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# When Food Safety Concern Decreases Safety: evidence from the informal meat market

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**ABSTRACT**

This paper investigates the design for food safety regulation, as related to quality standards. Requirements for higher quality standards, *ceteris paribus* enforcement mechanisms, have two effects: a) they increase the safety level in the formal market and b) they increase the costs of complying with regulations and therefore also increase informality. This trade-off determines the safety level, which may paradoxically decrease with the establishment of higher quality standards. The Brazilian meat market provides some indications of this adverse effect of regulation, especially in regard to sanitary norms Nos. 304 and 145, issued in 1996 and 1999 respectively, as well as the co-existence of three different sanitary inspection systems. As a general finding, more lenient food safety regulations are associated with a decrease in informality. A qualitative survey indicates that other variables, such as income, measurement costs in consumption, and distribution channels are also important to explain the level of informality. In addition, although taxation is an important component of the opportunity cost of being formal, it is neither a sufficient nor necessary condition for informality.

**PALAVRAS-CHAVE:** Informal markets, food safety regulation, quality regulation, laughterhouses, meat.

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## 1. Introduction

Even care can be excessive. This statement is probably true in many contexts, from hedging strategies to child raising. Here we apply it to food safety regulation and its effects on informality and, hence, on safety levels. The adverse effects of food safety regulation do not directly result in lower quality standards. They rather derive from the indirect effect of the regulations on informality, since they raise the cost of being formal. In this paper we elaborate this argument, focusing on regulation as a possible explanation for informality. The Brazilian meat market provides some indications of this adverse effect of regulation, especially in regard to Brazilian Federal Sanitary Norms Nos. 304 and 145, issued in 1996 and 1999, respectively, as well as the co-existence of three different sanitary inspection systems.

Informality is a major characteristic of developing and transitional countries, where enforcement mechanisms are less effective than in developed countries. Enste and Schneider (1998) measured the underground economy using different models, and concluded that informality reaches 39.2% of the GDP in developing countries, 23.2% in transitional economies and 14.2% in OCDE countries. Unfortunately, this problem is increasingly important, since informality grew in several countries in the first half of the 90's (Enste and Schneider, 1998: 39).

The Brazilian meat market is no exception. Approximately 40% of Brazilian meat originates from informal slaughtering, a fact that constitutes a major problem in food safety. Meat consumption without sanitary care may cause problems such as E. coli, Bovine Spongiform Encephalopathy (mad cow disease), tuberculosis and cisticercosis. The last three, besides having the capacity to cause human causalities, are particularly difficult for consumers to detect, because the related illness is perceived only years after consumption.

Informality derives from two sufficient conditions - a) the absence of sanitary inspection or b) tax evasion, which are usually present simultaneously. Informal meat production constitutes a subsystem - defined as the transgression of formal rules - that function in an entirely different way. It uses governance structures that are also distinct, because it is impossible to sign agreements based on verifiable information that can be used by the courts.

The literature on informal markets generally assumes that the main benefit of being informal is tax evasion (Loayza, 1996; Trandel & Snow, 1999). In some sectors, however, the costs incurred in conforming to regulation standards constitute the dominant variable that induces firms to operate in an underground market. These costs are related not only to higher quality standards but include the costs of complying with regulation routines, in general with the purpose of monitoring producers. Also, uncertainty and negotiation regarding the interpretation of rules are an important cost of formal activities.[1]

Although important as an explanation for informality, the literature on food safety regulations generally assumes perfect enforcement. As a consequence, the design of quality standards is circumscribed to the benefits and costs of complying with regulation, with no room for non-compliance (Antle, 1999).[2] Complementary to this literature, we try to explore the unintended consequence of food safety regulation on informality and, as a consequence, on the optimal level of regulation. This argument is similar to the one presented by Graham and Wiener (1995), who discusses the trade-off between 'target risks' and 'countervailing risks'.

The present paper is organized as follows. Section 2 describes informal markets and identifies in which of them regulation may affect the level of informality. Section 3 argues that the interaction between food safety regulation and the costs of being formal

affects safety levels, posing an additional element for choosing an optimal regulation design. Moreover, other variables, such as income, asymmetric information on consumption (consumer's measurement costs) and consumer habits are also important to explain informality levels. Finally, Section 4 describes a few features of the institutional environment of the Brazilian meat market, providing evidence as to the effect of regulation on informality.


## 2. Informal markets: general features

By definition, informal markets operate in a different institutional environment than do their formal counterparts. They of course have rules that govern interaction among human beings, but these rules are restricted to informal constraints. After all, informal markets are defined as such exactly because they transgress formal rules. But even the formal rules are important. Institutional design is one of the major elements in explaining the choice for informality.

The term informal market is still a broad definition, comprising various institutional settings and forms of organization. Since the effect of regulation on informality changes in accordance with market characteristics, it might be worthwhile to classify some of these markets. Some informal markets operate in socially condemned activities, such as drug trading, kidnapping, springing convicts from prison, and murder. In each of these intrinsically illicit activities, there are suppliers and buyers, prices, quality specifications and contract enforcement.[3] Although very different from formal markets, these modes of organization present the basic characteristics that allow them to be termed 'market.' Products may also be reproducible or an individual item, causing different effects of regulation on prices (Zuesse, 1998).

Other informal markets trade products or services that are intrinsically licit, but transgress one or another formal rule, a situation which is a sufficient condition for informality. The majority of these markets operate alongside their formal counterparts, and differ from them only in that they practice some form of tax evasion. We divide the informal market of licit products into four categories, which differ from one another with respect to the interaction between the parallel markets. Two conditions are met in the first category: a) consumers do not distinguish between the products of both markets, and b) the opportunity cost of being formal is excessively high, either because enforcement does not impose significant cost on informality, or else the costs of complying with regulation are excessively high. In this case, all products can be traded informally, constituting a single market. If attitudes toward risk and/or law enforcement are heterogeneous, formal and informal markets operate side-by-side, even with homogeneous products. Buyers and suppliers less averse to risk and subjected to a lower probability of inspection (e. g. small firms) tend to trade informally.

When products in the formal market differ from those traded informally, we distinguish two types of markets, depending on consumers' measurement costs. If consumers easily discriminate products deriving from formal and informal markets and, if that information is relevant for buying, the informal market can be treated as a market segment. In this case, the same firm may operate in both markets, as a market segmentation strategy (horizontal differentiation). For instance, consumers are aware of the formal electronics products market because sales vouchers allow post-sale services and warranty. Depending on consumers' price-elasticity, firms may sell products with or without taxes, operating in both the formal and informal markets. In the last category of market,

consumers may be unable to distinguish between formal and informal products, although they have intrinsically different qualities. As a consequence, formal and informal markets co-exist but are also subjected to adverse selection.

Quality regulation has a complex effect on this last type of informal market. First, the required quality that formal markets must comply with is the key-factor that differentiates products in both markets. Therefore, the higher (or stricter) the quality standards are, the greater are the differences between products from the formal and the informal markets. In addition, regulation may affect this market if it offers consumers reliable information, allowing them to distinguish between formal and informal products. As a consequence, consumers and firms that produce high-quality products demand regulation in order to avoid adverse selection. This is an important element that explains the emergence of food and drug regulation in U.S. in the late 19$^{th}$ century (Law, 2001). Quality regulation that is successful in providing reliable and relevant information transforms the fourth type of informal market (parallel with adverse selection) into the third type (parallel with perceived distinct products). That is to say, quality regulation is insufficient to eliminate informal markets because there may be a demand for products with low required quality.

Figure 1 summarizes the classification of informal markets described above. It differs from Enste and Schneider's presentation (1998) in that it emphasizes institutional features of informal markets rather than tax payment behavior.

**Figure 1**
**Informal Markets: Classification**
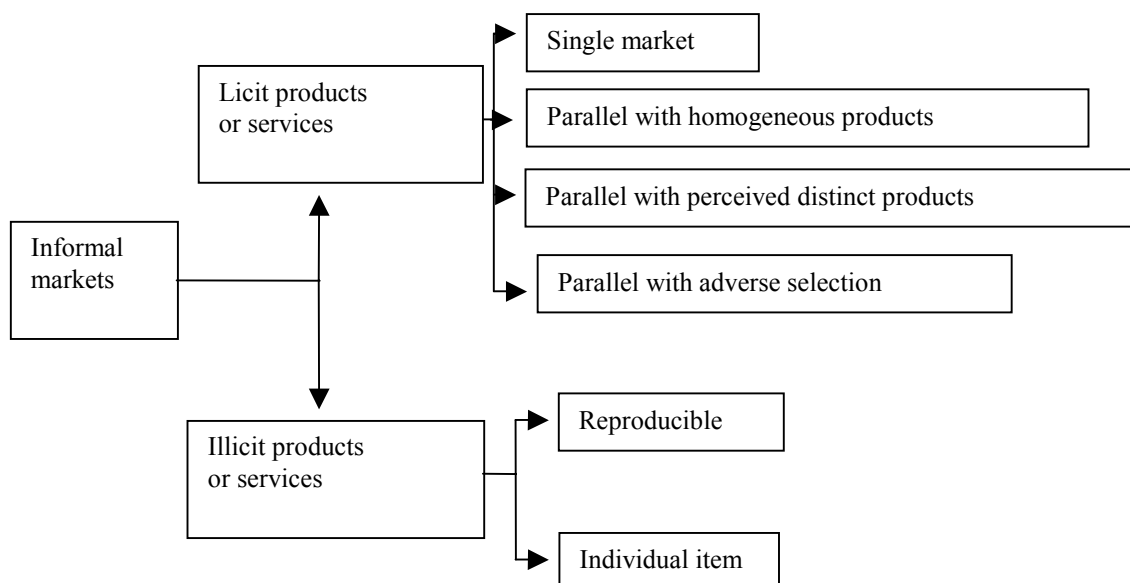


Besides its effect on the fiscal budget, informality causes three major inefficiencies: a) difficulties in enforcing property rights; b) difficulties in enforcing contracts, which restrict not only access to capital markets, but also the opportunity to profit from long-term coordination; and c) less access to public goods (Loayza, 1996).

In the food sector, informality also increases public health costs, inasmuch as products that do not comply with food safety norms imply higher risks. As a consequence, the benefits of being informal include lower quality-control costs and the approval of products that should have been discarded. In the particular case of the meat industry, the major benefit of informal slaughtering is the use of animals that would otherwise have been rejected due to lack of

quality, with direct consequences on public health. On the one hand, the benefits of informality in the food sector are greater for the transgressor, but the social costs are substantially greater as well.


## 3. Food safety regulation and informality

Two parallel markets – formal and informal, with distinct products – behave differently to the extent that food regulation imposes higher required quality. Products differ because certain sanitary practices are obligatory in the formal market, resulting in products with higher safety levels. Higher required quality standards, *ceteris paribus* the enforcement mechanisms, have two effects: a) they increase the safety level in the formal market (Antle, 1999), and b) they increase the benefits of being informal, thus increasing informality, which is associated with lower safety levels. This trade-off determines the real safety levels, which may decrease in the presence of higher quality standards.

This straightforward argument may be enriched with other variables, with the help of a quite simple model. A qualitative study on the meat market, based on semi-structured interviews made with sanitary and fiscal agents, slaughterhouses, and butchers' shops, provided the basic insights for choosing the relevant variables.

The risk associated with food consumption in the informal market (Ri) depends on three main elements: a) the technical status of production, b) consumers' measurement costs, and c) consumers' eating habits. If production techniques, chosen independently of required safety levels, imply higher quality, the informal market's risk will be lower. For instance, the fact that farmers largely use grass to feed livestock in Brazil and Argentina results in a negligible risk of mad cow disease, the occurrence of which is associated with the ingestion of animal protein. Also, if consumers' measurement costs are low, firms have an incentive to adopt stricter quality control in order to keep selling (Barzel, 1982). As a consequence, the risk associated with food consumption in informal markets – not subject to food regulation – falls when consumers' measurement costs decrease as well. Finally, consumer's eating habits also affect the risks associated with food consumption in general, because some of such habits inhibit the occurrence of illness. [‡]

Eating habits are not given. They may emerge in response of quality uncertainty in the food market. As a consequence, there is probably an endogeneity problem here, because it explains the risk in the informal market, but this risk may explain the emergence of consumers' habits. In this paper, we assume that habits are pre-determined, because, as an informal constraint, they change less abruptly than sanitary norms. Unless otherwise indicated, from this point on we will assume that the risk of the informal market is constant.

**Risk (informal market): Ri**

The risk associated with food consumption in the formal market (Rf) depends on the quality required by food safety regulation. Although quality is multidimensional, we will assume for simplicity's sake that it can be reduced to a single dimension with direct correspondence to safety. As stated above, the higher the required quality, the lower the risk in the formal market.

**Risk (formal market): Rf** = f(quality standards, Ri); f'<0

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[‡] For example, well-cooked meat eliminates the risk of tuberculosis and E. coli.

Finally, the appropriate design for food safety regulation hinges on informality or, more exactly, on the relative size of the informal market. Operating in an underground economy is a choice that depends roughly on the costs and benefits of being formal. Coercive enforcement mechanisms, particularly monitoring, inspections and fines, play a fundamental role, subjecting those who use informal markets to the risk of being caught, with the respective pecuniary and social costs. Given enforcement, the higher the required quality, the greater the benefit of being informal, as informality eliminates the cost of providing superior products, measuring quality, and complying with regulation monitoring procedures.[4] This effect can be counterbalanced if regulation increases the demand for formal products. However, if adverse selection still prevails, quality standards have a positive effect on informality. Moreover, informality depends on a set of variables that we treat as a vector of shift parameters ($\theta$).

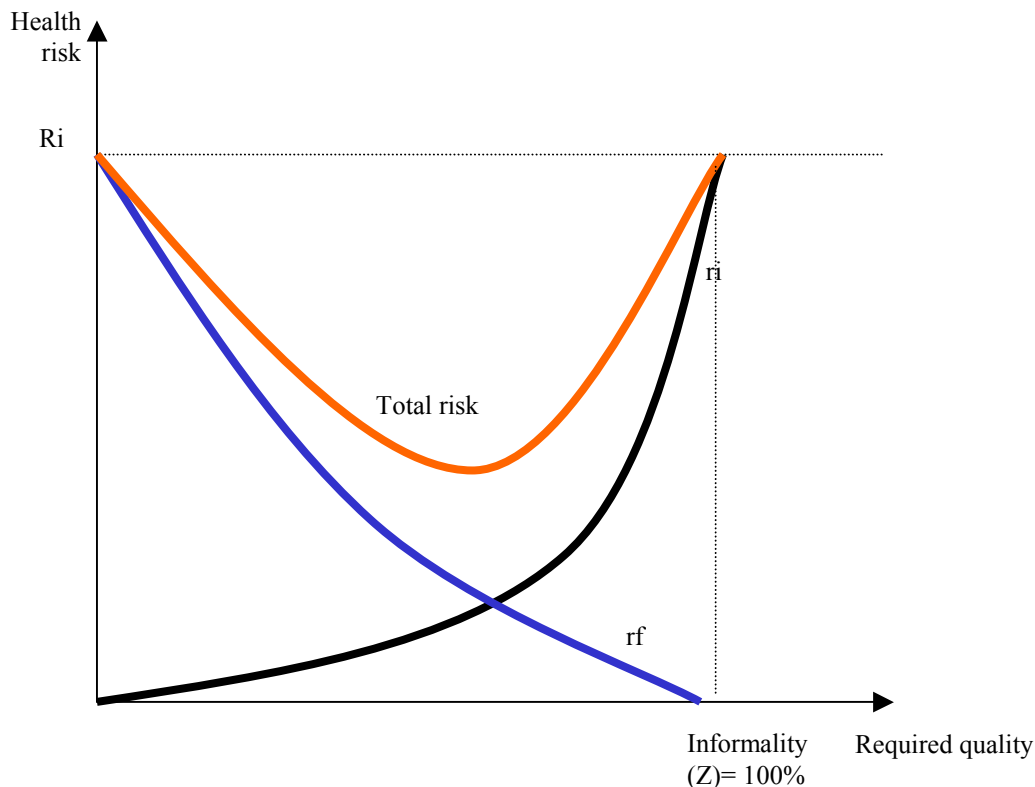**Informality** ($z$) = f(required quality, enforcement mechanisms, $\theta$); $0 \leq z \leq 1$

Four shift parameters deserve some attention for having important effects on informality. The tax burden is the most often mentioned in the theoretical literature and in policy discussions, having a straightforward positive effect on informality. It is worth mentioning that the lack of taxation is not necessarily a condition for informality, inasmuch as there are other relevant benefits in being informal. The empirical discussion presented in the next section illustrates a case where tax relief had no impact on informality. Consumers' measurement costs, for example, also have a positive effect on informality. If consumers perceive different safety levels between the formal and the informal markets, firms that operate in the informal market are forced to improve quality control and provide superior products. Conversely, lower consumer measurement costs reduce the benefits of being informal.

The greater incidence of informality in developing countries is partially due to their lower per capita income, which is the third shift parameter. Lower-income populations tend to present demands with higher price elasticity. As they are more sensitive to price changes, they tend to prefer products from informal markets that, although more risky, are cheaper. Finally, a formal rule is less likely to be transgressed if it is well embedded in the institutional environment (prevailing formal rules and informal restraints). And, if a sanitary norm conflicts with informal restraints, such as conventions and eating practices, informality is likely to be higher.

Figure 2 represents the relationship between the required quality level, informality, and health hazards. The rf curve represents the health risk in the formal market, weighted by its relative size [Rf * (1-z)]. This is a downward curve for two reasons. First, as the required quality increases, the risk in the formal market (Rf) decreases because superior products are traded. Second, the higher the required quality is, the greater the benefits of being informal and, hence, the greater the informality (z). As the relative size of a formal market shrinks, the health risk associated with food consumption in that market also falls. Moreover, when regulation does not demand required quality (in which case there is really no regulation at all), there are no benefits in being informal (z=0). Inversely, in the presence of extremely high quality standards, the formal market may cease to exist (z=1).

**Figure 2**
**Optimal quality level and informality**



The *ri* curve represents the risk of food consumption in the informal market, weighted by the relative size of this market ($Ri*z$). If the higher required quality has negligible effect on consumers' measurement costs, informality ($z$) is likely to increase. As a consequence, *ri* is upward sloping. If quality standards are too high, only the informal market prevails and the expected health risk is ($Ri$). This risk may be higher than the risk in the formal market with no regulation if informality inhibits the private provision of information about quality (e.g. brand names). In this case, no regulation is for sure better than a regulation that conduces all production to informality.

The total health risk is the simple sum of the respective curves of the formal and informal markets. If the first sanitary norms included in food safety regulation provide a stronger impact on safety and a lower adverse effect on informality, the total risk curve will be 'U' shaped, indicating that there is an optimal level of required quality, associated with an optimal level of informality. It is noteworthy that this 'optimal level' derives only from the health risk. Inasmuch as informality causes other inefficiencies – such as difficulties in enforcing property rights and contracts – society is better off with even lower quality standards.

Figure 2 allows one to carry out exercises of comparative statics in order to explore the effects of the shifting parameters. For instance, a tax increase, *ceteris paribus*, will foster informality, affecting all curves. Therefore, the resulting optimal level of required quality will be lower. As a policy implication, a significant increase in tax burden is likely to generate a weakening of food safety regulation. The same applies in regard to the effect of consumers' measurement costs. For products whose measurement costs are higher, the required quality standard is likely to be lower.[5] An increase in per capita income, on the other hand, has a negative effect on informality, shifting the vertical dotted line to the right and expanding the horizontal dimension of all three curves. As a consequence, optimal

required quality will be higher. A straightforward proposition derived from this result is that poor countries should require lower quality standards because the effect of regulation on informality is more significant in these places. Finally, if sanitary norms conflict with informal restraints, such as eating habits, informality is likely to be greater and, as a consequence, it would be better to have lower quality standards for food safety regulation.

The next section applies some of these arguments to the Brazilian meat market. As it is still quite difficult to measure all the variables presented in this simple model, the section focuses on the relation between sanitary norms and informality.

## 4. Food safety regulation in Brazilian meat market

With almost one million cattle raisers, more than 800 formal slaughterhouses, and 151 million animals, bovine meat production is one of the major industries in Brazil. Exports have been increasing since the industry received certification of lack of major cattle diseases, such as the mad cow disease and the "foot-and-mouth disease fever." Notwithstanding these positive results, informality oscillates between 40% and 50% of the bovine meat market, with serious negative effects on public health.

### Institutional environment

We have divided the analysis of the institutional environment that regulates meat production into three main issues: sanitary inspection systems, recent sanitary norms that require higher quality standards, and taxation.

The sanitary inspection system (see Law 5.760 of 1971) was the sole responsibility of the Federal Government. In 1989, Law 7.889/89 allowed states and municipalities to set up their own inspection systems in accordance with food regulations which specify quality standards. Although sanitary norms are uniform throughout the country, inspection systems at the three administrative levels (federal, state and municipal) differ in terms of required quality control and monitoring procedures. In addition, the federal system (SIF) allows the sale of meat throughout the country and on the international market. The recently established state system (SISP, for the State of São Paulo) allows meat to be sold within state borders. As expected, São Paulo State, the largest market, developed the most successful inspection system, since slaughterhouses do not suffer significant losses if they are required to restrict their market to state boundaries. The third inspection system, at the municipal level (SIM), allows sale of meat only within the municipality, which is a serious limitation to firm's development, inasmuch as consumption tends to be concentrated in urban areas, where cattle raising and slaughtering are less frequent.

The state inspection system is more frequently adopted by small slaughterhouses, mainly because of the lower quality and exchange costs when compared with the federal system (Mathias, 1999; Pigatto, 2001). In our field research we observed that some industrial plants that had been rejected by the federal system were operating under state inspection. This indicates that the lenience of the state system could be associated with the lower reliability of its inspections and, as a consequence, imply higher risk. This is the perception of large and varied retailers that, in general, prefer to purchase products that are under federal inspection. The municipal system, on the other hand, is quite variable, being very sensitive to local policies and commitments. As a general rule, the problem of capture and/or more lenience is more common in municipal inspections, because local public authorities take into account the trade-off between food safety and employment, slaughterhouses being important employers in some communities.

Table 1 summarizes various features, benefits and costs of each of the three sanitary inspection systems.

**Table 1-**
**Some Features of Sanitary Inspection Systems in Brazil: meat production**

| Inspection System | Main features | Main benefits | Main costs |
|---|---|---|---|
| **Federal (SIF)** | •Allows marketing throughout the country and abroad. • Government-hired inspection agents observe slaughtering; more intense monitoring (more agents per scale), but hired by slaughterhouses | • Better reputation on the domestic market (various retailers prefer federal inspection) | • Higher costs: investments, quality control |
| **State (SISP)** | • Allows marketing only within the state • Government-hired inspection agents are not necessary | • Lower required investments and costs of complying with regulation | • Restricted market (not significant for São Paulo State) • Lack of reputation in highly differentiated markets • Risk of capture |
| **Municipality (SIM)** | • Allows sale only within the municipality where slaughtered • Does not specify the number of agents | • Lower required investments and costs of complying with regulation | • Restricted market • High risk of capture |
| **Informal** | • Not restricted to administrative boundaries | • No taxes or quality control costs • Flexible to correspond to consumers' habits • High measurement costs for consumers (formal and informal are indistinguishable) | • Difficulty of enforcing contracts • Higher risk for consumers and suppliers |

Claiming that domestic meat consumption was subjected to excessive risk, the Brazilian Ministry of Agriculture issued Sanitary Norm No. 304 in April, 1996, raising sanitary standards. This norm required slaughterhouses to bone and pack the meat within their own facilities before it reaches the meat retailers. This norm was expected to exclude from the market slaughterhouses and distributors with low hygienic standards and/or those unable to implement facilities for boning and packing the meat. In effect, this sanitary norm raised the costs in the formal market, consequently increasing the benefits of going informal. The meat retailers' lobby managed to postpone the implementation of boning at slaughterhouses, since their competitive advantage against supermarkets was providing customized cuts and boning. To the extent that Sanitary Norm 304 transferred these activities to the slaughterhouses, it influenced the competition between meat retailers and supermarkets. Finally, in January, 1999, Sanitary Norm 145 established boning and packing, with nationwide determinations regarding shelf life, weight and cut. As this norm increased the costs of being formal without changing enforcement mechanisms, it may have a positive effect on informality.

The ICMS value-added tax is the major component in the fiscal burden on formal activities in the area of meat production, and allegedly one of the main causes of informality (Silva and Batalha, 2000). The original value-added tax, as of 1984, was 17% nationwide. As the ICMS is defined by the states, it was necessary to coordinate all federal levels in order to establish a uniform tariff. In 1992, meat, defined as a basic product, benefited from a decrease in value-added taxes, which fell to 7%. Finally, in the second half of the 1990s, some states applied mechanisms to reduce the tax burden on slaughterhouses, with the acknowledged objective of inhibiting the informal meat market. In the State of São Paulo State, the mechanism presumes that slaughterhouses provide no added value and, as a consequence, are not required to pay direct taxes.[6] All changes observed in taxes incident on meat production are conducive to decreases in informality, all other aspects being equal.

**Measuring informality**

Measuring informality means measuring unregistered transactions, implying problems in the reliability of results. In order to mitigate this problem, we adopted two different methods, as recommended by the literature on informal markets (Enste and Schneider, 1998). It should also be mentioned that we are not primarily interested in the absolute level of informality, but in its consistent variation through time.

We first obtained official data on cattle slaughtered under inspection, by number of animals, comprised of information on the three sanitary inspection systems. We used two different approaches to estimate the total number of heads of cattle slaughtered (with and without inspection). The first is based on figures on cattle hides as reported by the leather industry,[7] which is a proxy for the total number of cattle slaughtered. This is a rough estimation, but the leather industry double-checks it with chromium consumption, used for tanning. The second estimation makes use of data from a private consultant company, based on consumption estimations and interviews with market operators. Results of both estimations, presented in Table 2, are somewhat consistent, as well as alarming. Informality ranges from 40% to over 50%, with no signs of abating.

**Table 2**
**Informality in the Meat Market**

| Year | Cattle slaughtered under inspection (in thousands)* "a" | Cattle hide reported by leather industry (in thous)** "b" | Estimated cattle slaughtered w/o inspection (%) "1-(a/b)" | Cattle slaughtered (in thousands)*** "c" | Estimated cattle slaughtered w/o inspection (%) "1-(a/c)" |
|------|------|------|------|------|------|
| 1989 | 13,462 | 23,000 | 41 | 24,162 | 44 |
| 1990 | 13,375 | 23,000 | 42 | 24,419 | 45 |
| 1991 | 13,934 | 23,500 | 41 | 27,135 | 49 |
| 1992 | 14,563 | 24,000 | 39 | 30,043 | 52 |
| 1993 | 14,951 | 24,500 | 39 | 29,530 | 49 |
| 1994 | 15,512 | 25,900 | 40 | 28,410 | 45 |
| 1995 | 17,174 | 26,900 | 36 | 30,667 | 44 |
| 1996 | 18,919 | 27,900 | 32 | 32,689 | 42 |
| 1997 | 14,886 | 29,100 | 49 | 31,464 | 53 |
| 1998 | 14,906 | 30,200 | 51 | 31,029 | 52 |
| 1999 | 16,787 | 31,600 | 47 | 31,029 | 46 |
| 2000 | 17,059 | 32,900 | 48 | 32,850 | 48 |

Source: IBGE*, CICB** e FNP***

Table 2 shows that the 1992 tax reduction may have been related to a slight decrease in informality in subsequent years. On the other hand, it is clear that taxes are neither a necessary nor a sufficient condition for informality, inasmuch as they were significantly lower at the end of the 1990s, when informality reached its peak. Sanitary Norms 304 and 145, issued in 1996 and 1999, respectively, seem to have had an adverse effect on informality, a fact that is consistent with the argument presented in the preceding section. When quality standards are higher and enforcement mechanisms have continued the same, the benefits of informality are greater. There is no evidence, however, to prove the second step of the argument, which relates the increase in informality to a decrease in safety levels, because actual safety depends on other variables as well, such as consumer habits.

Moreover, we estimated informality for the five macro-regions in Brazil, with the Northeastern Region presenting a significantly higher share held by the informal meat market (around 70%). That region has two important features that may explain that result. First, it has the lowest per capita income in Brazil and, therefore, a local demand that is more sensitive to price changes. In addition, Northeastern consumers traditionally buy meat at street markets, preferring what they call 'hot meat' (meat exposed to the elements) (Silva and Batalha, 2000). In marketing channels such as street markets, it is costly for consumers to distinguish whether the meat comes from the formal or the informal market.

As a second exercise, we compared the data from the three sanitary inspection systems in the State of São Paulo. To measure informality at the state level, we used the cattle-slaughter estimation from the same private consulting company. Table 3 presents two noteworthy results: a) the reduction of the share of the federal sanitary inspection system and, b) a significant reduction of informality in this state.

**Table 3**
**Cattle slaughtered in State of S.Paulo (in thousands)**

| Year | Total* Under Inspection | Federal* | (State+ Municipality) | Federal share | Total slaughtered | Informality |
|------|------|------|------|------|------|------|
| 1995 | 4,226 | 2,625 | 1,601 | 62% | 5.793 | 27,1% |
| 1996 | 4,218 | 2,684 | 1,533 | 64% | 6.003 | 29,7% |
| 1997 | 4,307 | 2,633 | 1,673 | 61% | 5.522 | 22,0% |
| 1998 | 4,383 | 2,372 | 2,010 | 54% | 5.708 | 23,2% |
| 1999 | 4,462 | 2,437 | 2,025 | 55% | 5.639 | 20,9% |
| 2000 | 4,472 | 2,443 | 2,028 | 55% | 5.533 | 19,2% |

Source: Ministry of Agriculture, State Department of Agriculture, and FNP

**Discussion**

The results suggest that some slaughterhouses that were formerly under federal inspection opted to switch to a less expensive inspection system, at state or municipal level. Our field research indicates that these slaughterhouses usually deal with undifferentiated products and sell predominantly within the state, which increased the net benefits of the state and municipal systems. Finally, the significant decrease in informality suggests that more lenient sanitary standards, such as those exercised by the state and municipalities, means that slaughtering houses which had been informal move into the formal market.

These findings are weak evidence that over-regulation can be prejudicial. Weak because informality is a function with several variables, including some that are not observable on an annual basis. For example, although there is information about consumer habits, we do not know the exact behavior of this variable through time and, as a consequence, we are not able to control its effects on informality. The same applies to private provision of signal about quality (using brand names), that affect the demand for meat (Barcala et al., 2001; Holleran et al., 1999). Neither effect is likely to be significant because informal rules (e.g. consumer habits) tend to change slowly, and the branded meat market in Brazil accounts for less than 2% of the total.

**5. Concluding Remarks**

The design of food safety regulation comprises several dimensions, such as coercive enforcement mechanisms and the required quality. This paper investigated some implications of the latter, particularly if it has adverse effects on informality. In developing countries, where per capita income is low and enforcement mechanisms are less effective, excessive demands for quality can sometimes reduce the actual safety level.

In order to compare different sanitary norms, each of them is analyzed in three dimensions: a) enforceability; b) required quality standards, and c) the costs of being formal. The three dimensions interact to determine a) the costs and benefits of informality and, hence, the level of informality, and b) the food safety level in the formal market. A qualitative survey also indicates that other variables, such as income and asymmetric information on consumption and distribution channels, are also important in explaining informality levels.

The results suggest that Sanitary Norms Nos. 304 and 145, issued in 1996 and 1999, respectively, had a positive effect on the level of informality. This effect may overweigh the benefits of higher quality standards, inasmuch as informality increases the risks related to food consumption. There is also evidence that sanitary regulations at the state and municipal levels - generally less expensive than federal regulation - have reduced informality.

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Notes:

[1] Becker and Henderson (2000) provide an example of these costs in air quality regulation in U.S.

[2] Loader and Hobbs (1999) is an exception, discussing the strategic response of firms to food regulation. Their focus though is private quality strategies and not informality.

[3] Vertical integration is commonly observed in some of these markets, i. e., buyer and supplier are the same person or organization. Off course, the transaction still exists, but is not governed by market or hybrid forms. One possible reason for the intense occurrence of vertical integration is the difficulty of enforcing contracts without the help of formal rules.

[4] This cost is equivalent to the notion of cost of exchange, developed by Benham & Benham (2000).

[5] Measurement costs also explain the emergence of food regulation in the U.S.A. (Law, 2001), because such measurement provided consumers with information, mitigating the adverse selection problem. In contrast, our argument here emphasizes the quality specification level in food regulation, given its ability to transmit information to consumers. There are two explanations for the failure of regulation in providing information to consumers. First, it is costly to check whether a product is formal or informal (for example, eating in a restaurant). Second, the information provided by regulation (formal versus informal) is less relevant to consumers than other information signals. This is the case of national assurance systems whose motivation was not a consumer demand (Holleran at al., 1999).

[6] Actually transforms a value added taxes into sales tax

[7] Data from the Brazilian Leather Industry Association (*Centro da Indústria de Curtumes do Brasil – CICB*).