Active and Passive Waste in Government Spending: Evidence from a Policy Experiment*

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Abstract

We propose a distinction between active waste (a situation where the presence of waste benefits the public decision maker, as in the case of bribery) and passive waste (pure inefficiency, possibly due to excessive red tape). We analyze purchases of several standardized goods by over 200 Italian public bodies and exploit a policy experiment that introduced a national procurement agency. A revealed preference argument implies that the decision to buy from the new procurement agency rather than from traditional suppliers can be used to distinguish between active and passive waste. Our results indicate that: (i) Different public bodies pay widely different prices for observationally equivalent goods, with centralized bodies paying on average at least 25% more than semi-autonomous bodies; (ii) Price differences are mostly due to passive rather than active waste – on average passive waste accounts for 79% to 92% of estimated waste; (iii) There is no trade-off between passive and active waste.

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1 Introduction

How efficient is government in providing public services? The answer to this question should inform our decision of whether to provide the service and in what form. In particular, it should impinge on the choice between direct public provision and outsourcing to private contractors (Hart et al., 1997).

A key related question is what determines how efficiently a certain public service is provided. This paper proposes a framework and a test to assess the relative importance of *active waste* and *passive waste*. This dichotomy has been present, in various forms and with different names, in discussions of the role of government at least since Buchanan and Tullock (1962, Chapter 18). Our contribution is to develop a formal framework and provide quantitative evidence.

Active waste is such that its presence entails direct or indirect benefit for the public decision-maker. In other words, reducing waste would reduce the utility of the decision-maker. The classical example is corruption in procurement, whereby the public official inflates the price paid for a certain good in exchange for a bribe. Active waste is perceived to be a key issue in public management. For some, it is even *the* key issue. It makes, for instance, the top four list on the World Bank's Challenge to Reduce World Poverty: "Combat corruption, or there is not much that can be done that is effective."

Passive waste, in contrast, is such that its presence entails disutility for the public decision-maker. In other words, reducing waste would (weakly) increase the utility of the decision maker. In this case, the decision-maker is not averse to reducing waste but, for some reason, she is not able to do so. In his critique of public procurement practices in the US, Kelman (1990) offers several examples where substantial waste was generated by excessive and unreasonable rules. For instance, the US army had a complex procurement protocol which applied to all goods and services. When applied to simple day-to-day goods, the protocol produced absurdly inflexible procurement procedures that resulted in both high prices and low quality.[1]

Knowing whether active or passive waste is responsible for the cost of government services is important for policy purposes.[2] Kelman (1990, 2005) argues that fighting the kind of passive waste he identifies in US federal procurement requires giving

[1] Examples abound, the reader can consult, e.g., the tender document for the procurement of chocolate cookies and brownies to the US army (available at http://www.dscp.dla.mil/subs/support/specs/mil/44072.pdf at the time of writing).

[2] We assume that we are in a second-best setting. If it were possible, it would always be optimal to give the decision-maker a claim on the residual of the government activity. However, this is usually not possible because of risk aversion, limited liability, or an inability to measure and monetize ex ante the government's objectives.

public officials more discretion and more empowerment. Instead, the presence of active waste typically calls for stricter rules and external controls.

Identifying active and passive waste from observed costs of public services is challenging as both forms of waste result in high costs and are thus observationally equivalent. Our identification strategy consists in finding a policy experiment that affects the behavior of public bodies differently, depending on whether most of their waste is active or passive.

We analyze procurement purchases by a representative sample of Italian public bodies over the period 2000-2005. Our dataset contains detailed information on the purchase of 21 generic goods. For each purchase, this includes quantity, brand, model, specifications, delivery conditions, and – most importantly – the price paid.

Two features of the data make it well suited for our purposes. First, procurement of generic goods is ideal because generic goods, such as printers and gasoline, are standardized, produced by a handful of firms and purchased by several public bodies. This allows us to measure waste as the difference in prices paid for the same goods across the public sector. Second, Italy is an appropriate testing ground for theories about public administration, because of the high level of heterogeneity among public bodies. Public bodies differ by geographical location (and hence possibly culture), size and governance systems, all dimensions that can affect both active and passive waste.

To identify active and passive waste we exploit a change in the Italian procurement system that created a policy experiment. The experiment introduced a centralized procurement agency, Consip, that supplied the same good to all public bodies at the same price, thus effectively eliminating public body-specific active waste.

We develop a simple theoretical framework to illustrate that the choice to buy from Consip provides evidence on whether differences in cost structures are due to active or passive waste. A revealed preference argument suggests that if public bodies with higher costs are less likely to switch to the central agency, it is an indication that they benefit from waste, namely the difference in costs is due to active waste. Vice-versa, if public bodies with higher costs are more likely to switch, it is an indication that they suffer from waste, namely waste is passive. The strategy relies exclusively on the fact that, by definition, the utility of the public decision maker is increasing in active waste and decreasing in passive waste. The identification is unaffected by the potential presence of waste in Consip itself, as it only relies on the fact that Consip treats all public bodies equally.

The empirical analysis exploits two sources of variation. First, we observe the same public body purchasing several goods at several points in time. Second, we observe the same good being purchased both when it can be feasibly purchased from

Consip and when not. We are thus able to estimate the average price paid by each public body when buying on the open market and the decision to switch to Consip when it is feasible to do so.

Our main findings are as follows. First, the average prices paid by different Italian public bodies vary substantially. The public body at the 90th percentile of the fixed effect distribution pays on average 55% more than the one at the 10th percentile. If all public bodies were to pay the same prices as the one at the 10th percentile, sample expenditure would fall by 21%; if we do not include public bodies below the 10th percentile for which savings are negative, sample expenditure would fall by 27%. Since public purchases of goods and services are 8% of GDP, if sample purchases were representative of all public purchases of goods and services, savings would be between 1.6% and 2.1% of GDP.[3]

Second, our reduced form estimates indicate that bodies that were spending more when buying from Consip was not feasible are more likely to buy from Consip when they are given the chance. Within our theory, we interpret this finding as an indication that passive waste plays a more important role than active waste in explaining price differences among public bodies.

Third, we bring our model to the data and, making specific functional form assumptions, we quantify the extent of active and passive waste for each public body in our sample. The model estimates indicate that on average 79% to 92% of estimated waste is passive and that passive waste accounts for the majority of waste in at least 85% of our sample public bodies. Recalling that the public body at the 90th paid on average 55% higher prices than the public body at the 10th percentile, our estimates indicate that, at the average values, if passive waste were eliminated the difference would be at most 10%.

Fourth, differences across public bodies are correlated with institutional characteristics rather than geography or size. Semi-autonomous bodies (universities and health authorities) pay the lowest prices. Compared to these, the average town government pays 11% more. The difference increases further for regional governments (20%), social security institutions (24%), while the average ministry tops the list with 41% higher prices. Overall, the results indicate a clear price ranking with semi-autonomous bodies at the bottom, local governments in the middle and centralized state administration at the top.

Fifth, the difference among the three classes of public bodies is entirely due to passive waste. That is, compared to central public bodies, more autonomous public bodies have less passive waste and the same level of active waste. This indicates that

[3] In the conclusion section, we present some (limited) evidence that such wide disparities between prices paid by different public bodies are observed in the UK as well.

in our sample there seems to be no trade-off between rules and discretion. To the extent that giving autonomy to purchasing managers in central public bodies would make them behave like their counterparts in universities or health authorities, our evidence indicates that more discretion would not lead to higher active waste.

Overall our findings are consistent with the hypothesis that, in aggregate, most waste in the procurement of generic goods by the Italian public sector is not due to corruption but to inefficiency. Our results do not in any way imply that corruption is not an important issue in public procurement in Italy. They just indicate that passive waste seems to have an even larger effect.

Empirical economic analysis of government inefficiency and corruption can be divided into two strands, according to whether it makes use of opinion surveys or direct measurements of outcomes.[4] The second approach, to which our paper belongs, is less developed and more recent. Examples include Di Tella and Schargrodsky (2003), Reinikka and Svensson (2004), Olken (2006, forthcoming), Bertrand et al. (2006), Fisman et al. (2006), Fisman and Miguel (2006), Hyytinen et al. (2006).

The paper that is closest to ours is Di Tella and Schargrodsky (2003), who study prices paid for a number of basic inputs by hospitals in Buenos Aires in the 1996-97. During that period there was a crackdown in corruption involving hospital audits. The authors estimate that average prices paid by hospitals went down 10% as a result of the crackdown. The authors also find a significant (and negative) effect of public managers' wages on the prices paid by hospitals, which is consistent with the theory of corruption by Becker and Stigler (1974).[5]

Within the direct-measurement approach, our paper offers a number of original contributions (besides developing the theoretical distinction between active and passive waste). Most importantly, the Consip natural experiment allows us to distinguish empirically between active and passive waste. Second, our data provides comparable measures of waste for a number of public bodies which differ by mode of governance, geographical location, and size. This allows us to see how waste depends on institutional arrangements. Lastly, our sample is representative of an amount of public spending corresponding to 2.5% of Italy's GDP, and hence our estimates have large-scale implications, even without making claims on their external validity.

The remainder of the paper is organized as follows. Section 2 provides information on the context and the policy experiment. Section 3 presents the theoretical framework. Section 4 discusses the methodology and the empirical findings. Section

[4] See Rose-Ackerman (1999) and Svensson (2005) for surveys. See also Auriol (2006) for a recent contribution that studies capture and extortion in public purchase.

[5] In the conclusion, we will compare our findings to Di Tella and Schargrodsky's (2003) results. Our estimates of active waste in the Italian public administration are not dissimilar from theirs.

5 concludes.

2 Institutional Background and the Policy Experiment

Italy is an ideal testing ground for theories about public administration, because of the high level of heterogeneity among public bodies. There is a high degree of diversity in institutional arrangements both in terms of the type of law that is applicable (public law or private law) and in terms of modes of governance (political appointment, election, managerial hiring). Broadly, one can identify three models of public bodies in Italy with substantial differences in terms of autonomy and accountability:

- Napoleonic bodies. Until 1948, the Italian public administration functioned as a monolithic organization, where the central government took all the important decisions which then trickled down to the periphery through a well-defined hierarchy of bodies. As we shall see, this mode of governance is now far from universal. However, it still survives in the central administration (the one which depends from the national government). The prototypical Napoleonic body is the ministry, which is typically headed by a career politician who is part of the current government, the minister. In practice, the operations of the ministry tend to be controlled by entrenched civil servants.

- US-style local bodies. The 1948 Constitution instituted three tiers of locally elected bodies: regions, provinces, and towns. Major changes occurred in the 70s which led towards more autonomy. Since the end of the 90s, the CEOs of local public bodies (the region's governor, the province's president, and the town's mayor) have been elected directly and have broad powers. The region/province/town council cannot remove the CEO without calling for new elections. As in the US, local elections tend to focus on practical local issues and candidates' personalities, rather than national ideological positions.

- Semi-autonomous bodies. In the last two decades, a number of Napoleonic bodies have been transformed into semi-autonomous agencies. The most important example comes from the health system. While the system is still publicly funded, the provision is delegated to about 200 local health authorities. Each health authority is headed by a director general, appointed by the regional government, who has a standard private law employment contract. Also the other high-level managers working in health authorities have private-sector

contracts. Each health authority enjoys substantial budgetary and administrative autonomy.[6]

At a more informal level, Italian public bodies may be affected by local culture. Putnam (1993) and several other authors have argued that there are structural differences in the social capital between the South and the North. Ichino and Maggi (2000) have documented systematic output differences for the same private organization (a bank) between branches located in the North and in the South. Finally, public bodies also vary in size, which can also affect active and passive waste. For instance, bribes might be easier to hide in purchases made by large public bodies but these could also pay lower prices because of bulk discounts. Large public bodies may also be more bureaucratic, which could be correlated with passive waste.

2.1 Public Procurement

To understand what drives government efficiency in different public bodies, it is useful to study an activity which is common to all public bodies. The purchase of standard commercial goods is a natural choice.

Public spending for goods and services accounts for a sizeable share of GDP in all OECD countries. The average share in the 90s was 8.8% in the US, 13% in the UK (Audet, 2002).[7] The figure for Italy is 8%, or 125 billion euros in 2006. Of this, 40% is spent on generic goods such as desktops, paper, and telephones, which are the focus of this paper.

Public spending for goods and services is regulated by procurement law. For purchases valued at 130,000 euros or above, the procurement market is regulated by a EU Directive, applicable to all public bodies as well as private undertakings.[8] Public purchases below the EU threshold value are governed by national legislation, within the limits of which each public body is allowed to adopt its own rules.[9] The

[6] For the purpose of this research, we put universities in the category of semi-autonomous bodies. While the central government sets nation-wide rules regarding professorial salaries and promotion criteria, individual universities have full control of day-to-day activities and can raise funds. University presidents are elected by the university staff.

[7] These figures reflect total expenditure for consumption and investment goods, minus employee compensation. Excluding the defense sector, the shares are 6.2% for the US, 10% for the UK and 7.4% for Italy. See Audet (2002) for details.

[8] Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts.

[9] For central public administrations see Regio Decreto RD 827/24 (1924). For local administrations see Decreto Legge DLGS 267/00 (2000). For semi-autonomous bodies see Decreto Legge

legislation is specific to the type of public body, and it distinguishes between central, local and semi-autonomous bodies.[10]

In general, within each public body there is a purchasing manager responsible of procuring the goods and services that other members of the public body need. In some instances, this is the person who has to find directly a supplier, think of telephony services for the entire organization. For this reason, the purchasing manager establishes close relationships with suppliers and their local representatives. In some other instances, this person may just be sent purchasing orders for approval, think of a single specific PC needed by an academic.

In all cases, purchasing managers are responsible for ensuring that purchases are in line with procurement law. The purchasing manager therefore has to be familiar with the various pieces of legislation and regularly informs the other members of the organization of the relevant purchasing procedures.

2.2 The Policy Experiment: Consip

In the late 90's, the Italian government launched a program to reduce public expenditure for goods and services. A key component of this program was the creation of a central procurement agency, Consip, whose purpose is to coordinate the procurement of commonly purchased goods and services.[11] The rationale behind Consip is twofold. First, since contracts, tender documents, and eventual litigation, are centralized, Consip can save on transaction costs. Second, compared to individual public bodies Consip has more buyer power that can be exploited to obtain lower prices.[12]

In essence, Consip procures goods and services via *framework agreements.* These are general contracts between a procuring entity and a supplier for the delivery of goods and services within a certain time frame at specified price and conditions.

DLGS 502/92 (1992).

[10] It is impossible to provide a precise mapping of these transpositions, as they differ by public bodies even within the same institutional class. For instance, within the Central Public Administration there are rules that differ even by type of Ministry.

[11] Consip is a limited liability company totally owned by the Italian Treasury. It was established in 1998, initially to provide technical advice to the central public administration in the area of Information Technology (IT). From the year 2000 it was further assigned the role of a central purchasing body. It initially started on a small scale and has increased its size over the years. At the end of 2005 it employed approximately 500 people (290 in IT, 160 in procurement, 50 staff). The operations are wholly Italy-based and are carried out mostly in Rome.

[12] Central purchasing units exist in most European countries. To name a few, SKI in Denmark, Hansel in Finland, Ugap in France, Bescha in Germany, Statskontoret in Sweden, OGC Buying Solutions in the UK. For a full list see http://www.ks.dk/english/procurement/guide/cpo-countries/

Public bodies can buy the goods or services specified in the contract, at the terms and conditions specified therein. Goods can be purchased on-line from the Consip catalog or ordered via fax or phone. From the point of view of a public body, these agreements are a set of pre-tendered contracts with a range of suppliers from which public sector customers can purchase goods and services.

Consip agreements typically cover generic goods such as office stationery, office furniture, IT products and services (e.g., software, PCs, printers), utilities (gas, telecoms), payment cards (e.g., fuel cards, meal coupons). The products and the quantities to be purchased are determined by the Treasury in each budget year. Once the type and amount of goods to be procured are identified, Consip calls for tenders. In practice, Consip typically adopts procurement auctions that award the contract to the cheapest price or to the most economically advantageous offer.[13]

Consip agreements typically cover the supply of up N units that can be sold in a certain period, until a final date T. Within these limits, the agreement is said to be "active" and the selected provider commits to fulfill any order at the terms of the contract. Consip does not commit to buy any units, so that if no public body puts an order, no single unit is sold. The Consip website, provides information on the state of each agreement, from the tendering stage to the expired/exhausted stage.

After initial pilots in 2000, Consip established 70 agreements concerning more than 40 product categories in the period up to the end of 2005. To benchmark the relevance of Consip in public procurement, consider that the total value of purchases of products and services made from the Consip catalog was €14 billion, that is 12% of total procurement expenditures in 2005. The value of purchases of the same products and services from other sources was €26 billion, or 22% of total procurement expenditures in 2005. Thus, conditional on a product being offered, the value of Consip purchases accounted for a third of the value of total purchases of that product.

The key feature for our identification strategy is that public bodies can choose whether to buy from Consip or on the open market. The precise extent to which they are free to choose varies somewhat by year and by institutional class as specified in the Budget Act. This choice was entirely free for all public bodies in 2004 and 2005. Conversely, all public bodies were required to buy from Consip if an agreement for an equivalent good was active in 2003. This requirement applied to Central public bodies also between 2000 and 2002, while all other public bodies were free to choose during that period.[14] In practice, even when public bodies were formally required

[13]Since the purchases are substantial in monetary value and well above the EU threshold of 130,000 euro per purchase, the procurement rules that apply to Consip are primarily to be found in the EU public procurement law.

[14]In 2002, Consip-determined prices (that is, the prices of the framework agreement) became a

to buy from Consip, off-Consip purchases could be justified if goods with different characteristics were needed.

3 A Model of Active and Passive Waste in Procurement

Consider a purchasing manager working for a public body. He receives requests for goods and services from various parts of the organization and he procures the requested products from commercial producers.

Let us first examine the situation when Consip is not present. Suppose that at a certain time t the manager working for public body i must purchase a certain quantity of a fully specified good g. The total price that the manager pays for this good is denoted with:

$$p_{igt} = f_{igt}\left(b_{igt}, \mu_i\right),$$

where $b_{igt} \geq 0$ is a variable under the control of the manager, which represents the direct benefit (i.e., a "bribe") that the manager receives for that transaction. The other argument of the price function, μ_i, is an exogenous variable which represents the "inefficiency" of the manager in organization i. The final price p_{igt} is an increasing function of both b_{igt} and μ_i. We will discuss the nature of b_{igt} and μ_i shortly.

The purchasing manager has the following objective function

$$\Omega_{igt} = -p_{igt} + \beta_i b_{igt},$$

where β_i is the active waste propensity parameter for public body i.

The purchasing manager feels a pressure to keep prices low. This may be because he is genuinely motivated to save public money or because he knows that he will face negative consequences if he overpays. The purchasing manager may also like bribes. That happens when $\beta_i > 0$ (β_i can also be negative, representing a manager with moral scruples, who will in equilibrium choose $b_{igt} = 0$).

Our two key parameters are β_i and μ_i, and it is worth spending some words about their interpretation. We assume that public bodies have persistent differences, due to cultural, institutional, or historical characteristics.[15]

In this context, the parameter β_i is best interpreted as a set of norms that is conducive to active waste. For instance, the risk of prosecution may be higher for

benchmark for all public bodies. If a public body bought a Consip-available good not from Consip, it had to be because it was cheaper to do so, unless the public body took the responsibility to state that the characteristics of the Consip-supplied good did not satisfy their needs.

[15] Manager i's objective function contains a normalization. One could add a multiplicative para-

certain public bodies than for others because of a culture of whistleblowing. A higher risk of prosecution means that bribes are less appealing (for instance β_i can incorporate a probability of getting caught that is linear in the amount of bribe received). The passive waste parameter μ_i may come from a variety of sources. Following Kelman (1990, 2005), one may suspect that excessive regulatory burden may make procurement cumbersome and increase the average price that the public body pays. Red tape in turn depends on the mode of governance of the public body, which – as we argued early – varies greatly within the Italian public administration.

While we make a number of assumptions for expositional matters, our main results rely mainly on one feature of the model, namely that active waste provides a direct benefit to the purchasing manager (through $\beta_i b_{igt}$) while passive waste does not. In particular, we could extend our model to let passive waste be endogenous too (see Appendix), in which case the purchasing manager would decide both the amount of bribe that he gets and the amount of effort that he puts in.

What is the equilibrium when Consip is not present? The manager determines price $\hat{p}_{igt}$ and bribe $\hat{b}_{igt}$ through the first-order condition (we make the standard assumptions on differentiability and concavity of the function f_{igt}, and suppose that the non-negativity constraint on the bribe is not binding):

$$\frac{\partial}{\partial b_{igt}} f_{igt}\left(b_{igt}, \mu_i\right) = \beta_i.$$

The equilibrium payoff for the manager is

$$\hat{\Omega}_{igt} = -\hat{p}_{igt} + \beta_i \hat{b}_{igt}.$$

We then have our first result:

Proposition 1 *If there is no Consip deal, the price paid by public body i is an increasing function of both the passive waste parameter μ_i and the active waste parameter β_i.*

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meter π_i in front of the price, as follows:

$$-\pi_i f_{igt}\left(b_{igt}, \mu_i\right) + \beta_i b_{igt}.$$

Such parameter indicates the relative strength of the price reduction component. This objective function is equivalent to one where

$$-f_{igt}\left(b_{igt}, \mu_i\right) + \frac{\beta_i}{\pi_i} b_{igt}.$$

Therefore, we can normalize π_i to one without loss of generality. Our active waste parameter β_i must then be interpreted as the active waste propensity relative to price reduction propensity.

This result highlights the inability to identify the cause of waste from price data alone. A high price can be due to passive waste or active waste.

How do things change when we add Consip to the picture? We make two assumptions: (i) The price that Consip charges for good g at time t is the same for every public body (and it is denoted with p^c_{gt}); (ii) If manager i buys from Consip, he receives no bribe. We do not make any assumption on the process through which the Consip price p^c_{gt} is generated or whether the Consip price is better or worse than the off-Consip prices. In particular, our results are valid as stated even if Consip itself is subject to active and passive waste. Our identification strategy relies exclusively on the fact that Consip treats all public bodies in the same way.

Manager i's payoff if he buys from Consip is

$$\hat{\Omega}^c_{igt} = -p^c_{gt} + \nu_{igt},$$

where ν_{igt} is some idiosyncratic preference for Consip with continuous distribution over the real line.

When Consip is present, the purchasing manager has the option to buy off-Consip. However, the off-Consip price function may be different from the price function that the manager faced before Consip appeared. This could be due to a number of reasons. The presence of a Consip reference price may make off-Consip prices more competitive. Also, the bargaining power in the active waste relation may be altered (the purchasing manager may have to agree to a lower price in order to obtain the same bribe). We take the most general view and we assume that the new price function is different from the previous one (we denote it as $\tilde{f}_{igt}$ instead of f_{igt}). The only maintained assumption is that $\tilde{f}_{igt}$ is increasing in both b_{igt} and μ_i. Hence, the total price that the manager pays if he buys off-Consip is

$$p_{igt} = \tilde{f}_{igt}\left(b_{igt}, \mu_i\right).$$

The presence of Consip may also create additional payoff effects that do not work through price. For instance, a purchasing manager may feel pressured into buying from Consip in order not to appear corrupt. Or the risk of getting caught taking a bribe is now higher. We capture this through an additional term $h\left(p^c_{gt}, b_{igt}\right)$ (which is likely to be negative). In particular, it could be the case that $h\left(p^c_{gt}, b_{igt}\right) = -\delta_g - \theta b_{igt}$, indicating that a manager who chooses to buy off-Consip incurs a fix stigma plus an additional risk of prosecution that is increasing in the amount of kickbacks he receives.

In sum, the utility of a manager who buys off-Consip when a Consip deal is available is

$$\Omega^n_{igt} = -\tilde{f}_{igt}\left(b_{igt}, \mu_i\right) + h\left(p^c_{gt}, b_{igt}\right) + \beta_i b_{igt}.$$

As before, the manager chooses b_{igt} to maximize Ω^n_{igt}. We assume that $\tilde{f}$ and h are smooth and satisfy the standard conditions for the existence and uniqueness of an interior solution. The maximal payoff is denoted with $\hat{\Omega}^n_{igt}$.

Thus, when Consip is present, the manager chooses between buying from Consip and getting payoff $\hat{\Omega}^c_{igt}$ or buying off-Consip and receiving payoff $\hat{\Omega}^n_{igt}$. We can now state:

Proposition 2 *If a Consip deal is active, the probability that public body i buys from Consip is an increasing function of the passive waste parameter μ_i and a decreasing function of the active waste parameter β_i.*[16]

P roof. The manager buys from Consip if $\hat{\Omega}^c_{igt} \geq \Omega^n_{igt}$. The probability that he buys from Consip is then given by

$$\Pr\left[\nu_{igt} \geq p^c_{gt} + \hat{\Omega}^n_{igt}\right].$$

Note that p^c_{gt} does not depend on μ_i and β_i, and that $\hat{\Omega}^n_{igt}$ is increasing β_i and decreasing in μ_i. To see this, apply the envelope theorem to

$$\hat{\Omega}^n_{igt} = -\tilde{f}_{igt}\left(\hat{b}_{igt}, \mu_i\right) + h\left(p^c_{gt}, \hat{b}_{igt}\right) + \beta_i \hat{b}_{igt}.$$

We have

$$\begin{aligned}
\frac{\partial \hat{\Omega}^n_{igt}}{\partial \mu_i} &= -\frac{\partial}{\partial \mu_i}\tilde{f}_{igt}\left(\hat{b}_{igt}, \mu_i\right) < 0; \\
\frac{\partial \hat{\Omega}^n_{igt}}{\partial \beta_i} &= \hat{b}_{igt} > 0
\end{aligned}$$

which proves the statement. ■

Proposition 2 captures the essence of the distinction between active and passive waste, and it can be understood as a classical revealed-preference result. A higher β_i denotes a situation where the manager can benefit more from active waste. This corresponds to an improvement of his choice set, which can only make him better off. Instead, a higher μ_i corresponds to a worsening of the manager's choice set: for every b_{igt} he chooses he gets less utility. Thus, an increase in β_i makes off-Consip purchases more appealing and an increase in μ_i makes them less appealing. Our basic argument requires only an assumption on the monotonicity of the choice sets

[16] The probability of switching is a constant function of β_i when $\beta_i < 0$.

and it applies to a class of models that is much larger than the one which we consider in this simple set-up.

Proposition 2, combined with Proposition 1, permits identification of the source of waste. Take a public body that used to overpay for a certain good g before Consip arrived. If the body switches to Consip, we should be more likely to conclude that it was passive rather than active waste. We can make this point in a stark way by considering the two polar extremes. If all public bodies are perfectly efficient ($\mu_i = 0$ for all i), then we know for sure that there exists a positive relation between the price paid before Consip arrived and the probability of switching to Consip. Figure 1 (a) depicts this case. If instead all public bodies are perfectly honest ($\beta_i = 0$ for all i), then we know for sure that there exists a negative relation between the price paid before Consip arrived and the probability of switching to Consip (see Figure 1 (b)).

4 Data and Methodology

4.1 Data Description

We analyze data on procurement purchases of generic goods made by a sample of Italian Public Bodies (PBs) between 2000 and 2005. The data was collected in a survey designed and implemented by the Italian Statistical agency (ISTAT) in three rounds, administered yearly between 2003 and 2005.

The survey covers a broad range of generic goods, such as office supplies and furniture, computers and utilities. Sample goods were chosen on the basis of three criteria: (i) comparability, that is homogeneous goods whose price depends on a few observable characteristics, (ii) diffusion, that is goods that are purchased by most PBs, and (iii) relevance, that is goods that account for a sizeable share of the budget for most PBs.

The survey was administered to the office clerk responsible for receiving, paying and filing invoices in each PB. The respondent was asked to report the unit price, the date of purchase, the quantity purchased and several characteristics of each good.[17] A list of the sample goods and the available characteristics is reported in Appendix 2. For durable goods, e.g., computers, the manager was asked to report each purchase made in the five years before the survey. For non-durable goods and for services, e.g., landline contracts, the manager was asked to report information on the last purchase only.

[17] Copies of invoices were collected from a sub-sample of public bodies to cross-check the accuracy of responses.

The survey was administered to five hundred PBs. Of these, 447 were selected by cut-off sampling on expenditures and account for 80% of the expenditure in goods and services by the Italian public sector as a whole. The remaining 53 PBs were added to the sample to represent institutional categories with small budgets, e.g., mountain town councils. The survey response rate was over 70%. Respondents and non-respondents do not differ on observable characteristics such as location, annual expenditure and institutional category.

In the analysis we exploit two key sources of variation. First, we observe the same PB purchasing several goods at several points in time. Second, we observe the same good being purchased both when a Consip agreement is active and when not. We are thus able to estimate the average price paid by each PB when buying on the open market and the decision to switch to Consip when Consip agreements are active. Figure A1 shows that, importantly, agreements for different goods are switched on and off at different points in time; this allows us to control for time specific unobservables that affect price and purchasing decisions.

Three rules define our working sample. First, as the identification relies on within PB variation, we include in the analysis only PBs for which we have data on at least ten purchases.[18] Second, to maintain comparability across PBs we exclude goods that are purchased exclusively by a few PBs.[19] Finally, we eliminate price outliers by dropping the bottom and top centile of the price distribution of each good. Our final sample contains 6,068 observations on purchases of 21 goods by 208 PBs over the period 2000-2005. On average 52% of purchases are made when a Consip agreement is active and 48% when there is no active agreement.

Table 1a illustrates the sources of variation at the PB level. We classify sample PBs by the three governance classes discussed in Section 2.1, plus a residual class of PBs whose governance structure does not clearly fall in any of the three categories. PBs' size, measured by annual expenditure in 2000, ranges from an average euro 3 million for mountain village councils to over 1000 million for ministries. Since the sampling strategy oversamples larger PBs, the share of total expenditure accounted for by PBs in our sample is proportional to the average PB size in a given class. At one end ministries in the sample account for 92% of the total expenditure by the universe of ministries in Italy, sample universities account for 43% and sample mountain village councils for 13%.

[18] This restriction eliminates 1612 observations. Compared to the sample PBs, the excluded PBs have lower annual expenditure but are equally likely to purchase when a Consip agreement is active and equally likely to purchase from Consip.

[19] Excluded goods are buses, refuse trucks, and bio-fuel, which are purchased by fewer than 20 PBs each, and CAT scanners, which are purchased exclusively by health authorities.

PBs in all classes buy on average 11 different types of goods, and observations are roughly equally split between periods with and without active Consip agreements. Finally, Table 1a shows that PBs in all institutional classes buy at least some goods from Consip when feasible. Central PBs are more likely to buy from Consip than local PBs and semi-autonomous bodies, a pattern we will analyze in more detail in Section 5.4. At the single PB level, 96% of the sample PBs buy from Consip at least once, and all PBs buy off-Consip at least once when there is an active agreement.

Table 1b shows the average price paid and quantity purchased for each good. To ensure comparability across different months and years price is normalized by the monthly consumer price index. Table 1b highlights that, unconditionally, there is substantial variation in price, as for all goods the standard deviation is at least half the mean and for some it is larger than the mean. Our aim in the next section is to assess how much of this variation can be explained by observed characteristics and to exploit information on the decision to switch to Consip to shed light on the reasons for the residual price variation. In line with wide variation in the size of different PBs, Table 1b also illustrates that the quantity bought in a single purchase exhibits considerable variation and that for most goods, periods with and without active Consip agreements are of equal length. The last Column in Table 1b shows that when an agreement is active, all the sample goods are purchased both from Consip and outside. The variation in the share reflects variation in the relative attractiveness of the Consip deal.

4.2 Empirical Method

Our model suggests a two-stage empirical strategy, where the first stage corresponds to Proposition 1 and the second stage to Proposition 2. Namely, we first estimate the prices paid by different PBs for observationally identical goods when Consip agreements are not available and then analyze the decision to switch to Consip, when available, to uncover the rationale for waste. This allows us to assess whether the cost differences are due to active or passive waste. Next we bring our model to the data and, making specific functional form assumptions, we retrieve an estimate of active and passive waste for each PB, which allows us to quantify the effect of active and passive waste.

Our first step is to estimate the average price paid by each PB for all goods purchased as the PB fixed effect in a regression of price paid by PB i for good g at time t (p_{igt}) when no Consip agreement is active for good g. The log-price equation is:

$$\ln p_{igt} = X_{igt}\gamma + \rho_g \ln Q_{igt} + \eta_g t + \theta_g + w_i + \varepsilon_{igt} \tag{1}$$

where X_{igt} is a vector of good specific characteristics, Q_{igt} is the quantity purchased, t is the time trend, and θ_g are goods fixed effects.[20] We allow the effect of quantity and of the time trend to be different for different goods. We control for quantity purchased to capture possible bulk discounts. Since all specifications include good specific trends, we control for price shocks that are common to all PBs at the same time. Therefore, the assumption needed to identify ρ as the causal effect of quantity on price is that all PBs face the same price schedule at any given point in time. To account for price differences due to transportation costs and market accessibility, we have also added several geographical control variables to our baseline specification of (1).[21] None of these significantly affected price, in line with the fact that our sample goods are produced by large firms and easily available at retail stores across the country.

Our coefficients of interest throughout are the estimated PB fixed effects, $\hat{w}_i$, as $\omega_i = \exp(\hat{w}_i)$ is the average price paid by PB i on all the goods it buys.

Second, we analyze data on purchases of all goods g at times t when Consip agreements are active for the good in question and assess whether the decision to buy from Consip, depends on the average price paid when there are no active agreements by each PB. The switching equation is:

$$C_{igt} = \alpha\hat{w}_i + \eta_g t + \psi_g + \upsilon_{igt} \tag{2}$$

where $C_{igt} = 1$ if PB i buys good g at time t from Consip, 0 otherwise. $\hat{w}_i$ is PB i's fixed effect estimated in 1 above, t is the time trend, and ψ_g are goods fixed effects. As above, we allow the effect of the time trend to be different for different goods.The residuals υ_{igt} are clustered at the PB-good level to account for interdependence of purchases of the same good made by the same PB, findings are also robust to clustering at the PB or good level separately.

Throughout the coefficient of interest is α,which captures the relationship between the estimated price differential and the probability to switch to Consip. The coefficient α sheds light on the rationale for waste in our sample. A positive coefficient indicates that PBs that pay more in the absence of Consip gain more from switching to Consip when feasible. This suggests that the difference in prices paid

[20] To select the characteristics to be included in X_{igt}, we estimate price regressions for each of the goods that include all available characteristics and a time trend. We then choose the characteristics whose coefficients are significantly different from zero at the 10% level or higher. We thus drop characteristics for which there is little or no variation (e.g. all paper weighs 80g/m2) and characteristics that are highly correlated with others. Included characteristics are indicated with a (*) in the Appendix list.

[21] Controls included regional dummies, town size, driving distance from either Milan or Rome, both in kilometers and in hours.

by different PBs for observationally equivalent goods is due to passive waste. On the other hand, a negative coefficient indicates that PBs that pay more gain less from switching to Consip, thus providing evidence for active waste.

To quantify the contribution of active and passive waste to total waste both in aggregate and for each PB we bring the model to the data and, using specific functional forms, we retrieve PB specific estimates of passive and active waste. The implementation will be discussed in detail in Section 5.3.

Our identification strategy throughout relies on the fact that we observe the same PBs making purchases when Consip agreements are active and when they are not. While the timing of agreements is plausibly exogenous to the individual PBs, the purchasing manager might affect the timing of purchases. The identification then relies on the assumption that timing of purchases, that is whether to purchase when an agreement is active, is not correlated with the parameters that determine the purchasing manager's behavior (μ_i and β_i in the model). This assumption would be violated if corrupt managers anticipate or postpone purchases to avoid periods when agreements are active, so to avoid having to justify paying higher prices than Consip. Likewise, our identifying assumption would be violated if managers wait or delay purchases to wait for an active agreement, for instance to minimize search effort. In Appendix 3, we present evidence on timing of purchases to check whether strategic timing is a concern in this setting. We rely on the intuition that if managers were to time purchases strategically we should observe a spike or drop either just before or just after agreement the start and/or end of an agreement. Appendix 3 shows evidence against strategic timing, thus providing support for our identifying assumption.

5 Empirical Analysis

5.1 Active vs Passive Waste

Figure 2 shows the distribution of PB fixed effects $\hat{w}_i$ estimated by (1) above. The estimates indicate that different PBs pay considerably different prices for similar goods. For instance, the PB at the 90th percentile pays, on average, 55% higher prices than the PB at the 10th percentile. A back of the envelope calculation suggests that if all PBs were to pay the same prices as the one at the 10th percentile, sample expenditure would fall by 21%. If we do not include public bodies below the 10th percentile for which savings would be negative, sample expenditure would fall by 27%. Since public purchases of goods and services are 8% of GDP, if sample purchases were representative of all public purchases of goods and services, savings would be between

1.6% and 2.1% of GDP.

To show that $\hat{w}_i$ captures PB specific features as opposed to pure noise, we exploit the fact that we observe almost all of the same PBs buying at least some of the same goods from Consip. We use these observations to estimate a "placebo" $\hat{w}_i^P$ as the PB fixed effect in the equivalent of (1) from Consip purchases. Since individual PBs have no influence over the Consip price, $\hat{w}_i^P$ by construction does not capture PB specific features. Reassuringly, $\hat{w}_i$ and $\hat{w}_i^P$ are not correlated (correlation coefficient=-.07). Appendix Figure A3 show that $\hat{w}_i^P$ exhibits considerably lower variation than $\hat{w}_i$, and the Kolmogorov-Smirnov test rejects the null of equality of distributions (p-value .001).

As further evidence, we compare the fixed effect model (1) to a random effects model for both out-of-Consip and Consip purchases. The Hausman test rejects the null in the out-of-Consip sample but fails to reject in the sample of Consip purchases.

Table 2 reports estimates of (2).[22] The simple correlation between the probability of switching to Consip and estimated waste reported in Column (1) indicates that PBs that on average pay more when no agreement is active are more likely to buy from Consip when an agreement is active. The point estimates and standard errors are unchanged when we add goods fixed effects (Column 2) and good-specific trends (Column 3). An increase in waste from the 10th to the 90th percentile, increases the probability of buying from Consip by 9.7 percentage points, 25% of the sample mean (.37)

The discussion in Section 3 highlights that different classes of PBs were subject to different requirements regarding Consip purchases at different points in time. In particular, we can identify three regimes. Regime I applied to PBs belonging to the Central Public Administration between 2000 and 2002–these PBs were required to buy from Consip if there was an active agreement for an equivalent good. Regime II extended the requirement to all PBs in 2003. Regime III eliminated the requirement for all PBs for 2004 and 2005. In practice, even if PBs were required to buy from Consip they could easily circumvent this, and indeed we do observe purchases out of Consip even when PBs were nominally obliged to purchase from Consip. Nevertheless, the mandatory requirement might have made it more difficult to buy out of Consip. The coefficient of waste will be biased upward if the mandatory requirement is correlated with the PB fixed effects, for instance because Central Administration PBs pay higher prices and are also more likely to be required to buy from Consip. The Regime I and Regime II indicators in Column (4) show that, indeed, PBs were

[22] We estimate (2) by linear probability to facilitate the interpretation of the coefficients. Given that the mean of the dependent variable is .37, that is far from both 0 and 1, estimating (2) by probit or logit yields similar results.

more likely to buy from Consip when required to do so, but this leaves our estimates of α unchanged.

On the basis of Proposition 2, we view the finding that the coefficient α is positive as broadly supportive of the hypothesis that passive waste is more important than active waste in explaining differences in prices among Italian public bodies. To quantify the relative importance of active and passive waste, we will have to wait until the model estimates in Section 5.3. In the meantime, we address a number of potential issues regarding our current findings.

5.2 Estimation Concerns and Robustness Checks

A key concern is that $\hat{w}_i$ might be measured with error. Measurement error in this setting can arise from two sources, namely from unobservable good characteristics and from the fact that $\hat{w}_i$ are estimated rather than directly observed. Below we argue that both types of measurement error would lead us to underestimate α, thus making it more difficult to find evidence for passive waste.

First, if unobservable quality differences explain part of the price differential between PBs, the "true" w_i^* is lower for PBs with high estimated $\hat{w}_i$, and higher for PBs with low estimated $\hat{w}_i$. Other things equal, substituting w_i^* for $\hat{w}_i$ in (2) would yield higher estimates of α, providing further support for the passive waste hypothesis.

The second source of measurement error derives from the fact that $\hat{w}_i$ are estimated rather than directly observed. This introduces noise that can lead to an attenuation bias in α, thus making it more difficult to find evidence for passive waste as above. The spurious variation introduced by the use of estimated $\hat{w}_i$ however, also reduces the standard errors thus making it more difficult to reject the null hypothesis that $\alpha = 0$. Reassuringly, we can show that a 1000 replication bootstrap of the system of equations (1) and (2) yields similar standard errors as in Table 2.

Our identification relies on the assumption that the nature of waste is the same for all goods. To address this concern we first check whether our estimate of $\hat{w}_i$ are driven by one good by re-estimating $\hat{w}_{i-g}$ excluding good g from the estimates of (1). This exercise reveals that the $\hat{w}_{i-g}$ are highly correlated, thus ruling out that previous findings were driven by outliers.

A related concern is that the identifying assumption would be violated if waste is active only for some goods and not for others. Our estimates might then hide this form of active waste because we use all sample goods to estimate α. For instance, it might be easier to hide bribes in "complex" goods, whose price might be more sensitive to unobservable characteristics, which can then be used to justify paying

higher prices. To assess the practical relevance of this concern we split goods into "simple" and "complex", where "simple" include goods for which unobserved quality differences are unlikely determinant of price, and allow the coefficient of waste to differ by complexity.[23] We then re-estimate (1) and (2) using the complex good sample only where we expect to find stronger evidence for active waste. Column 5 in Table 2 rules out the possibility our findings were driven by simple goods, as the coefficient of waste is of the same magnitude and precisely estimated when we restrict the sample to complex goods only.

The identification relies on the assumption that the idiosyncratic preference for Consip, ν_{igt}, is not correlated with determinants of active and passive waste. To the extent that ν_{igt} is negatively correlated with μ_i, e.g., because more inefficient managers are lazier and reluctant to learn how to buy from Consip, we are less likely to find evidence for passive waste.

If, on the other hand, more inefficient and lazier managers prefer to buy from Consip to save time, they might be more likely to switch even if Consip were to offer higher prices/lower quality goods. To assess whether this is the case, we restrict the sample to PBs that buy a given good from Consip when feasible and we estimate the following regression:

$$\ln p_{igt} = \beta C_{igt} + X_{igt}\gamma + \rho_g \ln Q_{igt} + \eta_g t + \theta_g + w_i + \varepsilon_{igt} \tag{3}$$

where C_{igt} equals 1 if PB i buys good g from Consip at time t and 0 otherwise, X_{igt} is a vector of good specific characteristics, Q_{igt} is the quantity purchased, t is the time trend, θ_g are goods fixed effects and w_i are PB fixed effects. We allow the effect of quantity and of the time trend to be different for different goods. To assess whether Consip purchases are systematically correlated with goods characteristics, Columns 1 and 2 in Table 3 report estimates of (3), without and with the vector of goods characteristics X_{igt}. The findings indicate that Consip prices are on average 20% lower if characteristics are not included, whereas savings increase to 28% when characteristics are included. Overall, the results indicate that PBs who switch to Consip pay *lower* prices for goods with *better* characteristics.

The fact that purchasing managers might be able to adjust on the quality margin raises the issue that PBs who do not switch, might strategically alter the characteristics of the goods purchased in order to justify buying outside. To assess whether purchasing managers change the characteristics of the goods when buying out of

[23] Simple goods are: photocopier paper, MS office software, heating diesel, landline and cellular line rental contracts, lunch vouchers, office chairs and office desks. Results are robust to excluding lunch vouchers, office desks and office chairs from the simple goods category.

Consip, we restrict the sample to PBs that do not buy from Consip when feasible and we estimate the following regression:

$$\ln p_{igt} = \varphi A_{igt} + X_{igt}\gamma + \rho_g \ln Q_{igt} + \eta_g t + \theta_g + w_i + \varepsilon_{igt} \tag{4}$$

where A_{igt} equals 1 if good g purchased by PB i on the market is available from Consip at time t and 0 otherwise. All other variables are as defined above. To assess whether Consip purchases are systematically correlated with goods characteristics, Columns 3 and 4 in Table 4 report estimates of (4), without and with the vector of goods characteristics X_{igt}. The coefficient φ is precisely estimated and very close in magnitude across columns. The findings thus indicate that the existence of a Consip agreement is not systematically correlated with goods characteristics, that is, there is no evidence that PBs who do not buy from Consip change the characteristics of the goods they buy when there is an active agreement.

A final question of interest is whether PBs who do not switch to Consip, do so because they pay lower prices or buy higher quality goods at higher prices. To shed light on this issue we compare the prices paid by PBs who buy from Consip and PBs who do not. To do so, we restrict the sample to periods when a Consip agreement is active for the relevant good and estimate:

$$\ln p_{igt} = \delta C_{igt} + X_{igt}\gamma + \rho_g \ln Q_{igt} + \eta_g t + \theta_g + \varepsilon_{igt} \tag{5}$$

where C_{igt} equals 1 if PB i buys good g from Consip at time t and 0 otherwise and all other variables are as defined above. Column 5 indicates that PBs who buy from Consip pay on average 17% less. Controlling for goods characteristics, however, Column 6 shows that the estimated savings fall to 12%, suggesting that PBs who do not buy from Consip buy higher quality goods. The results in Columns 5 and 6 thus highlight imperfect substitutability across goods with different characteristics as a possible reasons why some PBs choose not to buy from Consip.[24]

5.3 Model Estimates

Our findings so far indicate that the aggregate behavior of purchasing managers in our sample is in line with the passive waste hypothesis. In this section we bring

[24] While the findings in Column 6 are an interesting aside, they obviously do not impinge on the validity of our estimate of the coefficient α because they are based on observable quality variables, which are controlled for in equation (1) (we compare the switching decisions of public bodies that were buying goods of the same quality before Consip arrived). We can also show that PBs that stay out of Consip buy better goods for "complex" goods only. In the "complex" goods sample savings are 22% without quality controls and 15% with controls. In the "simple" goods sample they are 7% with and without controls. This is consistent with our previous argument that the price of "complex" goods is more sensitive to changes in quality/characteristics.

our model to the data and provide a structural estimate of active and passive waste for each PB. This allows us to quantify the contribution of both sources to total waste and to uncover whether the reduced form estimates hide that active waste is an important component for several PBs in the sample.

To do so, we must first re-visit the model with a view to making it amenable to structural estimation. We will make functional assumptions on the price function, the manager's objective, and the distribution of errors.

Let us begin by assuming that the price function takes the following quadratic form:

$$f_{igt}\left(b_{igt},\mu_i\right) \equiv \bar{p}_{gt}(1+\mu_i+b_{igt}^2)\varepsilon_{igt},$$

where $\bar{p}_{gt}$ is a 'reference price' (to be discussed later) and ε_{igt} is a lognormally independently distributed error. The error is realized *after* the manager makes his decision.

The objective function for manager i (for a single good g purchased at time t) becomes:

$$\Omega_{igt} = -\frac{p_{igt}\left(b_{igt},\mu_i\right)}{\bar{p}_{gt}} + 2\beta_i b_{igt}.$$

The active waste component is the same as before (multiplied by two) and hence it deserves no further discussion. The price component says that the cost in terms of payoff of paying price p_{igt} depends on the reference price $\bar{p}_{gt}$. The higher the reference price, the lower the stigma or pressure associated with paying a high price. We think of the reference price as some statistics about the price paid by other public bodies. For instance, it could be the lowest price obtained by any public body (including the Consip price) or it could be the average of the prices paid by all public bodies. In the empirical implementation, we will use a number of specifications for the reference price. The objective function can be re-written as

$$\Omega_{igt} = -(1+\mu_i+b_{igt}^2)\varepsilon_{igt} + 2\beta_i b_{igt}.$$

The parameters μ_i and β_i denote, as before, the propensity to active and passive waste. Note that $\mu_i \in (-1,\infty)$ and $\beta_i \in (-\infty,\infty)$ (a negative β_i denotes a manager who receives a negative utility from bribes).

If we want to use this model for structural estimation, we need to allow public bodies to buy multiple goods. We shall do this in the simplest way, by assuming that there is no direct payoff interaction between purchases. Namely, we assume that the overall payoff of manager i (over a certain period of time, say a year) is given by

$$\Omega_i = \sum_{g,t} q_{igt}\Omega_{igt},$$

where the Ω_{igt}'s are specified above and the weights q_{igt} represent the amount spent on purchasing good g at time t. Such amount is evaluated not at the actual price but rather at the reference price $\bar{p}_{gt}$. Given this linear structure, the manager maximizes every Ω_{igt} separately.[25]

When Consip is not present, the maximal expected payoff for good g at time t is attained when

$$b_{igt} = \begin{cases} \beta_i & \text{if } \beta_i \geq 0 \\ 0 & \text{if } \beta_i < 0 \end{cases}$$

The equilibrium price is

$$\hat{p}_{igt} = \begin{cases} \bar{p}_{gt}\left(1 + \mu_i + \beta_i^2\right)\varepsilon_{igt} & \text{if } \beta_i \geq 0 \\ \bar{p}_{gt}\left(1 + \mu_i\right)\varepsilon_{igt} & \text{if } \beta_i < 0 \end{cases}$$

and the maximal expected payoff is

$$\hat{\Omega}_{igt} = \begin{cases} -\left(1 + \mu_i - \beta_i^2\right) & \text{if } \beta_i \geq 0 \\ -\left(1 + \mu_i\right) & \text{if } \beta_i < 0 \end{cases}$$

When a Consip deal is active, the Consip price is given by $p^c_{gt} = \gamma_g \bar{p}_{gt}$, where γ_g may be greater or smaller than one. The manager's payoff if he buys from Consip is:

$$\Omega^c_{igt} = -\frac{p^c_{gt}}{\bar{p}_{gt}} + \nu_{agt},$$

where ν_{agt} is normally distributed and i.i.d..

The manager's payoff if he buys off-Consip is:

$$\Omega^n_{igt} = -\frac{p_{igt}\left(b_{igt}, \mu_i\right)}{\bar{p}_{gt}} - \delta_g + 2\beta_i b^2_{igt},$$

where δ_g captures a direct (positive or negative) effect of the presence of Consip on incentives.

Proposition 3 *With the functional forms above, the price equation is*

$$\log p_{igt} = \log \bar{p}_{gt} + \omega_i + \log \varepsilon_{igt} \tag{6}$$

and the switching equation is

$$\Pr(\textit{Consip}) = \Pr(-\nu_{agt} < \sigma_i + c_g). \tag{7}$$

[25] The no-interaction assumption fails when the purchasing manager is concerned about the overall spending level. Then, paying a high price for good g' makes him more reluctant to pay a high price for good g''. However, note that, on the theoretical front, the importance of this kind of interaction tends to zero as the number of purchases by a public body tends to infinity. On the empirical front, there is no obvious reason why this issue would lead to biased estimates.

P roof. The maximal expected payoff for a manager who buys off-Consip when a deal is active is

$$\hat{\Omega}^n_{igt} = -\left(1 + \mu_i - \beta_i^2\right) - \delta_g.$$

The manager buys from Consip if and only if $\hat{\Omega}^n_{igt} \leq \Omega^c_{igt}$, namely,

$$\nu_{agt} \leq \left(1 + \mu_i - \beta_i^2\right) + \gamma_g - \delta_g.$$

When a deal is not active, the price equation (in logarithms) yields:

$$\log p_{igt} = \log \bar{p}_{gt} + \log(1 + \mu_i + \beta_i^2) + \log \varepsilon_{igt}. \tag{8}$$

Note that this corresponds to our previous reduced-form equation for waste: $\omega_i = \log(1 + \mu_i + \beta_i^2)$. When a deal is active, solving the manager's choice problem yields:

$$\Pr(\text{Consip}) = \Pr\left(\nu_{agt} \leq \left(\mu_i - \beta_i^2\right) + \left(1 + \gamma_g - \delta_g\right)\right) = \Pr(-\nu_{agt} < \sigma_i + c_g). \tag{9}$$

If we define $\omega_i = \log(1 + \mu_i + \beta_i^2)$ and $\sigma_i = \mu_i - \beta_i^2$, equations (8) and (9) yield the statement of the proposition. ■

We assume that ε_{igt} and ν_{agt} are independent and normally distributed, hence we estimate (8) and (9) separately by ordinary least squares and by probit, respectively. This yields estimates of ω_i and σ_i. Combining these with the non-negativity constraint on b, we can retrieve an estimate of μ_i and b_i for each PB in our sample.

The reference price $\bar{p}_{gt}$ must be specified. A natural definition is: the lowest price paid by any public body at time t for a good with the same exact specification. In practice we do not observe purchases of identical goods in a short span of time and thus cannot specify $\bar{p}_{gt}$ for all g and t. To estimate the ω_i term in (8), we proceed as follows. First, we estimate the average price paid by each PB for all goods purchased when Consip agreements are not active as the PB fixed effect in a regression of price paid by PB i for good g at time t on good characteristics, quantity and good specific trends as in (1). PB i fixed effect measures the average price paid by PB i relative to a reference PB. Second, we consider four alternatives for the choice of the reference PB. We start with the literal interpretation that the reference price is given by the public body that pays the lowest average price, followed by the public body at the 1st, 10th and 25th percentile (a "good price").

Table 4 reports the descriptive statistics of μ_i and b_i under alternative assumptions on the reference price $\bar{p}_{gt}$. Higher reference prices lead to lower estimates of active waste because, by definition, higher prices are not counted as waste when the reference price is higher. The results illustrate that, in line with the reduced form evidence, the average μ_i is always larger than the average b_i, and that passive waste

accounts for at least 79% of total waste. Moreover, passive waste is larger than active waste for at least 85% of the PBs in the sample.

Finally, the share of PBs with positive active waste is at least 21%. Thus, while passive waste accounts for most of the cost differences in our setting, a substantial number of PBs exhibit some active waste. Concentrating on the case when the reference price is set at the minimum, in Figure 3 we plot our estimate of active and passive waste, where each dot represents a different PB. Figure 3 illustrates that the range of μ_i is wider than the range of b_i and that, interestingly, active and passive waste are uncorrelated. This indicates that there appears to be no trade-off between the two forms of waste, namely we find no evidence that low passive waste comes at the price of high passive waste and vice-versa. In the next section we present evidence on the correlation between waste and systems of governance, which will allow us to shed some light on the trade-off between rules and discretion.

5.4 Waste and Governance

The evidence reported throughout indicates that the difference in prices paid by different PBs for observationally equivalent goods is due to passive waste. The purpose of this section is to identify the PBs characteristics that are correlated with waste, to provide some independent support to the earlier findings. PBs in our sample differ along three dimensions: (i) institutional class, (ii) geography, and (iii) size (expenditures).

As discussed in Section 2, PBs can be broadly grouped in three institutional classes: Napoleonic bodies, local governments and semi-autonomous bodies. These three categories are subject to different procurement laws and they differ by the level of autonomy and by the rigidity of their budget constraint. Procurement laws and the degree of autonomy should affect passive waste whereas the latter can affect both. Geography can proxy for cultural factors that might affect both active and passive waste. Finally bribes might be easier to hide in purchases made by large PBs but these could also pay lower prices because of bulk discounts. Large PBs may also be more bureaucratic, which could be correlated with passive waste.

In Table 5 we first analyze how the price paid when Consip agreements are not active depends on PB characteristics, we then use our model estimates to disentangle the effect of PB characteristics on passive and active waste. In Column (1) we regress the average price paid out of Consip on PB characteristics. Column 1 shows that central PBs pay more than local government and these pay more than semi-autonomous bodies. The estimates imply that compared to semi-autonomous bodies, the average town government pay 12% more. The difference increases further for

regional governments (20%), social security institutions (25%), and ministries (43%). While institutional class is correlated with price, neither geography or size are. The coefficients of these variables are precisely estimated and not significantly different from zero.

In Columns (2) and (3) we regress our estimates of passive and active waste on PBs' characteristics. The results indicate that autonomy is correlated to passive waste only and that active waste is similar in all PBs. This suggests that in our sample there seems to be no trade-off between rules and discretion. Compared to central PBs, more autonomous PBs have less passive waste and the same level of active waste. To the extent that giving autonomy to purchasing managers in central PBs would make them behave like their counterparts in universities or health authorities, our evidence indicates that more discretion would not lead to higher active waste.

Finally, it is also important to stress that the differences in managerial behavior across goverance types might be due to sorting if, for instance, jobs that grant the manager more autonomy attract managers with better skills.

6 Conclusion

The evidence available from our data indicates that excessive procurement prices paid by Italian public bodies for standardized goods are due to passive waste rather than to active waste. In addition, there is no trade-off between the two forms of waste, namely public bodies with lower passive waste do not have higher active waste. The key driver of passive waste appears to be the mode of governance, with Napoleonic public bodies performing worst, US-style local authorities in the middle, and autonomous agencies as the winners.

Our findings do not imply that corruption is not a serious problem in Italy. Our structural estimates indicate that active waste can account for up to 20% of the cost differences across public bodies, which is in line with the estimates for Argentinian hospitals by Di Tella and Schargordsky (2003). However, our stark results about the importance of passive waste also indicate that economists should view sheer inefficiency as a problem which is potentially more important than corruption.[26]

[26] Another obvious conclusion from our work is that agencies like Consip can produce serious public savings. The cost of running Consip is limited (160 people are employed in the procurement department). Public bodies that switch to Consip save 28% of the purchase price. Public bodies that do not switch pay on average 12% more than the price of similar items on the Consip catalog. There are other savings in terms of reduced litigation and reduced administrative costs, which we are unable to quantify.

To what extent do these findings provide guidance on related issues? First, our results are obtained for standardized goods, which account for about 40% of Italy's procurement expenditure. The remaining 60% is spent on one-of-a-kind goods, which range from specialized software to road construction. One should probably expect active waste to be more important for this type of goods, both because they are more likely to be supplied by local firms and because they are more easily manipulable. Likewise, active waste might be more important in other spheres of the public sector, such as public employment (Alesina et al, 2000).

Second, it would be interesting to know to what extent our results apply to other countries. Besides the above cited study by Di Tella and Schargrodsky (2003), we are unaware of other studies of this kind. In Britain the National Audit Office (NAO, 2006) is in the process of collecting information on prices paid by public bodies for standard office goods. So far, the only data available on price disparities covers four categories of goods: toner cartridges, electricity, A4 sheets, and post-it notes.[27] The price disparities (for a homogenous good) between different public bodies are high. The good with the lowest disparity is electricity (the highest price is only 73% higher than the lowest price), while the highest dispersion is observed for post-it notes (139%, same size, same brand). While these data are very preliminary, they suggest that the price variation that we observe is not unique to the Italian context.

Third, according to Transparency International's corruption perception rankings, Italy, with a score of 5/10, is one of the two most corrupt nations in Western Europe and it ranks alongside developing countries such as Malaysia and Tunisia. Then, our findings suggest that passive waste may be an important, if not the dominant, factor to explain government inefficiency for a range of countries.

Fourth, it would be interesting to compare public procurement with private procurement. The goods in our sample are bought by firms too. Our same methodology could be applied to study waste and its causes in the private sector and it might provide a new angle to study corporate governance.

[27] See Table 27 (NAO, 2006). For cartridges and post-it notes, a particular brand was specified. The range represents the difference between the highest price and the lowest price. The data covers purchases by 121 public bodies. "Outliers" were eliminated.

	Price Range	% Variation
Toner cartridge (per cartridge)	£41 to £89	117
Electricity (day rate kWh)	4.8p to 8.3p	73
Box of 5x500 sheet A4 (80g/m2) 100% recycled	£6.95 to £14.95	115
Post It notes (pack of 12)	£4.41 to £10.55	139

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7 Appendix 1: Endogenous Passive Waste

In the baseline model in Section 3, active waste is endogenous, in that the purchasing manager chooses the level of bribe b_{igt}, but passive waste is exogenously given. For public body i, it is determined by its inefficiency level μ_i.

One may object that purchasing managers can do a lot to overcome institutional barriers. Conversely, even in the best regulatory environment a manager can just shirk. In the present section, we endogenize the level of effort that the manager puts into finding good prices.

If there is no active Consip deal, the price paid by PB i for good g at time t is:

$$p_{igt}\left(b_{igt}, m_{igt}\right)$$

where: $b_{igt} \geq 0$ represents active waste as discussed earlier; $m_{igt} \geq 0$ represents the quality of the search effort undertaken by public body i to procure good g (e.g., searching for best supplier, bargaining, finding creative solutions). The price p_{igt} is increasing in b_{igt} and decreasing in m_{igt}.

The manager has the following objective function

$$-p_{igt}\left(b_{igt}, m_{igt}\right) + \beta_i b_{igt} - \mu_i m_{igt}.$$

As before, the parameter β_i denotes public body i's active waste propensity. Instead, the parameter μ_i captures the cost in terms of effort/risk for the purchasing manager to engage in price-reducing activities.

For instance, suppose that one of the activities that can reduce price is to engage in direct bargaining with potential suppliers. Any public body that undertakes this activity for good g saves on average 10% of the price of good g. However, for certain public bodies this activity is more expensive than for others. It may be because of regulation (the rules may prohibit the type of informal contacts between public officials and suppliers that are customary in bargaining), because of human capital (the human capital of purchasing managers, who are hired through written scholarly exams, may be skewed towards administrative tasks rather than more entrepreneurial ones), or cultural (suppliers are perceived as 'enemies' that must be kept at arm's length). We assume that the parameter μ_i captures the overall cost effect of these elements.

As before, the purchasing manager solves a maximization problem, except that now there are two first-order conditions (as before we focus on interior solutions):

$$\begin{aligned} \frac{\partial}{\partial b_{igt}} p_{igt}\left(\hat{b}_{igt}, \hat{m}_{igt}\right) &= \beta_i, \\ -\frac{\partial}{\partial m_{igt}} p_{igt}\left(\hat{b}_{igt}, \hat{m}_{igt}\right) &= \mu_i. \end{aligned}$$

The equilibrium payoff for the manger is:

$$\hat{\Omega}_{igt} = -\hat{p}_{igt} + \beta_i \hat{b}_{ig} - \mu_i \hat{m}_{igt}.$$

As before, it is immediate to see that

Proposition 4 *The off-Consip equilibrium price is an increasing function of both μ_i and β_i.*

Suppose now that a Consip deal is active. The Consip price is p^c_{gt}, and the payoff from buying from Consip is

$$\hat{\Omega}^c_{igt} = -p^c_{gt} + \nu_{igt},$$

where ν_{igt} is some idiosyncratic preference for Consip.

If instead the manager buys off Consip he maximizes

$$\delta_g - p_{igt}\left(b_{igt}, m_{igt}\right) + \beta_i b_{igt} - \mu_i m_{igt},$$

which yields a certain maximal payoff $\hat{\Omega}^n_{igt}$. The manager buys from Consip if and only if $\hat{\Omega}^c_{igt} \geq \hat{\Omega}^n_{igt}$.

Proposition 5 *The probability that the PB switches to Consip is an increasing function of μ_i and a decreasing function of β_i.*

P roof. The probability of buying from Consip is

$$\Pr\left[\nu_{igt} \geq p^c_{gt} + \hat{\Omega}^n_{igt}\right].$$

By applying the envelope theorem, we see that $\hat{\Omega}^n_{igt}$ is increasing in β_i and decreasing in μ_i. ■

As before, the result is supported by an economic intuition that applies to a much more general set-up. The active waste parameter β_i expands the purchasing manager's choice set while the passive waste parameter μ_i reduces it. Hence, the former makes the Consip option less attractive and the latter makes it more attractive.

8 Appendix 2: Goods Characteristics

For each of the sample goods, we list the characteristics we have information on, in addition to price, quantity and date of purchase. Starred variables are significant determinants of price and are included as controls in all regressions. We report the unit of measure in parenthesis for continuous variables. Discrete or indicator variables are equal to 1 if the price includes the service/characteristics, and 0 otherwise.

1. Car Rentals: brand, model, rental agreement duration (months),* allowed mileage (km),* engine size (cc),* vehicle class (large sedan, medium sedan, compact car, large van, medium van, small van)*, insurance deductible (euros), price per extra km above allowance (euros), fuel type, maintenance indicator,

car pick up for repairs indicator, replacement car indicator, car replacement days (minimum number of repair days to obtain replacement car), full insurance (kasko) indicator, car wash indicator, leather seats indicator,* navigator indicator, air conditioning indicator, radio indicator,* tyre replacement indicator.

2. Photocopier Rentals: brand, model, rental agreement duration (months)*, rental payment frequency (months)*, speed (pages per minute)*, number of copies included in rental price*, cost of extra copies above allowance (euros)*, printer indicator, fax indicator, sorter indicator, finisher indicator, two sided copies indicator, autofeed indicator*, autofeed with two sided copies indicator,* waste collection service indicator, number of hours required to obtain repair assistance, machine replacement indicator, number of hours required to get delivery of paper, ink and other inputs.

3. Laptop Computer: brand, model, processor type, ram size,* hard drive size,* screen size,* cd reader indicator, dvd reader indicator,* cd writer indicator,* floppy disk drive indicator, included software, maintenance included indicator,* maintenance agreement duration (months).

4. Desktop Computer: brand, model, processor type, ram size,* hard drive size,* screen size,* flat screen indicator,* screen included indicator,* cd reader indicator, dvd reader indicator, cd writer indicator, dvd writer indicator, wi-fi indicator, floppy disk drive indicator, workstation indicator,* included software, maintenance included indicator,* maintenance agreement duration (months).

5. Office Desk: brand, model, shape (rectangular or l-shaped), width (cm), depth (cm),* drawers indicator, drawers type (fixed or on wheels), drawers price if not included in desk price, desk cover material, desk frame material,* safety certificate indicator,* fire hazard classification, warranty (number of months), delivery included indicator,* assembly included indicator,* fitting included indicator.

6. Office Chair: brand, model, armrest indicator, armrest type (fixed or adjustable),* backrest type (height adjustable, reclinable, both), safety certificate indicator,* fire hazard classification, warranty (number of months), delivery included indicator,* assembly included indicator.*

7. Landline Contracts: billing frequency.

8. Projector: brand, model, type (LCD or DLP),* brightness level (5 categories),* contrast level (5 categories),* resolution level (3 categories),* maintenance indicator, duration of maintenance contract (months), maintenance location indicator (in shop or on site).

9. Switch Network: brand, model, inspection indicator, customized design indicator, installation indicator, configuration indicator, trial indicator, maintenance indicator, duration of maintenance contract (months), maintenance parts included indicator.

10. Cable Network: brand, model, type, inspection indicator,* customized design indicator,* installation indicator,* configuration indicator, trial indicator,* labelling indicator, system management indicator,* certification indicator,* number of fibers,* maintenance indicator, duration of maintenance contract (months), maintenance parts included indicator.

11. Heating Diesel: supplier, transport included indicator, payment due date.

12. Motoroil: oil type (synthetic, semi-synthetic, mineral),* office delivery indicator, oil use (for petrol engines, small diesel engines, large diesel engines), payment due date.

13. Lunch Voucher: brand, model, contract duration,* e-voucher indicator,* invoice mode (upon delivery, upon use),* payment due date.*

14. Refuse Bin: brand, model, office delivery indicator, material (zinc, polyethylene, other), size (cubic meters).*

15. Paper: brand, producer, type (natural or recycled),* format (A3, A4, Letter),* color indicator,* delivery mode (to premises, at street level, warehouse collection), contract duration (months), delivery delay indicator, payment due date (days), forest sustainable indicator, low chlorine content indicator, weight (grams per square meter).

16. Mobile Phone Contract: service provider.*

17. MS Office Software: type (standard, professional, premium),* version (97, 2000, xp),* license type (education/government).*

18. Printer: brand, model, type (needle, inkjet, laser),* color indicator, speed (pages per minute),* two-sided indicator,* netlink indicator,* finisher indicator, drawer indicator,* materials included indicator.

19. Server: brand, model, os system indicator (windows, linux, unix),* shape (desk, rack, tower),* number of processors*, type (entry level, mid-range, advanced),* ram size,* number of slots,* back up facility indicator,* number of back up facilities, maintenance indicator, duration of maintenance contract (months)

20. Car Purchases: brand, model, type (car, van, suv)*, class (large sedan, medium sedan, compact car, large van, medium van, small van),* engine size,* fuel type, maintenance included indicator, police car indicator,* security car indicator, rescue car indicator, custom design indicator, design included indicator, beaming light indicator, siren indicator,* two-way radio indicator, custom color indicator,* navigator indicator*, air conditioning indicator,* radio indicator.*

21. Fax Machine: brand, model, type (inkjet, laser),* speed (page per minute),* modem speed,* automatic charge indicator, maintenance indicator, duration of maintenance contract (months).

9 Appendix 3: Strategic Timing

To test whether purchasing managers strategically alter the time of purchases to avoid the periods with active agreements or to buy while an agreement is active, we analyze how the probability of making a purchase changes as the start of an agreement approaches and just after the end of the agreement. Purchasing managers know well in advance when each agreement is due to start as this is publicized on the Consip website. They also know the latest date at which each agreement is due to end, although agreements could end earlier than the expiry date if the entire quantity the supplier committed to is exhausted before the expiry date.

If managers time purchases strategically, we expect their strategy to differ depending on whether they want to avoid or wait for agreements. Managers who want to avoid agreements periods, would want to purchase just before the start or just after the end of an agreement. Viceversa, managers who want to wait, would not purchase just before the start or just after the end. To take into account this difference, we analyze timing of purchases separately for PBs that buy from Consip and PBs that do not.

Figure A2 shows the distribution of purchases in the 60 days that precede and the 60 days that follow the agreement. The figure shows no evidence of strategic timing, namely the timing of purchases is not affected by the fact that the start of an agreement is approaching or an agreement just ended.

Table A1 is the regression equivalent of Figure A2. We divide the sample by PBs that buy from Consip and PBs that do not and estimate:

$$B_{gt} = \alpha_0 + \alpha_1 D_{gy} + \eta_g t + \eta_m + \eta_y + \eta_g + \varepsilon_{gt},$$

where $B_{gt} = 1$ if we observe a purchase of good g on day t, η_m, η_y, and η_g are month, year and good fixed effects and t is the time trend, which we allow to vary by good.

Our variable of interest is D_{gy},which measures the time until the start of the agreements in columns (1), (2), (5) and (6), and the time after the end of an agreement in the remaining columns. In the odd-numbered columns D_{gy} is measured in number of days, in the even columns we use splines at ten days interval. Throughout α_1 is small and not significantly different from zero, thus supporting our assumption that purchasing managers do not alter the timing of their purchases to avoid or wait for Consip agreements.

Figure 1: Model Prediction

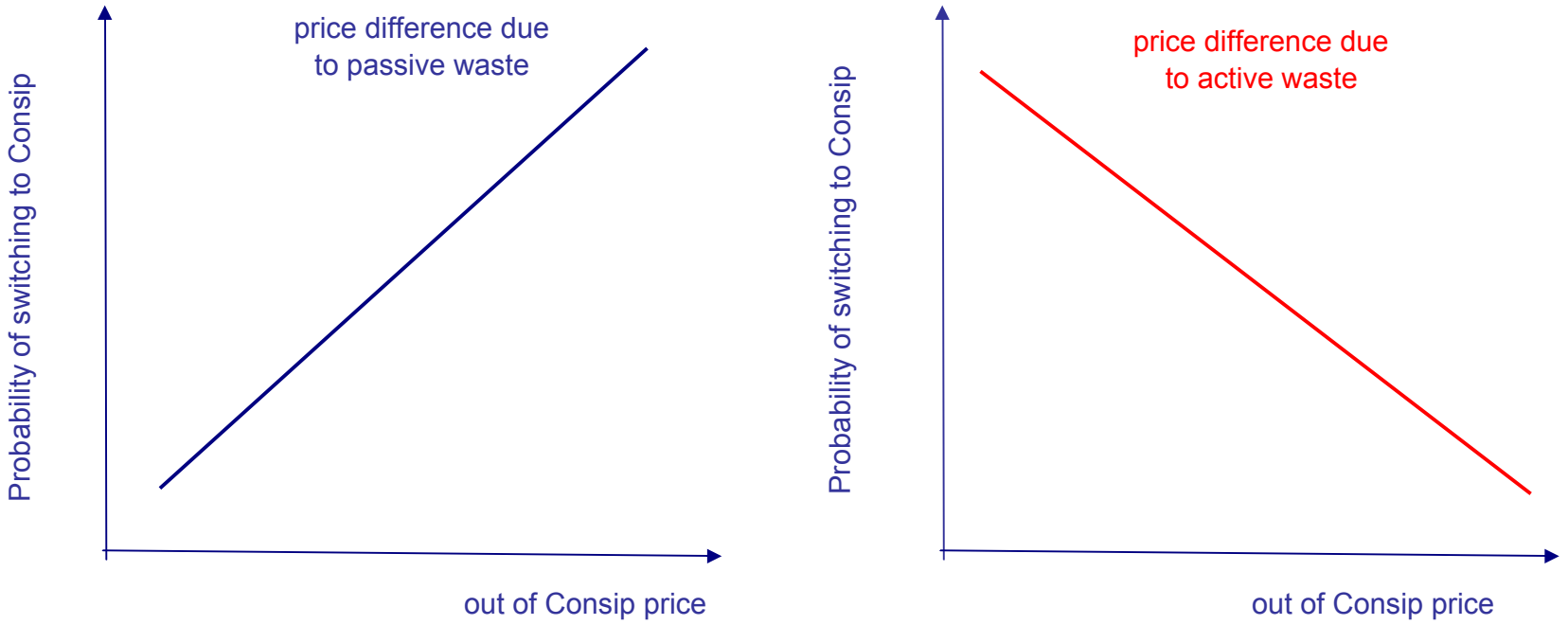
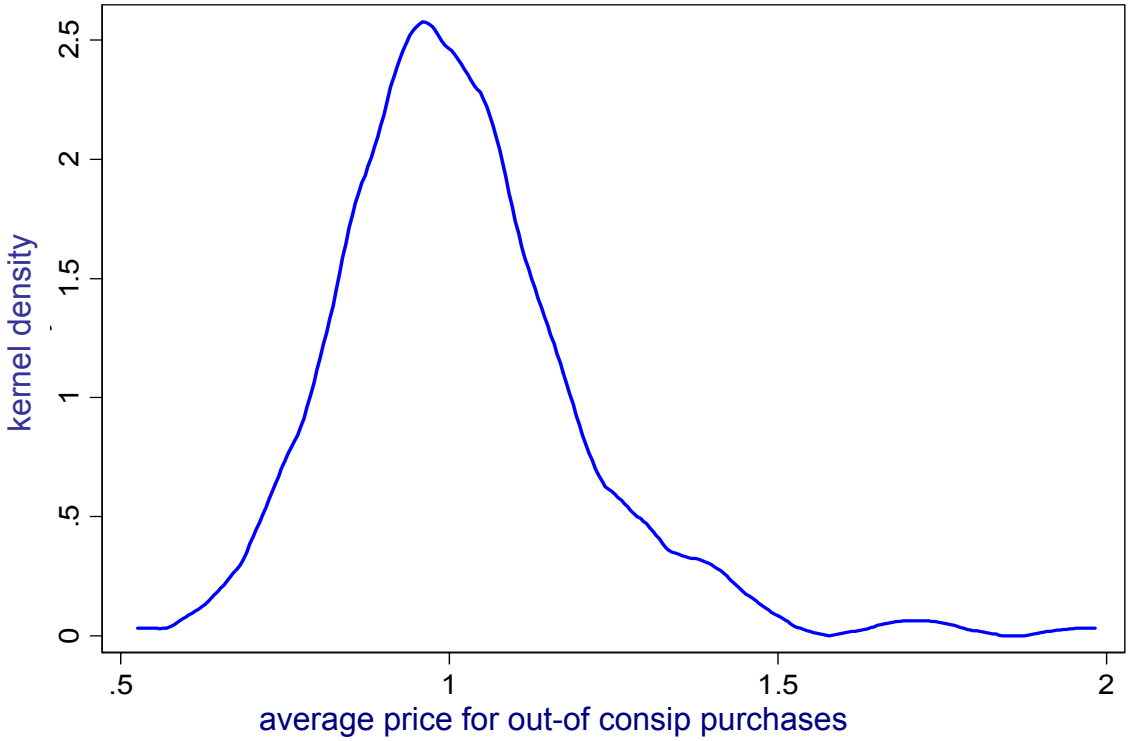


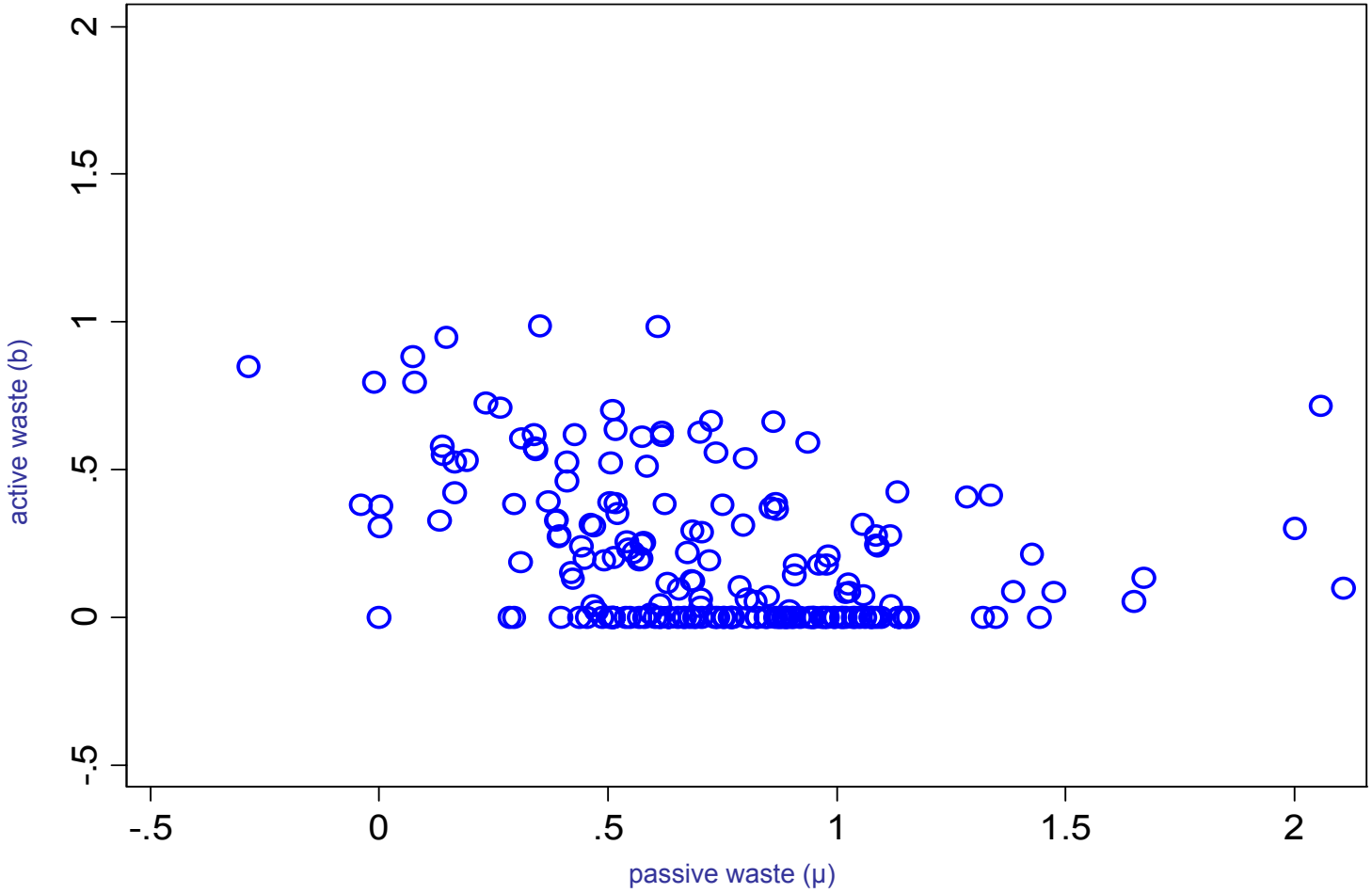
Figure 2: Average Prices of Goods not Purchased from Consip



percentile	1	10	50	90	99
price diff	0.67	0.79	1	1.23	1.68

Note: The average price for out-of consip purchases is estimated for each PB as the exponent of PB i's fixed effect in the regression of log price on: goods fixed effects, good specific trends, good specific quantities and good specific characteristics, using the sample of purchases made when a Consip agreement was not active.

Figure 3: Active and Passive Waste



Note: Each point represents a different PB. For each PB, passive and active waste are estimated from the price equation (6) and the selection equation (7) as explained in Section 5.3 under the assumption that the reference price is the lowest price paid by sample PBs, on average.

Table 1: Sample Description

1a: Public Bodies Sample

Governance Class	Number of PBs	Total Expenditure by Sample PBs in 2000 (E million)	Total Expenditure by Sample PBs over Total Expenditure by All PBs in 2000 (E million)	Average Number of Goods Purchased	Percentage of Total Purchases Made when a Consip Agreement is Active	Percentage of Consip Purchases Made when a Consip Agreement is Active
1. napoleonic bodies						
Ministries and Government	12	13368.0	0.92	12.2	59	62
Social Security Administration	3	1953.0	0.78	10.5	61	57
2. local governments						
Regional Councils	12	1683.9	0.61	10.6	51	26
Province and Town Councils	70	4162.2	0.21	11.9	51	39
3. semi-autonomous bodies						
Health Centres	81	6894.2	0.48	11.8	56	35
Mountain Village Councils	11	34.2	0.13	10.5	54	33
Universities	13	354.5	0.43	12	53	34
4. other	6	462.3	0.29	11.8	44	45

Note: The "other" category includes: The National Statistical Institute (ISTAT), the Institute for International Trade (ICE), the Higher Institute of Health (ISS), the National Research Institute (CNR), a Veterinary Research Center, and a Regional Research Institute. Total Expenditure by Sample PBs equals yearly expenditure for goods and services summed over all sample PBs in a given class. Tota Expenditure by All PBs equals yearly expenditure for goods and services summed over all the PBs belonging to that institutional class. Source: ISTAT XXXX

1b: Goods Sample

Good Type	(1) Observations	(2) Average Price	(3) Average Quantity per Order	(4) Percentage of Days when a Consip Agreement is Active	(5) Percentage of Consip Purchases when an Agreement is Active
Car Rental	160	399.5	4.81	53	68
		(208.6)	(9.58)		
Photocopier Rental	466	510.69	13.06	58	64
		(844.52)	(30.18)		
Laptop	775	1219.7	6.5	45	35
		(458.52)	(30.1)		
Desktop	648	992.5	16.0	39	47
		(587.5)	(62.84)		
Office Desk	245	232.1	11.9	10	11
		(171.9)	(26.02)		
Office Chair	280	96.6	30.4	25	5
		(52.7)	(86.2)		
Landline Contracts	143	1.89	125272	50	94
		(.74)	(292636)		
Projector	191	1438.0	1.82	13	44
		(647.3)	(2.44)		
Local Network: Switch	215	138.7	164.4	33	7
		(269.9)	(298.5)		
Local Network: Cable	102	3.33	8631.1	33	26
		(4.71)	(3245.3)		
Motoroil	23	5.19	681.34	41	0
		(2.01)	(1155.1)		
Heating Diesel	248	3.85	293583	50	30
		(13.81)	(504625)		
Lunch Vouchers	231	70.04	665895	79	52
		(4.57)	(1418723)		
Refuse Bins	63	152.63	290.76	0	0
		(184.94)	(768.58)		
Paper	755	2.40	6546.5	32	9
		(.922)	(22626.2)		
Mobile Phone Contracts	183	.041	1244620	57	59
		(.102)	(5011294)		
MS Office Software	155	233.2	151.1	56	20
		(91.5)	(483.1)		
Printer	294	483.95	22.6	43	47
		(576.7)	(96.9)		
Server	297	5967.5	3.45	0	0
		(6772.6)	(9.24)		
Car Purchases	345	10710.3	4.02	0	0
		(6112.7)	(11.23)		
Fax	249	338.16	6.89	45	41
		(158.85)	(18.02)		
Total	6068				

Note: For goods purchases, price equals the cost of one unit. Motor oil and Heating Diesel are measured in liters, Cables in meters. For goods rentals, price equals the monthly rent for one unit of the good. For Landline contracts, price equals the per-minute charge for national calls. For Mobile contracts, price equals the per-minute charge for calls to landlines. Quantity equals the number of items in a single purchase, except Heating Diesel and Motoroil, where quantity is measured in liters, Cables, where quantity is measured in meters, and Landline, Mobile and Lunch Vouchers where quantity is measured as total yearly outlay. Column (4) reports the number of days during which an agreement was active over the total number of days in our sample. During our sample Consip did not make agreements for refuse bins, car purchases and servers. Column (5) reports the number of purchases from the Consip catalogue divided by the total number of purchases made while an agreement is active for the good in question.

Table 2: Switching to Consip as a Function of Out of Consip Prices

Dependent Variable =1 if good purchased via Consip

Linear Probability Model-Standard Errors Clustered by PB-Good Type in parenthesis

	(1)	(2)	(3)	(4)	(5)
	Baseline	Good FE	Trends	Different Regimes	Complex Goods Sample
Out of Consip Price	.228***	.232***	.219***	.187***	.182**
	(.078)	(.063)	(.059)	(.057)	(.068)
Regime I (=1 if yes)				.306**	
				(.083)	
Regime II (=1 if yes)				.234***	
				(.027)	
Good FE	No	Yes	Yes	Yes	Yes
Good Specific Trends	No	No	Yes	Yes	Yes
P-value (H0: same slope)				.6918	
R-squared	.0060	.2429	.2753	.3041	.1630
Observations	3122	3122	3122	3122	1579

Notes: (***) (**) (*), indicate significance at the 1, 5, and 10% respectively. Out of Consip Price is estimated as PB i's fixed effect in the regression of log price on: goods fixed effects, good specific trends, good specific quantities and good specific characteristics, using the sample of purchases made when a Consip agreement was not active. Regime dummies capture the fact that different classes of PBs were subject to different requirements regarding Consip purchases at different points in time. Regime I applied to PBs belonging to the Central Public Administration between 2000 and 2002--these PBs were required to buy from Consip if there was an active agreement for an equivalent good. Regime II extended the requirement to all PBs in 2003. Regime III eliminated the requirement for all PBs for 2004 and 2005. Accordingly, Regime I =1 for Central Administration PBs before 2003, 0 otherwise. Regime II= 1 for all PBs in 2003, 0 otherwise. The omitted category is Regime III. "Complex" goods are cars (purchases and rental), desktops, laptops, fax machines, printers, photocopiers, servers, projectors and local cable networks. "Simple" goods are: photocopier paper, MS office software, heating diesel, landline and cellular line rental contracts, lunch vouchers, office chairs and office desks.

Table 3: Price Savings and the Quality Margin
Dependent Variable is Log(Price)
Linear Model- Robust Standard Errors in Parenthesis

	(1)	(2)	(3)	(4)	(5)	(6)
sample:	*PBs that buy from Consip*		*PBs that do not buy from Consip*		*All PBs, while agreement is on*	
Agreement Purchase (=1 yes)	-.199***	-.276***			-.171***	-.125***
	(.040)	(.038)			(.027)	(.028)
Agreement Active (=1 if yes)			.017	-.013		
			(.030)	(.026)		
PB FE	Yes	Yes	Yes	Yes	No	No
Good Characteristics	No	Yes	No	Yes	No	Yes
R-squared	.9611	.9769	.9529	.9663	.9447	.9553
Observations	3764	3764	4632	4632	2873	2873

Note: (***) (**) (*), indicate significance at the 1, 5, and 10% respectively. All regressions include good and year fixed effects, good specific trends, and good specific quantities. The sample in Colums (1) and (2) is restricted to PBs that buy the good from Consip when an agreement is active for that good. The sample in Columns (3) and (4) is restricted to PBs that do not buy the good from Consip when an agreement is active for that good. The sample in Colums (5) and (6) includes all PBs but is restricted to days when an agreement is active for that good..

Table 4: Estimates of Passive and Active Waste

reference price	average passive waste (μ)	average active waste (b)	share of PBs for which b>0	share of passive waste (μ/(μ+b))	share of PBs for which μ/(μ+b)>.5
min	.73	.20	.59	.79	.85
1st pctile	.41	.09	.39	.88	.91
10th pctile	.20	.06	.26	.92	.94
25th pctile	.09	.04	.21	.92	.95

Note: For each PB, passive and active waste are estimated from the price equation (6) and the selection equation (7) as explained in Section 5.3.

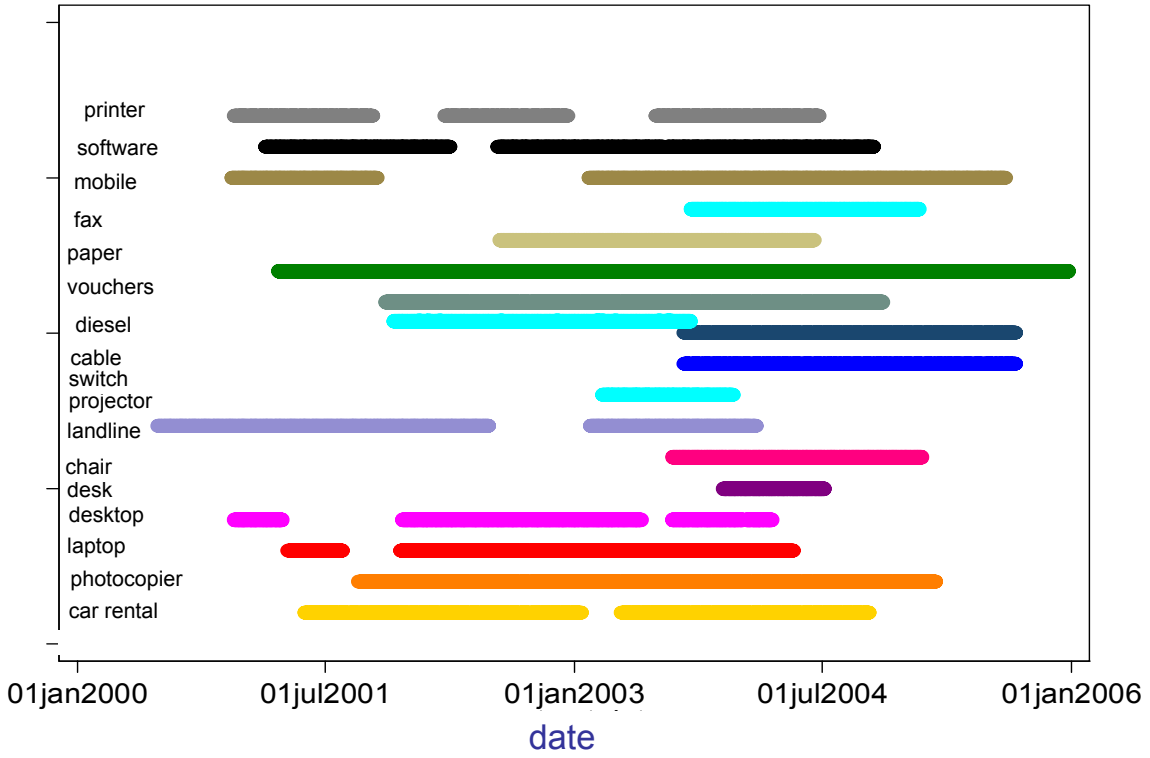
Table 5: PB Characteristics, Prices and Waste

Dependent Variables are the Average Price for Out of Consip Purchases (1), Active Waste (2) and Passive Waste (3)
Linear Model- Standard Errors in Parenthesis

	(1) average price for out-of consip purchases	(2) active waste (b)	(3) passive waste (μ)
governance types (category omitted: university)			
napoleonic bodies			
Ministries and Government	.412***	-.076	.962***
	(.134)	(.133)	(.227)
Social Security	.241***	-.142	.661***
	(.069)	(.171)	(.238)
local bodies			
Regional Councils	.197***	.193	.232
	(.061)	(.126)	(.176)
Province and Town Councils	.112***	.065	.173**
	(.031)	(.077)	(.083)
semi-autonomous bodies			
Health Centres	.045	.060	.038
	(.034)	(.077)	(.153)
Mountain Village Councils	.006	.068	-.055
	(.075)	(.144)	(.152)
geography (omitted: north)			
south-oc	-.004	-.081	.071
	(.055)	(.077)	(.118)
south	-.029	-.062	.001
	(.032)	(.073)	(.085)
centre	.007	.087	-.070
	(.030)	(.056)	(.063)
size			
log expenditure	-.009	.010	-.029
	(.018)	(.025)	(.035)
Adjusted R-squared	.2352	.0402	.2524
Observations	202	202	202

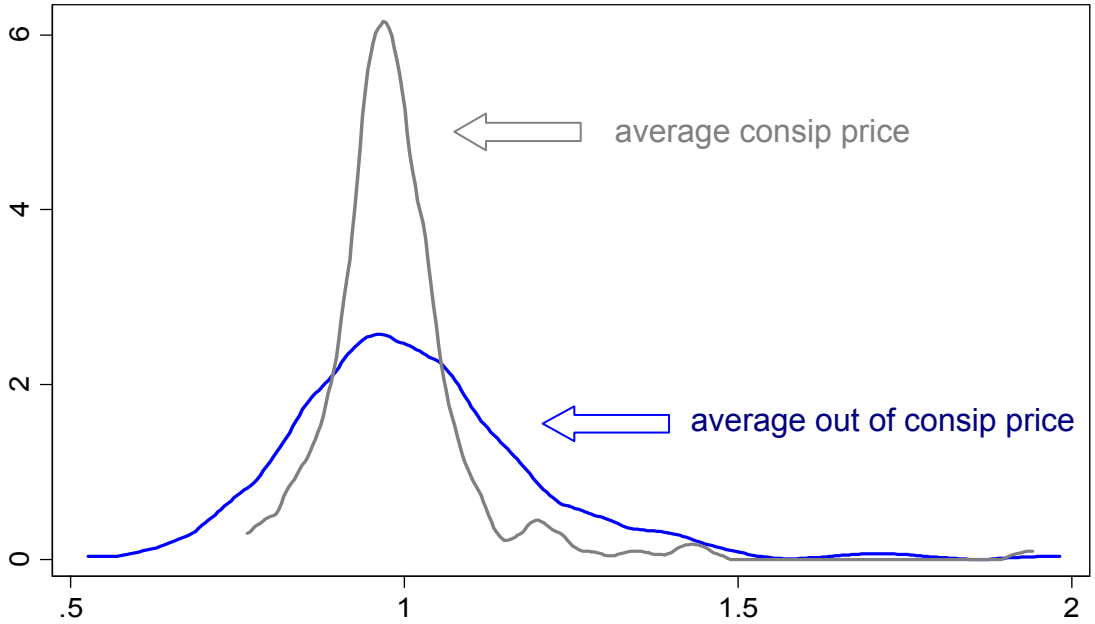
Notes: (***) (**) (*), indicate significance at the 1, 5, and 10% respectively. The omitted category for the type variable is "Universities". The omitted category for the geographical variable is "north". South-oc identifies the southern regions with high prevalence of organized crime (Campania, Puglia, Calabria and Sicilia). Six PBs that do not belong to any of the three governance classes are excluded from the sample.

Figure A1: Timing of Consip Agreements, by Good



Note: For each good, the line is full on dates when an agreement is active, blank when there is no active agreement.

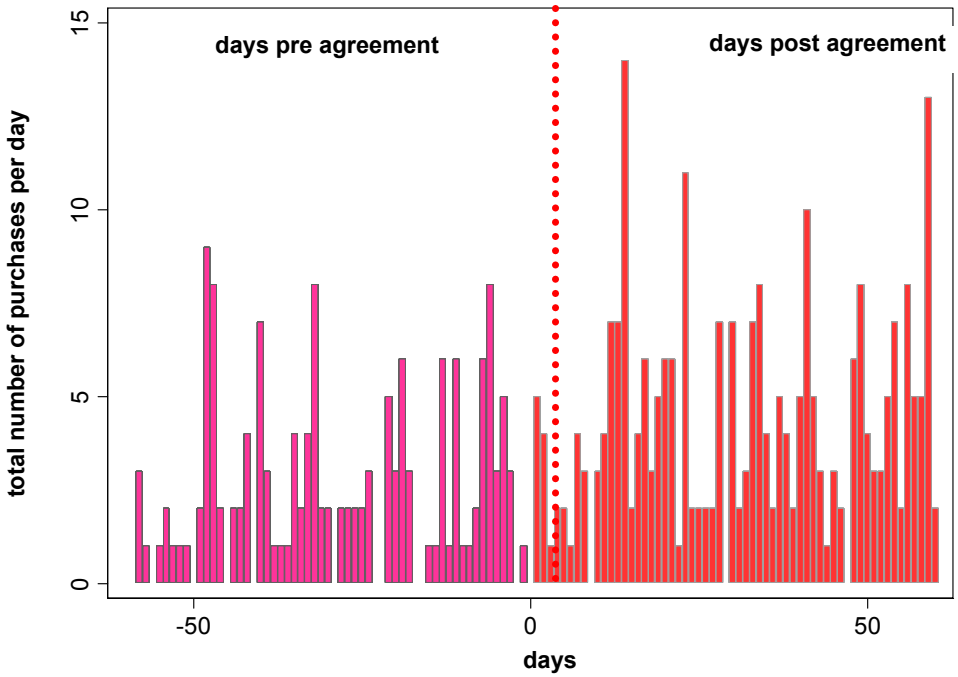
Figure A3: Average Price of Consip and Out of Consip Purchases



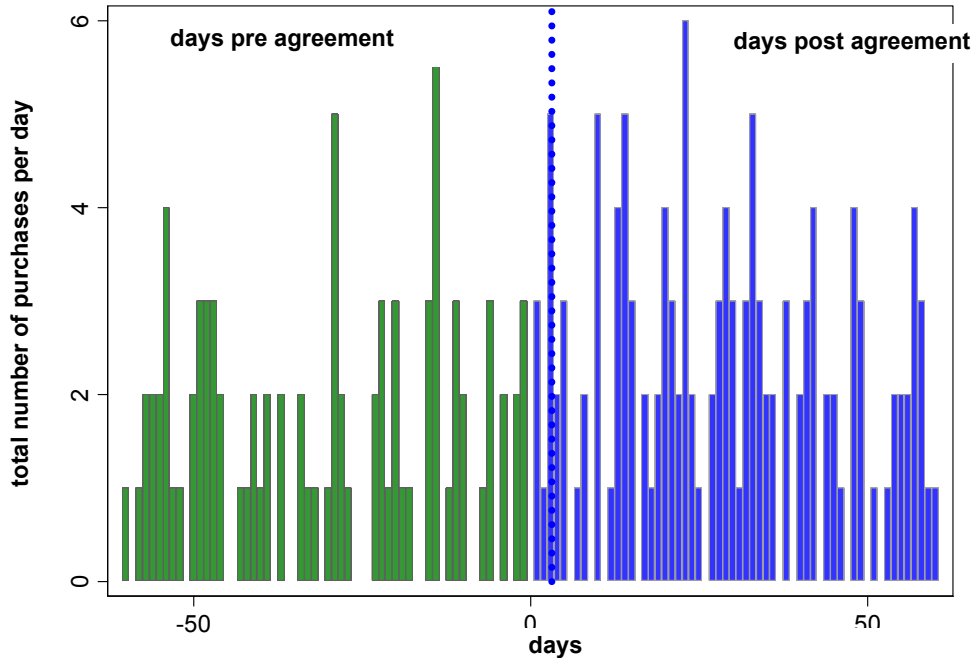
Note: The average price for out of consip purchases is estimated for each PB as the exponent of PB i's fixed effect in the regression of log price on: goods fixed effects, good specific trends, good specific quantities and good specific characteristics, using the sample of purchases made when a Consip agreement was not active. The average price for consip purchases is estimated following the same procedure, using the sample of purchases made from the Consip catalogue.

Figure A2: Timing of Purchases

Panel A: PBs that do not buy from Consip



Panel B: PBs that do buy from Consip



Note: The figure illustrates the number of purchases of all goods on the 60 days before the start of a consip agrement and on the 60 days after the end of the agreement. For each good, panel A only includes purchases by PB that do not buy the good from Consip when the agreement is active, whereas panel B only includes purchases by PB that buy the good from Consip when the agreement is active

Table A1: Purchase Timing

Dependent Variable =1 if good is purchased on day, 0 otherwise
OLS estimates; robust standard errors in parenthesis

	PBs that do not buy from Consip				PBs that buy from Consip			
	60 days before agreement		60 days after agreement		60 days before agreement		60 days after agreement	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
continuous measures								
number of days before agreement	.016				.001			
	(.017)				(.011)			
number of days after agreement			-.0002				.015	
			(.023)				(.015)	
splines								
number of days before/after agreement:								
11-20		.004		.111		.017		.016
		(.023)		(.042)		(.016)		(.029)
21-30		-.002		.040		.003		.024
		(.024)		(.036)		(.013)		(.030)
31-40		.015		.074		-.023		.018
		(.026)		(.038)		(.020)		(.030)
41-50		.003		.042		-.007		.009
		(.029)		(.038)		(.032)		(.028)
51-60		-.042		.074		-.020		-.004
		(.029)		(.039)		(.021)		(.030)
good FE	yes	yes	yes	yes	yes	yes	yes	yes
good specific trend	yes	yes	yes	yes	yes	yes	yes	yes
year and month FE	yes	yes	yes	yes	yes	yes	yes	yes
observations	1338	1338	858	858	1338	1338	858	858
R-squared	.1431	.1303	.2939	.2765	.1497	.1427	.2649	.2557

Notes: (***) (**) (*), indicate significance at the 1, 5, and 10% respectively. The omitted category for the number of days before/after agreement is 1-10. The sample in Columns (1)-(4) is restricted to PBs that do not buy from Consip when it is feasible to do so. The sample in Colums (5)-(8) is restricted to PBs that do buy from Consip when it is feasible to do so. In addition, the sample in columns (1),(2), (5) and (6) is restricted to 60 days before the start of each agreement for each good. The sample in Columns (3), (4), (7) and (8) is restricted to 60 days after the end of each agreement for each good.