6 signifies 'I never clean up after collecting/sorting waste'

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$: Robust standard errors in parentheses

Local industry productivity: quantity of recyclable material collected per hour (indicator 2)

Regarding indicator 2, the quantity that each waste-picker collects in an hour faces a significant rise with supportive policies. The provision of tools and/or machinery increases waste-pickers' recycling rates by 2.380 kilograms per hour of work, granting access to credits increases collection by 6.481 kilograms per worker, the institutionalization of waste-pickers by 15.960 kilograms per hour, coordination with the waste truck by 3.056 kilograms per hour and access to childcare facilities by 6.885 kilograms per hour. The provision of processing machines frees up time that waste-pickers would otherwise spend doing these processes manually, increasing their time available for collection, leading to higher rates of collection throughout their workday. As stated by Esteban (52) of the MNRCH in another intervention:

E: Our cooperative has a baler machine. This saves a lot of time, because some middlemen ask us to pre-wrap cardboard, and without the machine it needs to be done manually.

Access to credits allows waste-pickers to upgrade vehicles, increasing their collection capacity. Victor (60), a waste-picker from La Reina (CP municipality), argues:

V: Since micro-entrepreneurs here are accepted by the Banco de Estado [State Bank], we can obtain credits... So, you have to take advantage of these opportunities... The majority (of us) are trying to repair our (existing) vehicles or adding bigger containers onto them so we can carry more material...because (the amount of credit) is enough to upgrade.

As explained above, the institutionalization of waste-pickers allows them to gain the collaboration of neighborhoods that provide them with recyclable and reusable material, increasing their collection rate. As Lorenzo (45), a waste-picker leader from the cooperative in La Reina, explains:

L: (Neighbors would say:) 'Here come the waste-pickers – be careful, close the door, the waste-picker is here... 'he is looking for houses that he can steal from'. We are stigmatized. If you arrive with an identification card, they will say: 'Okay, he comes from the municipality'... They look at you and they see the municipality. For example, when we had our 'collection day', all of (the waste-pickers) were wearing green uniforms. All (of the neighbors) could identify us and were happy to donate (reusable and recyclable materials).

The coordination of waste-pickers with the waste truck schedule has a significant impact on increasing quantities collected per hour. Without this coordination, waste-pickers risk arriving to collect materials after the truck has already passed through for collection. When waste-pickers are aware of the route and timetable of waste trucks, however, they can first come through to salvage almost all recyclable and reusable materials in an urban area before it is taken away to landfills. This ultimately increases the quantity collected per individual. As explained by Carlos (48), a waste-picker leader from La Reina, and Esteban (52) again:

C: Here, everyone knows when the waste truck passes... Waste-pickers start collecting from the top of the hill at 7:00 am and finish here, near the recycling center, around 1:00 pm... This means that almost all the material that can be recycled ends up here (in the recycling center) and not in landfill... If a waste-picker tries to collect at 2:00 pm, he will find very little (material in the streets).

E: By coordinating with the truck, you collect much more (than going street-to-street)... You can collect twice as much as we would otherwise... You can take everything, as you can collect in large quantities.

The access of waste-pickers to childcare services increases collection rates per hour, particularly for women. This is because female waste-pickers face a higher burden of family tasks, forcing them to combine

collection activities with childcare responsibilities. This means that female waste-pickers can sometimes only collect intermittently, or must bring their children with them, slowing down their work. Access to care services (particularly through their personal network) allows them to fully concentrate on recycling, increasing their efficiency. As stated by Carolina (31), a waste-picker in Cerrillos (SP municipality):

C: Today, I had to sell my material for recycling...but I couldn't, because I had a (school) meeting at 9:00 am. It finished at 11:00 am, and then I had to prepare lunch...then I had the (school) enrolment... I have to collect between my home and the school, I can't go very far... I have to bring (my daughter) sometimes, I have nobody to leave her with, so collecting is harder.

Poverty reduction: income relative to minimum wage (indicator 3)

It appears that supporting policies can be effective in moving waste-pickers out of poverty, while simultaneously reducing income differences within cooperatives. More specifically, this indicator appears to be impacted by the provision of motorized vehicles, which boost monthly salaries by 0.44 times the minimum wage (USD 142.35), and by the institutionalization of waste-pickers, which increases salaries by 0.93 times the minimum wage (USD 300.88). Thus, the increases in productivity derived from the provision of motorized vehicles described in indicator 1 create a substantial increase in monthly salaries.

The trust and collaboration between locals and externally identifiable waste-pickers discussed earlier leads to higher incomes, as waste-pickers gain access to higher quality and higher quantities of materials. Moreover, in the CP municipal area, the institutionalization of waste-pickers also allows them to secure a stable place in street markets, where they are able to sell materials as reusable products for a higher price. As David (48), a waste-picker of in La Reina (CP municipality), noted on this last point:

D: The municipality helps us, and we pay the minimum 200-300 pesos [USD 0.32-0.48] for a municipal permit. We have a good relationship with the police and the municipal inspectors. I will say to the inspectors: 'I have to go to recycle, I won't be able to go to the street market. (And they say): 'No problem, good luck'...and I keep my stall (in the market). You can get more money for your products... Let's say you repair a stereo, a TV, a refrigerator, a cooker... you can sell a cooker in a street market for 15,000 [USD 24.20], but if you sell it in the recycling market (as scrap) you will get 3,000 pesos [USD 4.84].

Similarly, when households participate in waste separation, the entire collection process for recyclable and

reusable waste is sped up, and waste-pickers can collect more materials in less time and covering less distance. As Olivia (27), a municipal officer from La Reina, articulates:

O: The base of everything is the community that is willing to give (waste-pickers) all of their waste... Currently, neighbors give (material) at their front doors, separated, cleaned and in conditions that waste-pickers can handle safely... (Waste-pickers) receive not only paper, cardboard, and cans, but also tools, equipment, appliances.

As mentioned earlier, since the regularization of collection schedules allows waste-pickers to access more recyclable and reusable materials, it is natural that we see a boost in their monthly income.

Income equality: Gini coefficient within cooperatives (indicator 4)

In relation to reducing income differences within cooperatives (indicator 4), a large number of support policies appear to be effective: the provision of recycling centers reduces inequality by 0.041 Gini points, the institutionalization of waste-pickers by 0.127 Gini points, coordination with the waste truck by a very small 0.003 points, and the promotion of waste separation by a similar 0.004 points.

Recycling centers homogenize the prices paid per kilogram to waste-pickers. This is because all waste-pickers contribute their collected material to one single load, which is sold by large quantities. Unlike when they sell individually to a middleman, they do not face the penalization of lower prices for selling in small quantities. Moreover, waste-pickers associated with the recycling center share in its profits. Esteban (52), a waste-picker leader from the MNRCH, explains:

E: The recycling center creates a change... (Waste-pickers) benefit because they are paid a higher price (per kilogram), but also later on...(because the cooperative) has to invest in the improvement (of the center) or distribute the profits, and it is the members who decide what to do... So, you see the benefits even though you sell every day in small quantities.

Since the institutionalization of waste-pickers affects an entire cooperative and includes waste-pickers being introduced to neighbors, this helps those who are less naturally sociable to gain the trust and support of locals, which in turn increases their productivity and salaries, closing the gap between them and more inherently

sociable waste-pickers. Antonio (52), a waste-picker from La Reina explains how municipal support helps him to gain neighborhood cooperation:

A: When we started, we were all accompanied by a municipal officer as well as a monitor from Casa La Paz [an NGO]... I worked with Carlos [municipal officer], teaching people what they should and should not give (for recycling and reuse), door-to-door. It was hard work. We were given our uniforms and the houses to visit... Now, almost every family knows us and helps us.

Through similar mechanisms, the promotion of waste separation and the coordination of waste-pickers with the truck reduce inequality by a smaller proportion, as again they help less outgoing individuals to increase their collection rates.

Prevention of waste entering landfills: quantity of recyclable and reusable material (indicator 5) and toxic material (indicator 6) collected

Supporting policies seem to have a positive impact on waste-pickers' environmental protection indicators. Regarding the prevention of waste from ending up in landfills (indicator 5), the donation of machinery and tools, the institutionalization of waste-pickers, coordination with the waste truck, and having a place to leave children seem to have a positive effect. The similarity in the magnitudes of impact with indicator 2 regarding the coordination with the waste truck and the donation of tools and machinery, confirms that these policies increase collection rates of predominantly recyclable material, with little impact on the collection of reusable products.

The institutionalization of waste-pickers allows them not only to collect more recyclable materials, but also leads to an almost 1 kilogram per hour increase in the collection of reusable materials. This is due to the trust from municipal recognition allowing waste-pickers to enter locals' houses to collect large reusable items. As Olivia (27), a municipal officer in La Reina (CP municipality), discusses:

O: People open their doors to waste-pickers. I'm telling you, it's amazing. (Waste-pickers) are practically municipal officers that ask 'How are you doing?' and enter into houses, collecting kitchens, and taking all sorts of (recyclable and reusable) materials. There is a lot of trust. (The municipality) certifies that these waste-pickers are trustworthy people.

Access to childcare services increases the collection of rates by up to 8.703 kilograms per hour. This policy also boosts the collection rate of both recyclable and reusable products. Female waste-pickers tend to be more able to gain access inside houses, as people in our study tended to be more willing to trust them over men, allowing them to obtain more reusable products and to collect large household items. Since childcare allows them to be more efficient in their collecting, higher collection rates result. As commented by Esteban (52) in another intervention:

E: Women can collect more, as people give them much more material, especially in low-income neighborhoods. It is incredible, but people are more empathetic towards women, and so they can collect 'cachureos' [reusable materials] that people wouldn't give to men.

Regarding the collection of toxic materials (indicator 6), facilitating access to credit allows each waste-picker to collect an extra 63 kilograms per hour of toxic materials, while the institutionalization of waste-pickers sees an increase of 167.2 kilograms. Through access to credit, waste-pickers are able to obtain the necessary capital to manage this type of waste – waste-pickers without access to appropriate tools or storage tend to avoid the collection of toxic materials for fear of sustaining injuries. Belen (59), a waste-picker leader from Santiago Centro (DP municipality), explains:

B: I received a credit from the Banco Estado. There are waste-pickers that have received up to one million pesos... For example, I want to (use my credit to) build a small storage space in my house...which would allow me to collect products like batteries. This is fundamental (for my business).

Furthermore, since institutionalizing waste-pickers encourages neighbors to open their doors to them, waste-pickers are able to collect toxic materials – such as broken electronics – directly from the source, in a clean and safe manner.

Diversity of material recycled: number of different materials recycled (indicator 7)

In relation to the diversity of materials collected (indicator 7), the institutionalization of waste-pickers leads to 3.9 new types of material being added to the local recycling and reuse waste management system. Some materials are not profitable when sold in small quantities (time spent searching for/collecting/selling them versus price paid), or require cleaning prior to recycling (such as cardboard or detergent bottles), and so are normally not collected. As described by Natalia (50), Claudia (48), Victor (60) and Antonio (52), in a focus group with waste-pickers in La Reina (CP municipality):

V: The problem (with recycling some materials) is that our houses are too small.

N: You can't store (recyclable) material, you can't store the 'cachureos'... Only the tricycle. I have only the most basic necessities.

Since the institutionalization of waste-pickers increases neighborhood collaboration, materials tend to be cleaned before being handed in for waste collection, thus expanding the number of types of material that are recycled. As Sofia (46), a waste-picker leader from the La Reina, noted:

S: The neighbors already know what we collect and how the material needs to be... For example, detergent bottles need to be clean, because the detergent pollutes. The same goes for oil bottles... Cardboard must be clean, because if it comes with traces of food you can't sell it. My neighbors already know this and provide everything already cleaned.

Physical health: frequency of workplace accidents (indicator 8)

As well as increasing sustainable performance, supportive policies also have a positive impact on reducing the negative externalities of waste-picking. Work-related accidents (indicator 8) can be reduced by 0.340 accidents every six months by simply regularizing the schedules of collection for waste-pickers.

The regularization of collection schedules makes neighbors more willing to provide pre-sorted material and means that waste-pickers do not have to rush to open bags, thus preventing the risks that arise from waste manipulation. As expressed by Natalia (50), a waste-picker in La Reina:

N: My neighbors know when I come, and have everything ready... I don't put my hands into the waste, I have taught them... They give everything to me clean, crystal clean... They give one plastic bag with the 'cachureos', another with the cardboard, another with newspaper, everything separated.

Contrasting this, the access to storage in an informal plot increases workplace accidents by 2.102 occurrences every six months. This is due to an increased possibility of accidents in a storage place with poor working conditions and regular unprotected waste manipulation. As Esteban (52) of the MNRCH explains:

E: The problem with the accumulation of waste in (illegal) plots is the risk of fire and sanitary problems. You do not have the right conditions to store goods. Moreover, sometimes you have (other types of) accidents – cuts from broken bottles or sharp pieces of steel, as waste is dispersed all around.

Child labor: frequency of waste-pickers accompanied by a child (indicator 9)

The results for the frequency of children located at the workplace (indicator 9) raise an interesting point. Contrary to the literature, and as female waste-pickers consistently stressed during interviews, children are not brought to work as a means of complementing a waste-pickers' salary (Porto *et al.* 2004), as this indicator is not statistically significant, but is rather the result of having few alternative options for places to leave children during the workday. In this sense, the availability of public facilities (nurseries or schools) or waste-pickers using their social networks (typically relatives, friends or neighbors) significantly reduces the frequency of the indicator showing how often children are at the workplace by 1.117 and 1.813 standard deviations respectively. Carlos (46), a waste-picker leader from Maipú, offers an explanation:

E: This (problem) affects women more so than men... Our female co-workers have had to leave their children at home or take them to work many times, because they don't have access to public childcare. When they do have access to it, since we don't have a formal job, we have to pick them up either in the morning or in the afternoon. If you have a formal job they will keep children all day. We have spoken with the municipalities...to allow us to keep them in the nursery longer, so we can progress in our work. In some cases they have accepted (our requests).

However, the provision of a motorized vehicle increases the presence of children at work by 0.879 standard deviations. This is because, in the absence of childcare facilities, a motorized vehicle can provide a comfortable, covered area for children while their parents are working. Esteban (52) again explains:

E: We are fighting for access to nurseries, so we can go to recycle with clear minds... Many times waste-pickers, particularly single mothers or widows, have had to leave their children at home... But you are always worried that it is going to burn down (since flammable material is stored at home)... Tragedies like this have happened many times... In my own case, it was better to go to work with my children in my pick-up van...because who could I leave them with?

Waste dispersion: frequency of cleaning up after collecting (indicator 10)

For waste dispersion (indicator 10), our regressions did not show statistically significant results. We suspect that this is either due to us running out of statistical power, or due to a behavioral pattern that we are not able to capture in our data.

Working conditions: number of hours worked in a week (indicator 11)

Finally, working week length (indicator 11) can be reduced through the provision of tools and machinery, decreasing a workday by 50 minutes, equating to a reduction of 18 hours per month. A waste-picker's workday is split between collection and processing. The collection of materials can be done only at particular times and on particular days of the week, and tends to be tiring, and so waste-pickers cannot commit limitless time to this activity. However, when the processing time is sped up with tools and machinery, the workday length can be shortened. As explained by David (48), a waste-picker from La Reina (CP cooperative):

D: Triturated plastic, when it's chopped up, (recycling companies) will pay around 700 pesos per kilo...because it's almost raw material... I have a machine that you use to turn the bottles and put them in a bag. You can put up to 40 kilos in it... Same for cardboard, it needs to be wrapped, so with a baling machine you go much faster.

Table 7: OLS Models Testing Local Policy Impact on Economic Efficiency

INDICATORS VARIABLES	1: Earnings Hour Worked			2: Kilos Hour Worked (only recyclables)			3: Times Minimum Salary		
	1	2	3	4	5	6	7	8	9
Access to credits	-5.034 (268.8)	-7.859 (248.2)	-36.64 (244.1)	6.098** (2.963)	5.635* (2.972)	6.481** (3.046)	0.0874 (0.148)	0.107 (0.146)	0.102 (0.150)
Donation of tools and machinery	-90.78 (107.7)	-75.76 (95.78)	-111.8 (96.61)	1.056 (1.225)	1.450 (1.310)	2.380** (1.140)	0.0265 (0.0549)	0.00112 (0.0503)	0.000459 (0.0582)
Provision of tricycle	-283.3 (221.2)	-269.9 (252.0)	-101.6 (250.3)	-5.155* (3.069)	-2.989 (3.549)	-4.340 (3.394)	0.178 (0.152)	0.0906 (0.163)	0.0669 (0.169)
Provision of motorised vehicles	422.9 (331.4)	512.7 (382.0)	654.2* (390.3)	5.903 (5.994)	6.278 (6.794)	5.879 (6.142)	0.573*** (0.195)	0.476** (0.193)	0.440** (0.195)
Recycle center	180.7 (246.5)	241.3 (250.1)	209.8 (318.9)	7.148* (3.905)	4.678 (4.518)	-0.107 (4.925)	-0.138 (0.142)	-0.106 (0.155)	-0.0163 (0.202)
Informal plot	473.8 (352.1)	443.6 (378.7)	328.3 (383.4)	8.878* (4.995)	6.943 (5.303)	9.151* (5.105)	-0.168 (0.263)	-0.0661 (0.296)	-0.0778 (0.301)
Institutionalisation of waste-pickers	1,550** (419.7)	1,530** (392.6)	1,260** (344.5)	13.24** (4.115)	12.12** (5.402)	15.96** (5.056)	0.864** (0.216)	0.906** (0.191)	0.929** (0.211)
Coordination with waste lorry	-100.8 (69.83)	-105.0 (67.66)	-103.0 (69.33)	2.700*** (0.825)	2.803*** (0.865)	3.056*** (0.760)	-0.0383 (0.0352)	-0.0451 (0.0357)	-0.0504 (0.0333)
Waste-picker monopoly	618.8** (189.7)	708.7** (207.5)	833.8** (225.4)	3.877 (2.771)	2.590 (2.850)	1.259 (3.101)	0.222* (0.120)	0.196 (0.132)	0.170 (0.140)
Regularisation of schedules	96.44* (54.41)	88.18 (61.91)	152.3** (67.75)	1.401* (0.723)	1.390* (0.719)	0.225 (0.674)	0.0575* (0.0343)	0.0633* (0.0360)	0.0604 (0.0447)
Promoting waste segregation	-41.37 (57.65)	-39.42 (58.47)	-81.75 (62.28)	0.782 (0.856)	0.291 (0.862)	0.429 (0.848)	-0.0757* (0.0414)	-0.0615 (0.0414)	-0.0508 (0.0435)
Restrictions on work in landfills	-28.50 (125.5)	-15.09 (127.6)	-73.55 (142.9)	-0.153 (0.859)	-0.191 (0.821)	0.686 (1.054)	0.0368 (0.0789)	0.0281 (0.0771)	0.0344 (0.0852)
Place to leave children (social network)	96.42 (291.3)	139.5 (259.7)	17.70 (252.6)	7.240** (3.144)	5.707 (3.482)	6.885** (3.052)	0.0477 (0.182)	0.0697 (0.199)	0.0915 (0.215)
Place to leave children (school/nursery)	-21.02 (376.6)	52.92 (342.3)	-100.4 (344.3)	2.361 (3.669)	0.960 (4.117)	3.107 (4.005)	0.0702 (0.218)	0.0727 (0.229)	0.0896 (0.244)
No children	-190.5 (284.5)	-122.2 (248.1)	-246.5 (248.7)	3.590 (3.338)	2.976 (3.799)	5.290 (3.781)	-0.00884 (0.182)	-0.0364 (0.202)	-0.0321 (0.214)
Socio-economic controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Socio-spatial controls	No	No	Yes	No	No	Yes	No	No	Yes
Constant	1,038* (549.5)	946.0 (610.8)	-438.0 (889.9)	-21.90*** (7.838)	-15.69 (10.38)	-3.082 (14.58)	0.533 (0.347)	0.427 (0.422)	0.741 (0.566)
Observations	91	91	91	91	91	91	94	94	94
R-squared	0.455	0.478	0.501	0.507	0.536	0.573	0.519	0.549	0.551

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 8: OLS Models Testing Local Policy Impact on Social Equity and Environmental Protection

INDICATORS VARIABLES	4: Income Inequality by Cooperative			5: Kilos per Hour Worked (recyclable and reuse)			6: Kilos of Toxic Material per Month			7: Types of Materials Collected		
	10	11	12	13	14	15	16	17	18	19	20	21
Access to credits	0.00241 (0.00384)	0.00321 (0.00403)	0 (0)	6.522 (4.233)	4.952 (4.201)	5.783 (4.209)	59.82* (35.69)	79.13** (34.61)	83.55** (32.80)	0.0340 (0.624)	0.188 (0.683)	0.260 (0.667)
Donation of tools and machinery	0.00249 (0.00233)	0.00180 (0.00224)	0*** (0)	0.688 (1.324)	1.704 (1.509)	2.550* (1.412)	8.832 (14.78)	2.714 (14.90)	5.266 (15.49)	-0.0971 (0.230)	-0.122 (0.227)	0.00376 (0.197)
Provision of tricycle	0.0113 (0.00740)	0.00723 (0.00723)	-0*** (0)	-4.171 (3.372)	-0.236 (4.418)	-3.946 (4.170)	13.66 (38.97)	-9.768 (33.55)	-13.44 (36.33)	0.900 (0.938)	0.637 (0.939)	0.626 (1.024)
Provision of motorised vehicles	0.0149 (0.00926)	0.0137 (0.00836)	-0** (0)	14.03* (8.158)	13.84 (9.581)	12.37 (8.114)	-95.07 (64.62)	-104.0 (70.03)	-106.5 (71.35)	0.649 (1.029)	0.784 (1.069)	0.775 (1.104)
Recycle center	-0.0492*** (0.00473)	-0.0441*** (0.00563)	-0 (0)	1.345 (4.715)	-1.907 (5.063)	0.771 (5.786)	34.83 (33.78)	65.06 (46.42)	37.17 (52.41)	1.443** (0.622)	1.525** (0.657)	0.311 (0.858)
Informal plot	0.00640 (0.00623)	0.00868 (0.00532)	0* (0)	13.61 (11.09)	10.20 (10.35)	11.23 (9.729)	-22.83 (33.03)	-4.343 (28.54)	5.079 (35.13)	-1.379 (1.014)	-1.094 (0.909)	-0.783 (0.959)
Institutionalisation of waste-pickers	-0.129*** (0.00566)	-0.127*** (0.00571)	-0.124*** (0)	9.524** (4.569)	5.256 (6.055)	12.36** (5.376)	157.7** (67.07)	154.9** (69.22)	167.2** (71.21)	2.809*** (0.776)	3.715*** (0.977)	3.912*** (1.060)
Coordination with waste lorry	0.00248 (0.00167)	0.00267* (0.00160)	-0 (0)	2.825*** (0.900)	3.645*** (1.116)	3.402*** (0.971)	15.30 (12.35)	7.748 (11.38)	10.29 (11.76)	-0.291* (0.158)	-0.368** (0.171)	-0.268 (0.176)
Waste-picker monopoly	0.00678 (0.00581)	0.00799 (0.00636)	-0*** (0)	5.275* (3.016)	2.947 (3.135)	-0.614 (3.978)	-26.51 (55.72)	-17.26 (56.98)	-19.14 (64.35)	-0.682 (0.815)	-0.415 (0.829)	-0.205 (0.747)
Regularisation of schedules	-0.00113 (0.00117)	-0.000831 (0.00107)	-0 (0)	2.577** (0.993)	2.069** (1.019)	0.455 (0.892)	2.421 (6.407)	4.814 (7.093)	2.744 (7.907)	0.253 (0.162)	0.355** (0.177)	0.304 (0.199)
Promoting waste segregation	-0.00490*** (0.00133)	-0.00403*** (0.00138)	-0** (0)	0.436 (1.112)	-0.263 (1.150)	1.122 (1.063)	0.200 (10.22)	2.093 (10.06)	0.0967 (12.30)	-0.0674 (0.161)	-0.0797 (0.171)	-0.213 (0.203)
Restrictions on work in landfills	-0.00101 (0.00204)	-0.00106 (0.00182)	0 (0)	-0.741 (1.171)	-0.544 (1.124)	1.270 (1.238)	1.766 (11.58)	-0.252 (11.87)	3.122 (14.00)	0.213 (0.216)	0.252 (0.214)	0.283 (0.225)
Place to leave children (social network)	-0.0107* (0.00619)	-0.00723 (0.00549)	-0** (0)	7.460 (4.748)	5.314 (5.245)	8.703** (3.966)	-12.97 (50.60)	9.350 (42.94)	7.897 (42.22)	-1.068 (1.009)	-0.872 (1.125)	-0.997 (1.061)
Place to leave children (school/nursery)	-0.00500 (0.00652)	-0.00340 (0.00618)	-0 (0)	4.698 (5.005)	3.372 (5.629)	7.532* (4.474)	-12.39 (65.05)	-9.328 (68.95)	-7.602 (70.47)	-1.405 (1.058)	-1.257 (1.211)	-1.321 (1.145)
No children	-0.000709 (0.00714)	0.00168 (0.00635)	-0 (0)	4.166 (5.072)	3.311 (5.582)	7.457 (4.554)	-52.05 (54.99)	-21.39 (47.68)	-17.25 (48.39)	-0.614 (1.093)	-0.595 (1.236)	-0.544 (1.213)
Socio-economic controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Socio-spatial controls	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Constant	0.297*** (0.0128)	0.291*** (0.0147)	0.397*** (0)	-21.57** (8.833)	-19.28 (14.32)	26.50 (17.46)	3.451 (90.55)	74.93 (92.67)	59.44 (171.5)	8.924*** (1.845)	8.490*** (2.396)	6.290 (3.919)
Observations	96	96	96	87	87	87	71	69	69	86	84	84
R-squared	0.924	0.931	1.000	0.467	0.524	0.577	0.528	0.586	0.591	0.428	0.473	0.501

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 9: OLS Models Testing Local Policy Impact on Negative Externalities

INDICATORS VARIABLES	8: Quantity of Accidents			9: Frequency of Childwork			10: Waste Dispersion			11: Workday		
	22	23	24	25	26	27	28	29	30	31	32	33
Access to credits	0.621 (0.437)	0.660 (0.446)	0.624 (0.465)	-0.0145 (0.382)	-0.216 (0.324)	-0.150 (0.330)	0.201 (0.178)	0.176 (0.153)	0.180 (0.168)	-0.0867 (0.125)	-0.0971 (0.104)	-0.0928 (0.107)
Donation of tools and machinery	0.378 (0.234)	0.331 (0.279)	0.340 (0.277)	-0.0191 (0.164)	0.0829 (0.151)	0.0743 (0.151)	-0.161 (0.127)	-0.0811 (0.0909)	-0.0764 (0.0809)	0.0987 (0.0748)	0.0884 (0.0642)	0.0931* (0.0550)
Provision of tricycle	0.501 (0.609)	0.343 (0.613)	0.0588 (0.574)	0.429 (0.411)	0.503 (0.435)	0.618 (0.411)	0.230 (0.422)	0.320 (0.413)	0.196 (0.433)	0.422*** (0.145)	0.361** (0.152)	0.225 (0.146)
Provision of motorised vehicles	0.388 (0.729)	0.223 (0.822)	-0.147 (0.819)	0.706* (0.401)	0.781* (0.460)	0.879* (0.446)	0.148 (0.485)	0.349 (0.495)	0.228 (0.523)	0.302 (0.219)	0.137 (0.234)	0.00359 (0.202)
Recycle center	-1.733*** (0.470)	-1.802*** (0.480)	-0.898 (0.645)	0.0526 (0.234)	0.000525 (0.309)	-0.391 (0.545)	-0.568 (0.434)	-0.734* (0.438)	-0.499 (0.463)	-0.303** (0.147)	-0.321** (0.152)	-0.0604 (0.208)
Informal plot	1.889** (0.941)	2.196** (0.915)	2.102** (0.936)	0.0979 (0.301)	-0.0652 (0.300)	-0.0760 (0.267)	-0.145 (0.463)	-0.171 (0.545)	-0.142 (0.537)	-0.458 (0.337)	-0.411 (0.336)	-0.380 (0.310)
Institutionalisation of waste-pickers	-0.514 (0.666)	-0.425 (0.899)	-0.0313 (0.997)	0.173 (0.508)	-0.153 (0.489)	-0.488 (0.595)	0.120 (0.370)	-0.0305 (0.333)	0.145 (0.404)	-0.179 (0.246)	-0.337 (0.221)	-0.145 (0.236)
Coordination with waste lorry	0.273** (0.130)	0.257* (0.134)	0.201 (0.139)	-0.153 (0.126)	-0.151 (0.103)	-0.103 (0.115)	0.0770 (0.0575)	0.0414 (0.0639)	0.0254 (0.0634)	0.0254 (0.0398)	0.0390 (0.0353)	0.0212 (0.0373)
Waste-picker monopoly	1.230*** (0.390)	1.129** (0.456)	0.826 (0.548)	0.231 (0.365)	0.0565 (0.442)	0.222 (0.401)	-0.0649 (0.403)	0.0161 (0.421)	-0.0737 (0.366)	-0.0184 (0.141)	-0.125 (0.128)	-0.224 (0.137)
Regularisation of schedules	-0.290** (0.127)	-0.292** (0.138)	-0.340** (0.153)	0.0314 (0.0722)	-0.0141 (0.0828)	0.0231 (0.123)	0.150** (0.0712)	0.103 (0.0667)	0.0801 (0.0874)	-0.0156 (0.0328)	-0.0176 (0.0382)	-0.0424 (0.0426)
Promoting waste segregation	-0.119 (0.128)	-0.0785 (0.143)	0.0385 (0.135)	0.105 (0.0917)	0.0830 (0.0966)	0.0421 (0.0932)	0.0198 (0.0792)	0.000248 (0.0920)	0.0404 (0.111)	-0.0855** (0.0396)	-0.0685* (0.0380)	-0.0243 (0.0414)
Restrictions on work in landfills	-0.290 (0.251)	-0.289 (0.250)	-0.200 (0.287)	-0.0682 (0.130)	-0.0987 (0.116)	-0.137 (0.113)	-0.123 (0.0977)	-0.0659 (0.0879)	-0.0323 (0.0937)	0.0139 (0.0601)	0.00447 (0.0563)	0.0411 (0.0577)
Place to leave children (social network)	-0.876 (0.791)	-0.898 (0.720)	-0.635 (0.697)	-1.628*** (0.436)	-1.696*** (0.412)	-1.813*** (0.399)	-0.294 (0.373)	-0.229 (0.393)	-0.125 (0.391)	-0.222 (0.218)	-0.263 (0.195)	-0.149 (0.174)
Place to leave children (school/nursery)	0.0574 (0.840)	0.131 (0.798)	0.359 (0.782)	-1.051** (0.463)	-1.022** (0.460)	-1.117** (0.437)	-0.561 (0.464)	-0.122 (0.384)	-0.0219 (0.401)	-0.164 (0.245)	-0.219 (0.221)	-0.109 (0.203)
No children	-0.205 (0.787)	-0.443 (0.760)	-0.360 (0.748)	-1.138* (0.677)	-0.749 (0.680)	-0.640 (0.738)	-0.283 (0.413)	-0.227 (0.436)	-0.176 (0.459)	-0.0170 (0.235)	-0.0896 (0.214)	-0.0347 (0.193)
Socio-economic controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Socio-spatial controls	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Constant	1.946 (1.244)	0.911 (1.424)	4.663 (2.993)	1.031 (1.029)	1.602 (1.115)	-0.455 (2.328)	-0.436 (0.737)	-0.802 (1.017)	0.321 (0.769)	0.879** (0.362)	0.720* (0.398)	1.953*** (0.646)
Observations	96	94	94	75	73	73	96	94	94	96	94	94
R-squared	0.403	0.431	0.466	0.347	0.449	0.472	0.182	0.253	0.270	0.220	0.325	0.386

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

There is no single ‘silver bullet’ that can increase the sustainable performance of waste-pickers and reduce the negative externalities of waste-picking, but rather a combination of supportive policies is required. The most important municipal policies seem to be those that organize waste-pickers to improve the efficiency of the recycling system. This is particularly true for policies recognizing waste-pickers as a municipal service, that foster waste separation in households prior to collection, that provide guaranteed collection areas to waste-pickers and that facilitate the regularization of waste-pickers’ collection schedules. These are particularly relevant given the low-cost implementation of these types of support policies. Municipal policies should also further focus on increasing the capital endowments of waste-pickers, particularly the provision of a location for waste accumulation, assisting waste-pickers with access to motorized vehicles and providing machinery and tools for work. Finally, the provision of childcare facilities not only significantly reduces the occurrence of children at work, but also facilities work for female waste-pickers, having a positive impact on their productivity. Overall, the positive impact of supportive policies, increasing the results of all but one of our indicators, seems to confirm the accuracy of co-production theories in predicting the direction of policy intervention.

5 Conclusion: a supporting role for local governments

Three billion people currently living in cities lack access to any type of solid waste management system, leading to an ever-growing environmental and sanitization crisis (UNEP 2015). Waste-picking provides a spontaneous solution to accomplish ISWM while also bringing employment to vulnerable populations. The objective of this paper has been to analyze the role that local governments play in enhancing waste-pickers’ sustainable performance. The results suggest that higher levels of local governmental support can improve the sustainable performance of waste-pickers in collection rates, salaries and working conditions. This contradicts dualist, voluntarist and legalist predictions that there will always be a negative relation between government intervention and waste-picker performance.

Waste-pickers under co-production policies performed systematically better for our sustainability indicators, and the cooperatives working under repressive or dualist/voluntarist policies performed systematically worse. Weak support policies, put in place in the supportive and legalist municipalities, generally did not yield a significant difference for waste-picker performance. Similarly, some negative externalities were significantly reduced as consequence of supportive policies: the number of work-related accidents was reduced, and extensive workday lengths saw a decrease to legal levels. The results show that the predictions drawn from co-production theory have provided the most accurate theoretical framework for understanding the impact of municipal policies in Santiago de Chile.

The study has also drawn a number of support policy recommendations to improve waste management systems. The most significant findings of this paper are that policies must work towards a more organized picture of waste-pickers, through their institutionalization, fostering coordination with waste trucks, regularizing their collection schedules and promoting waste separation in households prior to collection. These are inexpensive measures that provide dramatic increases for waste-pickers' sustainable performance. The second lesson learned here is that municipal policies focused on increasing the more expensive strategy of capital endowments should aim to provide access to processing machines, upgrading to motorized vehicles and providing locations for waste accumulation. Finally, providing access to childcare alternatives is vital to allow the integration of female waste-pickers, in turn increasing collection rates and reducing the occurrence of children at the workplace.

The findings of this paper relocate the role of positive local government intervention as a central component in achieving sustainable waste-picking and moving towards more integrated and sustainable waste management systems in the developing world. Moreover, it opens up discussion about the reliability and relevance of a more positive involvement of local government to enhance the productivity of other informal economic sectors.

6 Notes

¹ We use also the term “Solid Waste Management” as it is commonly used by several authors (Dias 2016; Sharholly et al. 2008; Shekdar 2008; Velis & Vrancken 2015) to refer to a combination of several stages in the management of the flow of waste materials within the city and the region.

² Waste-pickers collect materials for recycling, removing 810 tons of waste from landfill each day (CONAMA 2005).

³ We would like to break down these five different theoretical approaches further, and particularly to address all the criticisms of co-production, but for the sake of operationalizing concepts and due to space constraints, in this paper we focus on the mainstream positions within each school of thought.

⁴ Lomnitz briefly speaks about waste-pickers in her study on Mexico “Cómo sobreviven los marginados”. She considers them to be a marginal group with weak or non-existent linkages with the formal economy. She particularly refers to waste-picking as a self-consumption strategy of intense utilization of waste as part of marginal populations’ strategy to adapt to a situation of scarcity of resources (p. 213). For instance, Lomnitz refers to waste-pickers as “...hunters and gatherers of the urban jungle...(who) wear used clothes, use empty cans as buckets to carry water to their homes, and cover their roofs with random materials found nearby... (Their) use of waste material can become a way of life” (p.91). Therefore, she conceives of waste-picking as an activity disconnected with the formal economy, one that is temporary and mainly survivalist (see also Medina 2007, p.14 for similar conclusions of this reading).

⁵ Birkbeck’s study in Cali (Colombia) reports that waste-pickers work for “industrial consumers” but are not hired by them, categorizing them as industrial outsourced workers (1978, p.1184). He explains that waste-picking provides an income for workers and inputs for the industrial (formal) economy (1979, p. 181). He links the demand for big raw materials from large companies to waste-pickers at the bottom of the hierarchy through a network of middlemen. He goes further explain that demand for raw materials is likely to increase waste-picker numbers (1979, p.1881). Through this formal-informal linkage, the formal industry avoids their social

responsibilities toward workers, while creating the illusion of enabling social mobility (1978, p1185). He establishes that “to some degree we can think of policies and programmes which would stabilize the work of the garbage pickers and marginally raise their income, at least in the short term”. Here, Birkbeck advocates for permanent organizations that are able to increase waste-pickers’ bargaining power to access waste and negotiate better prices. Birkbeck also considers that due to structural barriers (it is not possible to expect) any real improvement in waste-pickers’ livelihood. Demand and competition at the bottom prevent waste-pickers from establishing sufficient trust to organize and pool resources. Therefore, Birkbeck sees waste-picking as a means of labor exploitation: while he does in the short term recommend organizing, he has little faith that these changes can provide a long-term solution to exploitation.

⁶ In Medina’s book *The World’s Scavengers*, he explains waste-picking through a model of supply (caused by poverty) and demand (caused by industries’ needs for cheap substitutes), which are the two elements that presuppose a market’s existence (p.258). He states that this link plays an important role for the competitiveness of enterprises, and thus for economic growth. Medina (2007) is particularly optimistic that the formal-informal link can be mutually positive, since industries save on the costs associated with fixed capital, minimum wage, and regulations, while “research has found that workers paid by the piece are more productive than workers receiving wages” (ibid,p.260) – implying that waste-pickers can maximize their productivity and income. For Medina, waste-picker exploitation comes from two sources. First, from middlemen and corrupt leaders, and second, from the state applying repressive policies that Medina blames as the cause of waste-pickers’ poverty (ibid, p.257). He suggests that the route to the progress for waste-pickers is simply to eliminate these sources of exploitation, rather than through strong actions of support. Although he does discuss and recognize the link between waste-pickers and national and international recycling enterprises, he remains uncritical of the more structural link of exploitation that might exist in the formal-informal linkages, and completely silent regarding any type of public sector role in regulating this relationship, including the more active public sector actions of organizing, capitalizing or provide access to markets for waste-pickers. In his book, Medina explicitly mentions that supporting policies are necessary, but with little reference to exactly what he means by this or a more detailed

discussion of what types of policies should actually be implemented. He does explicitly mention bringing a rule-based, predictable and non-discriminatory system (p.263) to waste-picker activities that, in our view, rather equates to De Soto's (1989) policy recommendations of formalization, the free operation of informal entrepreneurs, and no further roles played by the public sector. Furthermore, he promotes market-based approaches of support, such as ending state subsidies for the consumption of raw materials to boost demand for recyclables. Although he briefly mentions the need for self-organization (p.265), source separation (p.266) and contracting waste-pickers for solid waste management at the end of his book, these represent rather marginal arguments. The more core arguments of his book are aligned with a supply-demand model where a free market for recycling and ending state/middlemen exploitation remain as the core policies for ending waste-picker poverty.

⁷ Sicular takes a detailed look at waste-picking in Bandung (Indonesia), identifying that waste-pickers collect materials for regular recipients (or middlemen) who in turn provide to large factories (formal-informal linkages). For the author, the poverty of waste-pickers is generated by their low payments that allow them to survive, but still trap them in poverty. He states that fully developed management systems are not adapted to the third world, and so calls for a flexible solid waste management system built on the existing network of waste-pickers. In this system, the consumer separates waste, cooperatives replace middlemen, and municipalities provide spaces for waste sorting and small processing facilities. This will lead to the provision of employment, higher incomes, and improved living and health conditions. We consider this interpretation of the failure of formal systems of collection and the potential for waste-pickers to fill the gap with governmental support can be interpreted as an early form of co-production (see also Jellinek 1993; Watson & Zerbe 1996).

⁸ Fergutz et al. (2011), along with describing the creation and evolution of a strong national association of waste-pickers that negotiates with enterprises and governments, describe emerging initiatives of support for waste-picker organizations through multi-stakeholder partnerships including communities, private enterprises and local governments. The authors analyze co-production initiatives in the Brazilian cities of Londrina – including door-to-door collection, the creation of sorting centers, transport with municipal trucks, and setting regular collection

schedule – and Salvador, where Wal-Mart has facilitated recycling “stations” where clients can bring their recycling materials. Additionally, they report the creation of national funding schemes that are available to cooperatives from financial institutions.

⁹ Wilson et al. (2006) point out that in Cairo, under the Zabbaleen Environment and Development Program financed by the Ford Foundation, the World Bank, Oxfam and others, waste-pickers were supported to upgrade their neighborhood infrastructure, to build a small industrial project with investment in processing machines, to expand their access to credits, plus obtained the right to collect a fee from users. The authors propose that current productivity initiatives must be complemented with social development programs, including access to schools and health systems.

¹⁰ Dias (2016) reports three case studies – Belo Horizonte (Brazil) Bogotá (Colombia) and Pune (India) – of increasing support to waste-picker organizations. Waste-pickers have been formalized, the municipality has promoted waste segregation at the source, programs for vehicle upgrading have been incorporated, equipment has been purchased and payments for the environmental benefits of waste-picking have been added on top of their regular income. The informal-public sector partnership and policies supporting the provision of a public service are characteristic of co-production approaches.

¹¹ The Latin American report of Perry et al. (2007) recommends policies of “carrots (to the formal economy) and sticks (to the informal economy)”. From a policy analysis point of view, we consider this to translate into more repressive actions toward the informal economy and expansion of formal solid waste management, which has already been proposed by dualist theory. Therefore, we think that in spite of the radically different conceptions of dualist and voluntarist theory, their ultimate policy recommendations are very much alike. Thus, in terms of the questionnaire design and later econometrical analysis, we frame the Dualist and Voluntarist Schools as comprising a single-policy approach toward waste-picking.

¹² The co-production municipality in our study has promoted the incorporation of waste-picker cooperatives on

the grounds of their social inclusion and redistribution of income toward vulnerable populations. In the municipality of La Reina, the waste-picker cooperative has been a relevant actor regarding policy from the outset, and had receive support to grow (for instance, it has gained municipal legal recognition and statutes that guarantee democratic representation), with a number of municipal investments being made to improve their economic returns, working conditions and environmental performance (see Table 3). In this sense, it is an example of policy design from below funded by municipalities from above (Meagher 2013). The empirical results of this study should therefore be associated with a supportive and more mainstream type of co-production that aims for the favorable incorporation of waste-pickers into waste management systems by bringing them to the policy table, rather than perceiving them as a cost-cutting strategy for public service provision that exploits waste-pickers as cheap labor (Miraftab 2004, Samson 2007, Fahmi 2010).

¹³ More critical reviews of co-production have argued that the unequal economic and power relations between formal and informal actors might lead waste-pickers to a situation of adverse incorporation and prevent a more transformative agenda. Empirical studies have shown that co-production has been used simply as a discourse of empowerment, in reality masking a cost-cutting strategy for municipal solid waste management where waste-pickers are exploited as cheap labor (Chen 2006, Meagher 2013, Miraftab 2004, Fergutz et al. 2011). Moreover, authors have underlined NGOs as intermediaries that are not necessarily able to balance the unequal power of informal workers, but can rather be used by the state to advance their own ends (Zerah 2009), or even to advance their own agenda by claiming to be the representatives of the interests of the poor (de Wit & Berner 2009). Furthermore, authors have raised concerns about the capacity of co-production to be an effective grassroots political strategy, as it fundamentally seeks to accommodate them within the system as it stands, rather than having a more fundamentally transformative agenda (Dias 2016).

¹⁴ We have decided to separate co-production from the Legalist School. The more mainstream co-production approaches to the informal economy, as well as empirical papers on waste-pickers (Joshi & Moore 2004, Booth 2011, Fergutz et al. 2011, Dias 2016, Wilson et al. 2006), describe an approach that is rather supportive, and with

the strong involvement of waste-pickers themselves in policy design. Although this does not eliminate the potential for unequal power relationships regarding policy design, we consider this to suggest a strong involvement of local governments in supporting waste-pickers through a large range of policy interventions in terms of organization, capital acquisition and the reduction in negative externalities. This contrasts with the legalist policy approach, which focuses mainly on the legalization of the activity, with a rather marginal role for local governmental action, translating into an approach of neglect or tolerance toward waste pickers.

¹⁵ Our analysis includes four cooperatives, offering a way for us to control for waste-pickers' organization when analyzing policy impacts. Nevertheless, a discussion about the role of social movements, their capacity to put pressure on local governments and therefore the agency of organized waste-pickers to shape policy outcomes for a more inclusive policy environment remains a relevant topic, deserving further detailed research. In the case of this particular paper, we do not address these topics, as our aim is to compare policy impacts rather than enter into a detailed discussion of the ways in which policies are shaped, and thus they lie outside the scope of this research.

¹⁶ Waste-pickers in Santiago are organized under the cooperative “Esfuerzo y Progreso”. Until 2013 (the time of data collection) policies in the Santiago Centro municipality were discouraging waste-pickers from collecting recyclable and reusable materials by restricting collection schedules (from 8pm to 8am), as well as imposing stricter identity controls in the streets and in informal street markets, thus resulting in the displacement of waste-pickers.

¹⁷ At the time of the data collection, the waste-picker cooperative “Las Hormiguitas” in Maipú operated in a laissez-faire policy environment. Although they were legally recognized by the municipality as an “organización social” (social organization), no further policies of support or repression towards their activities were put in place.

¹⁸ Cerrillos has supported waste-picker to organize in the local cooperative “Oresteplat”. On top of this, their primary support is to set ‘*operativos de recolección*’ (collection operatives) – a collection day every two weeks,

during which locals are permitted to leave unwanted items and recyclable materials outside their homes which can then be collected by workers from the waste-picker cooperative. No further support was provided to this organization, as this was seen as a temporary solution based on social aid rather than a more transformative local policy.

¹⁹ Since 2008, La Reina has promoted the social inclusion of self-organized waste-pickers in their recycling strategy. Toward this end, a multi-stakeholder platform was established, bringing together the local waste-picker cooperative (CREACOOOP), the NGO Avina, Universidad del Desarrollo and the municipality. As the waste-picker cooperative grew in its influence and organization since the beginning stages of policy design, it now proposes the majority of new local policies, and is backed up by the municipality in terms of finance and implementation. The municipality has been key to strengthening this organization over time, by helping them to become legally constituted, providing legal assistance and lobbying for central government funding for small and large capital investments.

²⁰ Unfortunately we do not have sufficient data to provide a cost-efficiency evaluation of co-production policies compared with other dualist/voluntarist, structuralist, and neoliberal approaches. Therefore, the results of our policy regression analysis should be taken as reflection of policy effectiveness rather than value for money.

²¹ All possible pairs are tested in this step.

²² Bonferroni corrections are used as they provide a rather conservative estimate, showing that differences among cooperatives must be substantially large if they are to manifest as significant differences.

²³ Quantitative analysis is reported along with qualitative evidence, primarily in the form of basic reportage using transcripts from interviews and focus groups.

²⁴ Our cross-section data allow us to regress controlling for a number of variables (5 individual and 3 municipalities characteristics). These variables control for the potential correlation of place- and individual-specific variables on the outcome of interest, given the effect of the policies on the sustainability indices proposed in our paper. As in any cross-sectional paper, we cannot rule out the possibility that other omitted variables may

be correlated with our outcome of interest., and therefore we do not claim a causal effect.

7 References

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