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Regulating a Consumer Good Market in the Presence of an Endogenous Black Market Alternative[1]

Regulando um mercado de bens de consumo na presence de um mercado negro endógeno.

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RESUMO

Este artigo estuda a regulamentação dos mercados em que os agentes econômicos (ou seja, os consumidores) tomam suas decisões de compra em um ambiente onde produtos legais competem contra substitutos ilegais, como armas ou cigarros. Nós também discutimos mercados peculiares que estão menos caindo nessa definição, como o comércio de órgãos humanos e animais selvagens, mas também os chamados bancos de sombra. Nosso foco é o impacto das medidas regulatórias que afetam assimetricamente os segmentos legais e ilegais de um mercado em padrões de concorrência, resultados de mercado e bem-estar. Nós pré-enviamos um modelo teórico-teórico para endogenizar a decisão das empresas de ir legal ou ilegal. Essa decisão está associada com custos diferentes, mas também com um tipo diferente de concorrência no mercado: diferenciação horizontal de produtos se todas as empresas são legais e rigorosamente regulamentadas, ou diferenciação vertical se não. Nosso modelo mostra que a regulamentação pode se atrasar se o mercado negro não for considerado. Uma regulamentação mais rigorosa - que só afeta o segmento legal - aumenta os incentivos para se tornar ilegal sempre que a nova medida de regulamentação aumenta os custos de entrada legal. A regulamentação em tal contexto leva à redução da qualidade média dos produtos e ao menor bem-estar dos consumidores.

Palavras-chave: Mercado Negro, Regulação, bens do pecado
JEL: K2, K23, L1, L51

ABSTRACT

This paper studies the regulation of markets where economic agents (i.e. consumers) make their purchase decisions in an environment where legal products compete against illegal substitutes, such as weapons or cigarettes. We also discuss peculiar markets less clearly falling into that definition, such as trade in human organs and in wildlife animals, but also the so-called shadow banking. Our focus is on the impacts of regulatory measures affecting asymmetrically the legal and the illegal segments of a market on competition patterns, market outcomes and welfare. We present a game-theoretical model to endogenize companies' decision between going legal or illegal. Such decision is associated with different costs, but also with a different type of competition in the marketplace: horizontal product differentiation if all firms are legal and tightly regulated, or vertical differentiation if not. Our model shows that regulation may backfire if the black market is not considered. More stringent regulation – which only impacts the legal segment – boosts the incentives for going illegal whenever the new regulatory measure increases the costs of legal entry. Regulation in such a context leads to lower average product quality and lower consumer welfare.

Keywords: Black Markets, Regulation, Sin goods

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[1] An earlier discussion of the cigarettes market exclusively is present in Bettini et al (2013). Parts of that earlier unpublished paper written by the overlapping coauthor were explicitly incorporated into the present paper. Such coauthor thanks Humberto Bettini and Lucia Salgado for a pleasant and fruitful collaboration working on the cigarettes market.

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1. Introduction

Recent years have witnessed a strong move towards more strict regulation of some already highly regulated sin goods markets around the world, such as cigarettes and spirits. The discussion about liberalizing some or all illegal drugs, regulating trade in human organs or wildlife animals, or allowing reimportation of medicines, all remain hot topics in policy debate. At the same time, all sorts of black markets seem to grow steadily around the globe.

Sin goods are usually defined as goods which can cause long-term negative effects going beyond the consumer (i.e. negative externalities), commonly associated with health.

A sin good is a good whose consumption provides short-term high pleasure (orutility to its consumer) but causes strong negative externality on society, which can be direct or in the long run, through for example higher health care burdens. For this reason, sin goods consumption is disapproved by the general public (including its consumers), who therefore tolerates high (or excise) taxation on then, the so-called sin taxes – to be levied on their consumption, if ever this happens to be considered legal. The typical examples of sin goods are cigarettes and spirits, as well as fatty food.

A black market is usually defined as a marketplace created beyond the borders of legality in order to avoid collecting taxes or respecting price and sanitary controls or other governmental impositions, such as simple prohibition. The existence of a black market usually implies that there is competition between legal products and illegal ones, as the relevant market – as defined in Competition Policy (Antitrust) – will typically encompass goods both legally traded and those coming from the black market as they shall be "regarded as interchangeable or substitutable by the consumer (by reason of the products' characteristics, their prices and their intended use)".[4] For example, smuggled and fake spirits and cigarettes compete against legally traded ones, illicit drugs are substitutable to some extent for licit ones, and the black market for transplanted organs is a substitute to queuing for longer in the official transplantation lines.[5]

Black markets, as seen, commonly arise for the so-called sin goods, but not only. While the economics of sin goods has attracted the attention in the field of industrial organization, the black markets emergence has not. Reviewing the literature on sin goods is beyond the scope of this paper, especially because they typically do not take a black market into account, as is the case for Gruber and Koszegi (2001 and 2004) and Gruber and Mullainathan (2005), which claim for higher excise taxes on cigarettes based on the time-inconsistence of smokers – such taxes are then interpreted as a self- control device. O'Donoghue and Rabin (2003 and 2006) go even further, claiming for possible Pareto improvements of sin taxes, benefiting

[4] Text extracted, thanks to a suggestion from the referee, from the European Commission website: Available in: http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=LEGISSUM:l26073&from=EN

[5] Although there is technically no market for transportation organs – as the legal segment bears no price – consumers do indeed face a cost of staying on the line in the legal segment.

both from time-consistent and time-inconsistent consumers at a time. All those papers, however, neglect the possibility of a black market. Immordino et al. (2015) question O'Donoghue and Rabin (2006) but not on the basis of a black market – they argue, instead, that taxation can be inefficient in terms of administration, collection and compliance costs. Wasserman et al. (1991) also focus strictly on the legal market when claiming for a more stringent regulation against smoking in public places at the same time as estimates very low price elasticities for cigarettes consumption both by adults and teenagers.

Our claim in this paper is that the potential existence of a black market and the incentives for it to arise and grow should not be neglected when the government is considering public policy to be implemented. In particular, it should be taken into account that a more stringent regulation only impacts (directly) the legal segment of a market, leading to a higher attractiveness of the black segment.

We start the paper by providing some Micro foundations for the emergence of black markets in section 2, where we also review the (early) literature on the topic. We segment black markets into two different categories: ones emerging from shortage of products (usually due to regulation failures) and ones coming from high prices charged in the legal market, leaving loads of avid consumers unserved. We include in this section a more thorough discussion of a particular black market of interest: shadow banking. It is an increasingly important economic activity, which is not illegal per se but is also on the outskirts of the reach of regulatory measures. We claim shadow banking, although legal, should be viewed as a black market in the sense employed throughout this paper.

The cigarettes market recent radical regulatory changes – and its seemingly disregard for the illegal market despite its importance in most developing and transition countries – motivated this paper and its sketch of a model, as did the lack of treatment of these market structures by Industrial Organization models. For this reason, section 3 is dedicated to providing some background on the Law and Economics of the cigarettes market and its regulation.

Section 4 presents the sketch of a game-theoretical model for markets where the illegal product could be a legal and tightly regulated one and explores its main result. The proposed sketch of a model is entirely based on the unpublished Bettini and al. (2013) and was thought for the cigarettes market, but could be easily tailored to other markets with black segments. In this section 4, we also present a literature review of Industrial Organization theoretical models related to our modelling strategy. None, however, endogenizes the type of competition effectively taking place, as we do. Moreover, by endogenizing the choice between going legal or illegal, we do not assume there is a black market but we allow for it to exist at equilibrium. We call it a sketch because it is still preliminary and does not have much structure. However, within such a humble environment, we are able to propose a first result which is intuitive and strong. It claims for stronger policies to reduce the appeal of black markets before implementing more stringent regulation of the legal segment of the market. Further research shall put more structure into the model and reach more quantitative results.

Section 5 concludes the paper.

2. Black markets

This section aims at analyzing markets where legal products commonly have to compete against illegal ones in the marketplace. This competition between legally traded products and a black market substitute is not a fair one, i.e. based on the merits, in the terms of most antitrust laws worldwide. Some competitive advantage is unduly granted to the illegal product and can be exacerbated by regulatory measures not taking the black market into account.

When digging for black markets to analyze in this section, we faced the most reputable candidates but also some unconventional markets that fully comply with the needed characteristics. We therefore present a discussion on the emergence of black markets and a few markets that commonly present a coexistence of a legal segment with an illegal or marginal one.

2.1. The Emergence of a black market

A black market frequently emerges in the presence of an inefficient market outcome (a market failure) – which may be explicitly due to public policy or not. It is the presence of deadweight loss – i.e. consumers whose willingness to pay are higher than the marginal cost of production but which are not being served – and the potential for mutually beneficial exchanges that motivates the emergence of a black segment of a market.6

The classic treatment of black markets focused on the most typical regulation failure: price controls leading to shortage of products. Boulding (1947) is a classic paper dealing with such problem and was followed by Plumptre (1947) and Michaely (1954). As mentioned by Boulding (1947), "a black market will develop if some buyers and sellers can be found who are willing to buy or sell at prices higher than the legal maximum in spite of the penalties involved".

The analysis in Boulding (1947) explicitly assumes consumers only buy from the black market if a product is not available in the legal market – i.e. if there is shortage. In other words, the supply and demand curves of the black market start not at the origin but at the quantity sold legally at the price cap fixed by law. There is thus no explicit competition between the legal and the illegal products – the black market acts at the residual demand of the legal segment.

Plumptre (1947) criticizes some of the assumptions in Boulding (1947), such as “that the legally sold quantity is purchased only by those who would normally bid the highest prices for it in a free market”. Michaely (1954) goes deeper and offers an alternative analysis, allowing for substitution between legal and illegal products.

In any case, all those early literature analyses – as mentioned by Michaely (1954) – focused on “a market in which a commodity (or service) is traded at prices higher than some

[6] It may, however, be the case that the initial market outcome is efficient, with no deadweight loss. Suppose for example there is a fringe of fierce competing firms (or an incumbent in a contestable market, i.e. facing constant threat of zero sunk cost entry), in such a way that the product is initially priced at marginal cost – and the market outcome is efficient. Then, suppose an illegal firm steps in with a lower cost, but with a lower product quality – specifically, it hurts the consumer in the long run, while it generates the same benefit (or utility) in the short run. However, there is asymmetric information: consumers do not know exactly the long-run impact. The new outcome, with the black market, may be inefficient because of asymmetric information, while the original outcome, with no black market, was fully efficient. For the time being, however, we will focus on black markets arising from market failures as the ones described in this section.

maximum predetermined price". They all, thus, deal with a black market arising from shortage of products, as in the case where the government imposes some artificial legal maximum price. We argue in this paper that a current example shall be the black market for transplanted organs, as well as the rents of real state in cities like New York.

There are, however, other reasons for the emergence of black markets. In some cases, due to those other reasons, the equilibrium price in the black market will end up being lower than in the legal market, as is the case for cigarettes, spirits, garments, and wildlife. It is also the case for shadow banking activities, which, although not illegal, should also be considered as a black market in this paper, since it bears the same issues as those more traditional black markets.

In these cases, the emergence of black markets is also related to the existence of deadweight losses, but they do not explicitly come from any sectoral regulation (as a price cap) or any product shortage. It is more a consequence of high prices charged by the established firms, which are often due to high taxation and/or the good being aimed at a selective clientele (luxury goods), leaving a high number of consumers unserved.

Although the black markets in those cases do not emerge from an explicit regulation failure, they may grow due to increased regulation. The following two subsections deal with those two types of black markets separately. In the second subsection we include cigarettes and shadow banking, which are discussed more thoroughly in the coming sections.

2.2. Black markets due to product shortage

The early literature mentioned in the previous subsection dealt with a particular economic problem: black market producers serving a residual demand of the legal market, when a product shortage arises due to an imposed price cap. The price controls in this subsection have no relation to price cap regulation, a classic regulatory instrument to deal with natural monopolies, common in infrastructure and public services sectors like electricity, transportation, gas, and several others.

The reasons for the imposition of a maximum price onto a market not subject to sectoral regulation (i.e. not a natural monopoly) may vary. Classically it occurs when there is a supply shock that, in the absence of any governmental intervention, would lead to a spike in market prices, leaving many consumers being unserved. Such a supply shock may be the consequence of war times, natural disasters (plagues, floods or droughts affecting crops), oil price spikes, among other reasons. Frequently, price controls are created due to political pressure.

The price control in those cases is usually coupled with a quantity rationing per consumer/household, in order to assure that every family has its minimum needs assured. In the absence of this rationing (and presence of price cap), the first come will be served, with no correlation with consumers' willingness to pay, and many will be unserved.

In fact, the quantity rationing alone can play the role of assuring that every family gets served to its basic needs, but prices in this case will go up considerably if the market is to reach

an equilibrium. What happens under price control is that the market outcome does not reach equilibrium, as at the price cap the quantity demanded is much higher than the quantity supplied in the market. This excess demand remains unserved, leaving potential gains for a black market provider.

The idea of a supply shock, i.e. a transitory situation, is however not necessary for the emergence of price controls, product shortage and black markets. Many examples did not arise from transitory supply shocks, but from an equilibrium price above a price the average consumer could afford.

In 1963, for example, the Cuban government established the "consumption booklet", which contemplated quotas for the consumption of essential goods at subsidized prices. This way the State aimed at assuring that everyone was served at low prices, not allowing entrepreneurs to inflate prices and grab profits. The main issue of this policy is that it conducts to an inefficient allocation of scarce resources, as there are efficient transactions which do not take place. Both profits and consumer surplus could be higher at the same time, if the market worked freely. In other words, consumers would like to buy more, even at higher prices, and producers would like to supply more. When both sides act to bypass the limits imposed by the government, a black market emerges.

Places where some good is forbidden – like illicit drugs, but also alcohol in some countries today, and in the USA from 1920 to 1933 – are bound to black market emergence, as prohibiting is equivalent to setting a price cap at zero.

During the Second World War, the State of New York implemented a rent control policy that is still valid in many cities of the state, including Albany, Buffalo and NYC. It has a few peculiarities: the ones benefitting from the control are not the first served, but something analogous (the already tenant), and not all apartments are subject to price controls in New York[7] – actually fewer and fewer. Thus, there is no need for a black market in this example, as the substitute – newer buildings and the ones whose tenant has changed – is also legal, but not subject to price controls.

The last two examples of interest that fit in this subsection are less commonly thought as an analogous economic problem, although they frequently bear a segment called black market: transplantation organs and children adoption. No one can morally or legally sell nor buy human tissue or organs[8], the same way as no one is legally allowed to pay or receive any advantage to facilitate the adoption of a child. A person in need of an organ for transplant is bound

[7] Price controls only apply "to residential buildings constructed before February 1947" and "the tenant (or their lawful successor such as a family member, spouse, or adult lifetime partner) must have been living in that apartment continuously since before July 1, 1971". Full details are available at the New York City Rent Guidelines Board website (accessed 28th July 2016): Available in: http://www.nycrgb.org/html/resources/faq/rentcontrol.html

[8] A New York Times article from 23rd May 2004 discusses "The Organ Trade", and mentions that "at least one country, Iran, has a legally regulated system to trade organs". It also mentions "a fierce debate about commercializing transplants" and cites a quotation of "Alexander M. Capron, the director of the ethics department of the World Health Organization" mentioning "transplant surgeons who believe that a good way to remedy the shortage of organs would be to offer payments". Available in: http://www.nytimes.com/2004/05/23/world/organ-trade-global-black-market-tracking-sale-kidney-path- poverty-hope.html?_r=0.

to waiting in the respective transplant queue the same way as avid parents have to queue and fill all bureaucratic procedures before becoming foster parents – and we label those two as "legal segments of the market", or simply "legal markets".

In economic terms, it means that the price cap in those legal segments is set to zero9, and there is well-documented shortage of organs in most places worldwide, as well as there are queues for adoption. This leaves space for the emergence of black markets in many countries, which can be a "voucher" for a better place in the queue or for the possession of a kid or an organ, which in turn can be a non-vital organ someone would like to donate (or sell), an organ someone stole from a corpse or even from someone alive without permission. There are even reported murders committed with the intention of stealing organs from humble people, the same way as there are reported kidnapping of children to be sold for adoption. Since no price control higher than zero is morally acceptable worldwide, there is no price policy governments may implement in these two legal markets. They can, however, act to increase efficiency in the legal branches – reducing bureaucracy and promoting organ donation, for example – and to make the black market less appealing: investigating and prosecuting those mafia dealing with transplantation organs or child trafficking. Those measures are analogous to the ones governments should focus on in the markets of the coming subsection.

2.3. Black markets due to high prices

In this section we opted to segment black markets in two categories. The one presented in the previous subsection exhibits product shortage leading to a black market where the price is above the one in the legal segment of the market. In this subsection we deal with markets where the black market arises due to a high price – well above marginal production cost – set in the legal market. This gives rise to a large number of unattended customers who would be willing to pay more than its production cost but have no access to the product, not because the product is not available, but because it is too expensive. Such high prices of the legal product are in many cases the consequence of heavy taxes, usually related to dissuading the consumption of what are considered as sin goods, being legal but bearing negative health impacts.

There is technically here no product shortage, as there is no price cap at which the quantity demanded is much higher than the quantity producers wish to supply on the market. There is, however, a market failure due to high price, known as deadweight loss, a traditional measure of market outcome inefficiency.

[9] We deal with these two markets in this subsection, but will argue in the coming subsection that they could be included there, as although the price is morally and legally set to zero, the actual price paid in the legal market in both is much higher, as it should include the cost in terms of time allocation, bureaucracy fulfilling and patience spent. Once those costs are included, the actual price can reach high values, and even infinity, as in the case of a vital organ expected to be legally obtained for transplantation at a date beyond the expected life time of the recipient in need. Other sorts of human being trafficking could also be included in this subsection – and for the same reason in the following subsection, once one incorporates into the price the risk premium due to the risk of being caught and sent to jail. We do not discuss more thoroughly those activities as they are illegal per se, meaning that also the buyer commits a clear-cut crime, in a way that there is no easy substitutability between a legal product and an illegal one in the marketplace, which is the focus of this paper.

Here, thus, the product sold in the black market is cheaper than the official product in the legal market, even in the case it bears precisely the same quality – as is commonly the case of reimported pharma products (Canadian medicines sold in the U.S. market for instance) or smuggled wildlife animals, or games and apps. These are different from the typical black market products which are cheaper but known to be of lower quality, as fake or smuggled products such as cigarettes, spirits, garments etc.

Wildlife animals trafficking is also a very challenging topic. Quality is usually not a concern for consumers of wildlife animals, most of the time endangered species. There exists a formal market for those animals, but bureaucracy and prices are considerably high, as there are quantity limitations and also profile checks.

The same economic issue analysis applies to firearms. Nevertheless, prices of firearms are smaller in the black market, in spite of all risks involved. One should also have in mind when studying the firearms black market that it includes illegal used guns and forbidden items (items exclusive of national defense, for instance), on top of items having identical substitutes priced in the legal market.

It is not clear, however, if prices of wild animals sold in the black market should be higher or smaller than in the legal market. Wildlife trafficking presents a similar tradeoff between consumers' easiness of obtaining and the risks involved. The actual price in the formal market is thus not only the face value, the same way as in the transplantation organs and child adoption markets mentioned in the previous subsection. If the price in the black market turns out to be higher than in the legal market, it would be the case to include wildlife trafficking in the previous subsection instead, since there would presumably be an underlying product shortage and queues to buy animals, similarly to the other queues mentioned.

In any case, time is definitely an important variable for wild animals too, as is for organs or adoption, which is not the case for cigarettes or firearms or shadow banking. Cigarettes and banking products are particularly easy to obtain in the legal market, leaving space for a black market to exist only if the illegal product is cheaper. It turns out that in most developing countries illegal cigarettes and shadow banking services are strikingly easy to obtain (as they are widespread), and indeed cheaper than their legal substitutes. The black market for cigarettes is the focus of the remainder of the paper. Before turning to that, we present next a brief discussion of shadow banking as a black market.

2.4. Shadow banking

According to the U.S. Federal Reserve (2013), "shadow banking, as usually defined, comprises a diverse set of institutions and markets that, collectively, carry out traditional banking functions – but do so outside, or in ways only loosely linked to, the traditional system of regulated depository institutions. Examples of important components of the shadow banking system include securitization vehicles, asset-backed commercial paper conduits, money market funds, markets for repurchase agreements, investment banks, and mortgage companies." The specificity of a shadow bank is that, differently from traditional banks, they do not receive

deposits and, due to not being subject to bank regulation, they take higher market, credit and liquidity risks, without the need to provide capital requirements fitting those risks.

Federal Reserve (2013) and IMF (2012) both emphasize the looser regulation those institutions face and the need for stronger regulation, which requires – in terms of our paper – incorporating them into the market analysis. The consequences of leaving these aside from the models and policy prescription can be catastrophic.

IMF (2012) mentions that "some parts of the shadow banking system are fragile and can pose systemic risks, yet commonly lack appropriate supervision and regulation, or procedures for safety net access and resolution. Addressing these issues is urgent".

According to Federal Reserve (2013): "Also interesting is that the 1907 panic involved institutions--the trust companies--that faced relatively less regulation, which probably contributed to their rapid growth in the years leading up to the panic. In analogous fashion, in the recent crisis, much of the panic occurred outside the perimeter of traditional bank regulation, in the so-called shadow banking sector." It then pointed out that oversight of the shadow banking system was being strengthened and listed some measures.

More recently, The Economist (2016) initiates by mentioning that: "ON JANUARY 5th, in a campaign speech in New York, American senator Bernie Sanders pledged to break up banks that were deemed 'too big to fail' and vowed to put a leash on their shadowy cousins. Janet Yellen, Federal Reserve's chair, has admitted that shadow banks pose 'a huge challenge' to the world economy. In an editorial for the New York Times in December, Hillary Clinton called for tough measures to contain the global bogeyman. Politicians and economists who often have little in common, unanimously agree that shadow banking, left to its own devices, has the potential to trigger another financial collapse." According to them, "The Financial Stability Board, an international watchdog estimates that globally, the informal lending sector serviced assets worth $80 trillion in 2014 up from $26 trillion more than a decade earlier." The European Commission website[10] mentions the shadow banking sector amounts to 25-30% of the total financial system, a number commonly diffused in the press.

There should be no doubt that stronger regulation on the banking sectors fosters the increase in shadow banking activities. In the words of the same European Commission website, "Since the financial crisis began in 2007-2008, the Commission has undertaken a comprehensive reform of the financial services sector in Europe. However, the benefits achieved by the new rules could be diminished by risks moving to less regulated sectors."

The sketch of a model presented in section 4 can fit well the analysis of the shadow banking sector. There is no doubt a firm decides in the first place to go shadow, since all activities performed by shadow banking institutions could well be performed by a bank, but a bank is tightly regulated. What is interesting is the role of the sectoral regulator in strengthening regulation of the black or shadow segment of the market, reducing thus the payoff attractiveness

[10] Available in: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-supervision-and-risk-management/financial-supervision-shadow-banking_en (accessed 13th September 2017)

of going shadow. This is much easier in the banking sector than in more traditional black markets, subject to smuggling, piracy etc. However, this does not mean public policy in those markets having a viable alternative black option should disregard that black market. It is quite the opposite, or catastrophic outcomes can be achieved in those black markets, too.

In line with this, The Economist (2016) mentions that "Shadow banks have flourished in part because the traditional ones, battered by losses incurred during the financial slump, are under pressure. Tighter capital requirements and fear of heavy penalties have kept them grounded."

In the sketch of a theoretical model we present in section 4, we are concerned about those regulatory measures impacting only part of the market: the regulated one. The model there focuses on the particular features of the cigarettes market, but its adaptation to deal with shadow banking would be straightforward, although it is beyond the scope of this paper.

3. The Cigarettes Marke

This section deals with the market subject to the highest amount of regulatory changes in recent times. It is, thus, where it is uttermost important to avoid unintended consequences of market regulation in case the illegal market is not incorporated into the analysis.

3.1. The Unified treatment of the cigarettes market

Many countries have in recent times approved laws prohibiting smoking in public places – such as bars and restaurants – and many others have limited or even abolished cigarettes advertisement as well as the sponsoring of public events. On top of all those limitations – whose motivation is grounded on health problems reportedly caused by smoking – in most countries the prices of cigarettes have increased due to a spike in taxes on this product to dissuade consumption, as reviewed in Salgado and Morais (2013).

Although this is an exciting field of work for Industrial Organization economists – due to intrinsic product characteristics, as well as demand behaviour, market structure and the variety of governmental intervention – the cigarettes market has not received due attention by theory and econometrics. Those radical changes in regulation are seldom studied through formalized economic analysis.

As reviewed in Salgado (2013), international experience indicates that the increase in taxes alone – and thus on prices – is commonly not only insufficient but can backfire. Many countries witnessed good-intended policy measures such as tax increase and price rises, which however culminated in an upraise of smuggling and other forms of stepping aside legality. These expose consumers to products of doubtful (if any) sanitary control. Tax increases alone were not seen as adequate only in Australia and Hungary, and were skilfully coupled with an increase in border protection against illegal trade. In those two countries, the intended reduction in overall cigarette consumption was eventually achieved.

A basic premise for the implementation of the increase in taxes is that consumers have no alternative but paying more for the cigarettes they usually consume, or reduce the quantity they smoke. In the limit – according to this premise – consumers could even quit smoking, with

some negative impact on tax collected in the present but a possibly positive impact in the future as concerns health conditions and future public budgets. Such basic premise is not, however, a situation that holds clear-cut in a number of countries, especially the low- and medium-income ones where smuggling of cigarettes is frequent. Violating this basic premise can invalidate the results of tax increase measures.

Notwithstanding, in spite of country-specificities, world measures towards smoking combat are rather unified. According to the World Health Organization (WHO) (2011), "in 2008, to help countries fulfill their WHO Framework Convention on Tobacco Control (FCTC) obligations, WHO introduced the MPOWER package of six evidence-based tobacco control measures that are proven to reduce tobacco use. MPOWER refers to M: Monitoring tobacco use and prevention policies; P: Protecting people from tobacco smoke; O: Offering help to quit tobacco use; W: Warning about the dangers of tobacco; E: Enforcing bans on tobacco advertising, promotion and sponsorship; and R: Raising taxes on tobacco. Each measure reflects one or more provisions of the WHO FCTC, and the package of six measures is an important entry point for scaling up efforts to reduce the demand for tobacco". This early document made no clear distinction between measured according to the same standards. Our claim is that a unified treatment is disturbing if a significant illegal cigarettes market exists. Ignoring the existence of such a market in theoretical modelling can lead to bad policy implementation.

In 2012, however, the World Health Organization presented the Protocol to Eliminate the Illicit Trade in Tobacco Products. According to the WHO at that time, "The Protocol was developed in response to the growing international illicit trade in tobacco products, which poses a serious threat to public health. Illicit trade increases the accessibility and affordability of tobacco products, thus fuelling the tobacco epidemic and undermining tobacco control policies. It also causes substantial losses in government revenues, and at the same time contributes to the funding of transnational criminal activities."

At the same token, WHO (2015) stated that "The illicit tobacco trade offers products at lower prices, primarily by avoiding government taxes through smuggling, illegal manufacturing and counterfeiting. Cheaper tobacco encourages younger tobacco users (who generally have lower incomes) and cuts government revenues, reducing the resources available for socioeconomic development, especially in low-income countries that depend heavily on consumption taxes. This money might otherwise be spent on the provision of public services, including health care."

The present paper takes the illegal market into account, assuming it is not possible to eliminate it completely. Our analysis challenges the measures affecting asymmetrically the companies legally established in the market and the products illegally introduced in the market of most developing countries in particular. It is applicable to cigarettes, but also to other markets as we studied in section 2.

There is no doubt the first four measures of MPOWER are positive for reducing the act of smoking as they affect the behaviour of people in general, and thus the legal and illegal companies symmetrically. However, it is our understanding that measures E and R only impact

the legal market, restricting solely the activity of the legally constituted companies. This is of crucial importance in countries where the illegal market takes a relevant share, implying that these measures E and R may backfire, concealing an inappropriate competitive advantage to the wrong players and thus incentivizing the black market. While the World Health Organization proposes the elimination of black markets as a remedy, one should understand the impacts of measures E and R when such a solution is unfeasible or at least limited.

We thus claim in this paper that some countries have specificities as concerns black markets not allowing a unified treatment. This impacts the effectiveness and self- sufficiency of tax measures to dissuade consumption of a particular good in a context of a non-negligible illegal market. As emphasized by the Global Analysis Project Team (2013) about the effectiveness of tobacco control policies in Thailand and Zimbabwe, "it cannot be assumed, therefore, that the tobacco control strategies being implemented in industrialized countries will be just as effective and appropriate when implemented in developing countries". The authors go on emphasizing that "there is an urgent need to expand the number of such tobacco policy studies, particularly in low-income and middle-income countries". We underwrite their claim and try to contribute in such direction.

3.2. Law and Economics of the cigarettes market

The cigarettes market deals with features of experience goods – i.e. one has to taste it to know if he/she likes it – and of credential goods – only an expert in a laboratory can attest its quality and adequacy to consumption. It is a good whose consumption can be time-dependent; a good whose consumption in public spaces generates negative externalities to other people; a good that provides some pleasure in the short term for the consumer but reportedly has negative long term effects on the smoker (and on third parties); a good whose consumption decision – at least as concerns preferred brand – is highly influenced by advertisement and marketing strategies of the firms in the sector.

Cigarettes are goods in their own class. In spite of being frequently pointed out as some sort of licit drug, they do indeed deliver pleasure to their consumers and also work as a social signalling device. Moreover, the cigarettes market is not only one of the most regulated markets all over the world, but certainly bears an impressive record of changes in regulation, as broadly reported in Carvalho and Lobão (1998), FGV (2010), Salgado and Morais (2013), among others. As such, economic regulation of this product is one of a kind.

On the other hand, as an economic activity, tobacco is responsible for a significant volume of jobs and income. In Brazil, for instance, family-run farms are the main tobacco growers, contributing to both rural employment and empowerment. For this reason, tough public policies looking at reducing the consumption of cigarettes are often received with criticism and organized résistance from both small farmers and large companies.

Data relating to cigarettes consumption and supposed health impacts are quite abundant. According to WHO (2011), tobacco smoking and physical inactivity are the two main behavioural risk factors behind deaths caused by non-communicable diseases (NCD). Moreover,

WHO (2009) says smoking is the reason explaining 90% of all world cases of lung cancer and around 20% of all other types of cancer.

Restrictive measures aiming at reducing smoking are embraced in almost every country. A variety range of such policies are available, such as raising cigarettes prices, non-price measures to reduce demand (consumer information, ban on advertising and promotion, on top of explicit smoking restrictions), public distribution or subsidy to nicotine replacement therapy and other cessation intervention, among others.

Brazil is not exempt from such trend. Indeed, decrees regulating all sorts of activities in the cigarettes sector are also present and have become increasingly restrictive. In 1996, advertising was banned from radio and television between 6am and 9pm. Since then, cigarette packs must carry warning phrases regarding the risks their consumption could generate. Also, no messages linking tobacco consumption to success in personal life aspects such as employment, sexual performance or sport can be broadcasted since 1996. Four years later, smoking was banned from commercial flights and other means of transportation. Also, advertising became confined to sales points and cigarette brands were banned from supporting cultural or sport events in Brazil.[11] As seen, many (restrictive) changes were introduced in Brazil, but still nothing as in Australia, where since December 2012 cigarettes packaging is standardized: anopaque colour pack containing only a discrete mention to the brand name. As regards price mechanisms, in 2011 the Brazilian government raised taxes to above 2/3 of the final price and set a minimum pack price at R$ 3,00 – to be raised yearly.[12]

It should be emphasized that the usual suspect justifying intense regulation is absent in the case of the cigarettes market. There is no possible claim of being a natural monopoly: sunk costs or other barriers to entry are not significant; the coexistence of (profitable) producers in the market is perfectly feasible and observed. The most traditional justification for strong regulation being absent, the market failure in question has to do only with asymmetric information – on quality, for example – and some paternalist behaviour by governments.

Moreover, compared with the addictive drugs market and alcoholic beverages market – similar in the sense of not being natural monopolies and dealing with a path-dependent product providing pleasure – the cigarettes market is the only one facing frequent changes in its regulation. Addictive drugs are usually illicit – and that is the end of the story. In some places, light ones are licit but regulation do not change that frequently – the rules are usually more or less established since the time those so-called light drugs are liberalized. As for alcoholic beverages, their sales are sometimes banished or restricted under religious claims but usually free in most occidental countries. Regulation is restricted to forbidding sales to under-aged or already drunk people, or in certain places considered as critical for public order such as close to highways or

[11] A comprehensive list of all regulatory measures related to cigarette sales and consumption in Brazil between the mid-1980s and year 2004 can be found at Annex C of Iglesias (2006).
[12] On 31st January 2011, R$3,00 was about USD 1.80, but on 30th September 2013 it was USD 1.35. On 31st January 2016, R$ 5,00 amounted to about USD 1.24, while on 30th September 2016 it was USD 1.53.

inside football stadiums. As concerns the cigarettes market, it faces changes in regulation being discussed or introduced almost every year in many jurisdictions.

Every new regulatory measure reframes the behaviour of its stakeholders, both firms and consumers, and thus reshapes the market it is intended to affect. Therefore, every new measure should be the object of careful inspection. This is particularly true for an economic activity where substantial changes take place quite frequently.

In spite of all those appealing – and challenging – features of the product and its market, the industrial organization literature has been quite silent on both theoretical modelling and empirical estimation of key parameters for the cigarettes market, although some analytical keystones are already set by seminal studies such as Chaloupka and Warner (2000). For a comparison, for example, the literature on medicines counts a substantial body of papers on the pharmaceutical market and some authors are well known as specialists on that. In what concerns the cigarettes market, not much is available, at least in Economics. This paper tries to fill partially such gap.

3.3. The Black market for cigarettes

In spite of its productive simplicity, cigarettes give birth to a complex market structure, where differentiated brands compete on basis of distinct flavours, intensities and toxicological loads. Such differences bring complexities to this market and impose a non-trivial framework for demand modelling.

Product differentiation also occurs in another non-negligible dimension: the legality of the producer. According to varied estimates, the Brazilian illegal market spanned between 15% and 35% of total sales in volume in the last two decades. The black market is also constituted of different types of illicit behaviour. FGV (2010) for example lists four distinct segments that coexist in the marketplace: (i) products from legally constituted firms; (ii) products from tax-evasion (legal) firms; (iii) smuggling originated products; and (iv) Brazilian falsified products that ignore trademarks. Far from being a typical Brazilian characteristic, illegal markets are present worldwide. In Canada, about 30% of total domestic sales in 2008 came from illegal vendors.

It is worrisome that counterfeit cigarettes are materially different from branded products, making smuggling a source of both fiscal and public health concerns. According to Pappas et al. (2007), chemical comparisons between counterfeit cigarettes and branded products show strong differences in at least three characteristics, namely (i) level of metals; (ii) level of tar/nicotine/carbon monoxide; and (iii) presence of miscellaneous contaminants.

Pappas et al. (2007) also notice that researchers from the Center of Disease Control and Preventions (CDC) and the National Center for Environmental Health found that the levels of cadmium, thallium and lead in mainstream smoke were far above the reference level for counterfeit than for authentic brands. Moreover, they do emphasize that toxic metal and metalloids constitute one of the more understudied major carcinogenic chemical classes in tobacco.

The features of the illegal products are far from just anecdotal: counterfeit cigarettes and other forms of illegality are widespread. On the supply side, World Bank (1999) says that about 30 per cent of internationally exported cigarettes are lost to smuggling, a situation more commonly found "where there are large variations in tax between neighbouring states or countries, where there is widespread corruption and when contraband sales are tolerated".13

The World Bank (1999) also recognizes that the problem is acute and that it is usual to witness criminal organizations standing behind large scale tobacco smuggling, holding comparatively sophisticated systems for the distribution of smuggled cigarettes in the destination country. According to the publication, this is commonly coupled with a lack of control on the international movement of cigarettes.

Criminal activity is also made easy by other reasons, as emphasized in World Bank (1999). The success of smuggling relies on the cigarettes passing through a large number of owners in a short time frame, making it virtually impossible to track down their movements. Additionally, poor enforcement of illegal sales and difficulty in separating legal from illegal sales contribute to reduce the smuggler's risk. The World Bank (1999) says that in Russia and in many low-income countries the majority of cigarettes are sold in the streets. Smuggling being such a common activity, it is hard to fight it. World Bank (1999) highlights above all a way not to act: "while smuggling is undoubtedly a serious problem, and while steep differentials in tobacco tax rate between countries are an incentive to smugglers, the appropriate response to smuggling is not to forego tax increases".

Accordingly, the more suitable alternative is to crack down on crime, by means of increasing controls and dissuading the expected profitability of this economic activity. The ineffectiveness of tax increases for dealing with illegal product sources is illustrated via empirical evidence from South Africa: "during the 1990s, South Africa increased its excise prices on cigarette sharply, by more than 450%. As a percentage of sale price, taxation rose from 38 to 50%. Smuggling rose, from zero to about 6%".

But what are the incentives producers (and dealers) face when choosing which side of legality to embrace? This is the theme of the sketch of a model we present in section 4.

4. Sketch of a theoretical model

This section presents the theoretical model we propose for studying a market in a country where there is a possibility of coexistence between a legal (and regulated) segment and another one at the margin, which we call a black market. We assume the product at stake has its price defined at a high level – much higher than marginal production cost – in the legal segment – whether by a regulatory body, whether by market mechanisms – leaving space to the emergence or strengthening of a black market.

Our analysis aims at exploring the impacts of regulatory measures in highly regulated market on the market outcome when there is a close substitute at the margin of the regulated

[13] The effect of tax differences between States of a Federation and neighboring countries also poses empirical difficulties. Wasserman et al (1991) deals with those in estimating the cigarette demand.

sector. We focus more specifically on the cigarettes market and on shadow banking. Both markets have been subject to steadily increase in governmental intervention in the regulated segment of their respective markets in recent times.

The (legal) cigarettes market for example has increasingly faced limitations on advertising and tax spikes – the E and R of the MPOWER measures of the WHO. We focus on the asymmetric impact of these measures on the legally constituted companies and the outlaws on the market outcome.

In order to allow us to focus on the market structure and the impact of the regulatory measures on the market equilibrium and welfare consequences, we assume the market size is given. This is a simplifying assumption with no loss of generality. Again, in the case of cigarettes, as a matter of fact, there is a whole branch of the literature – Barnett and Keller (1995) being a good example – discussing how demand should be modelled given the specificities of the product and thus consumer behaviour: addiction or not, time-dependence or not – in the case smokers consume for maintaining a given level of consumption each period independently – irrationality or rationality, among other controversial features on the demand side. This assumption of a given market size allows us to overcome such complex issues and focus on the regulatory impact on market outcomes through the supply side exclusively. Such assumption isolates the effects coming from an increase in the overall market itself from the ones coming from consumers migrating from the legal to the illegal product, because the illegal product is around the corner. We chose to focus on the latter in this paper.14

In our theoretical approach, we restrict attention to the incentives of a potential new entrant firm to enter illegally or on the other hand to decide to formalize its activities, becoming subject to all sorts of regulation affecting legally active companies. This is the sort of entry we want to focus on, the entry of a smaller player, usually not a multinational firm. In other words, our entrant is the type of firm that would only join the legal market if it is sufficiently attractive, i.e. if it pays off.

4.1. Relevant literature

To our knowledge, there is no article modelling theoretically any black market alternative focusing on the supply side, i.e. dealing with its market structure, allowing for the endogenous choice of going illegal. Given this lack of literature for such an important issue, the most relevant references for our theoretical modelling are the ones on vertical and horizontal differentiation, as reviewed quickly in Shy (1995) and more thoroughly in Beath and Katsoulacos (1991), among others. In Shaked and Sutton (1982) the notion of a perfect equilibrium in a multi-stage game is used to characterize industry equilibrium under Monopolistic Competition, where products are differentiated by quality. The analysis is based on a three stage non-cooperative game. In the first stage, firms choose whether or not to enter in the industry. At the end of the first stage, each firm observes which firms have entered, and which have not. In the

[14] If we were to allow the market size to change, this would only strengthen our results. For example, if a policy makes the black market more attractive and this decreases welfare for a given market size, the decrease in welfare would be even higher if the black market were growing due not only to consumers migrating from legal products to illegal ones but also from new consumers of the sin good at stake

second stage, each firm chooses the quality of its product. Having observed its rival's quality, in the final stage of the game, the firm chooses its price.

We propose here an extension of this setup allowing for firms that do not respect the law (i.e. the illegal firms) to choose – after observing the legal firms' behavior – to produce a good perceived as of lower quality (as these illegal firms do not incur the fixed costs of investing in trademarks and marketing) and then in a second stage to choose a low price.

Shaked and Sutton (1987) examine the relationship between advertising, R&D, and market structure. They build a Hotelling-type framework of a two-stage game and compute the equilibrium strategies. In its first stage, each firm may enter the market, by paying sunk costs $\sigma > 0$, and choose its location. In the second stage, each firm may produce any volume of output at zero cost. They find a Nash equilibrium in prices for given locations and then a two-stage price equilibrium in the two-stage game.

For our purposes, the important results in their model are the determinants of the level of market concentration. Does it depend upon the preferences of consumers or on the shapes of technology? The authors' answer for the interplay of these two factors is: "All that matters is the relationship between costs and consumers willingness to pay."

Motta (1993) analyses a vertical product differentiated model aiming at comparing (endogenous) equilibrium qualities under price and quantity competition. One of the main results of the model is that firms always choose to offer distinct qualities at equilibrium, independently of the hypothesis of costs and price or quantity competition.

Shaked and Sutton (1982) are closely related to the illegal side of our model. Those authors modelled a three-stage game where firms simultaneously choose to enter or not, their quality and their price (in this order) in face of consumers bearing heterogeneous incomes. Their point is that by choosing distinct qualities, firms can share the market accordingly (consumers with lowest incomes buy lowest quality goods etc.) and make positive profits, avoiding the typical Bertrand price competition which brings profits to zero when firms' products bear the same quality.

In our model we have a similar feature: two firms competing each producing a good of different quality and being able to weaken price competition through product quality choice, i.e. differentiation. However, differently from Shaked and Sutton (1982), prices in our market can be regulated, but this is only true as concerns the legal segment of the market.

Another crucial difference between our model and Shaked and Sutton (1982) is that their model deals with horizontal differentiation in a very specific and peculiar setup. Our idea for the illegal branch of our game tree is that differentiation occurs, but in its vertical version. Every consumer recognizes that the illegal product is of lower quality than the legal one produced by the incumbent firm. Therefore, our model is more closely related to Shaked and Sutton (1987).

4.2. The setup

We assume there is a sequential game, where the incumbent firm – player 1, the one choosing first – has already opted to be legally constituted and this is observed by a potential new entrant firm. For the sake of simplicity, we assume in the model that there is only one incumbent firm and there is only one potential entrant – just like in the classic Sylos and Modigliani (1958) paper. Results remain qualitatively the same by assuming more incumbent firms and/or more illegal producers.

The potential entrant has three possible strategies at its disposal, where the first one refers to his reserve utility or participation constraint: she can stay out of the market and make no profit. As soon as at least one of the other two alternatives is profitable, such participation constraint is fulfilled and can thus be ignored. The two relevant alternatives for the (now) entrant are to enter legally, competing on equal terms with the established incumbent, or to enter as a smuggler or producer of unregulated cheap cigarettes.

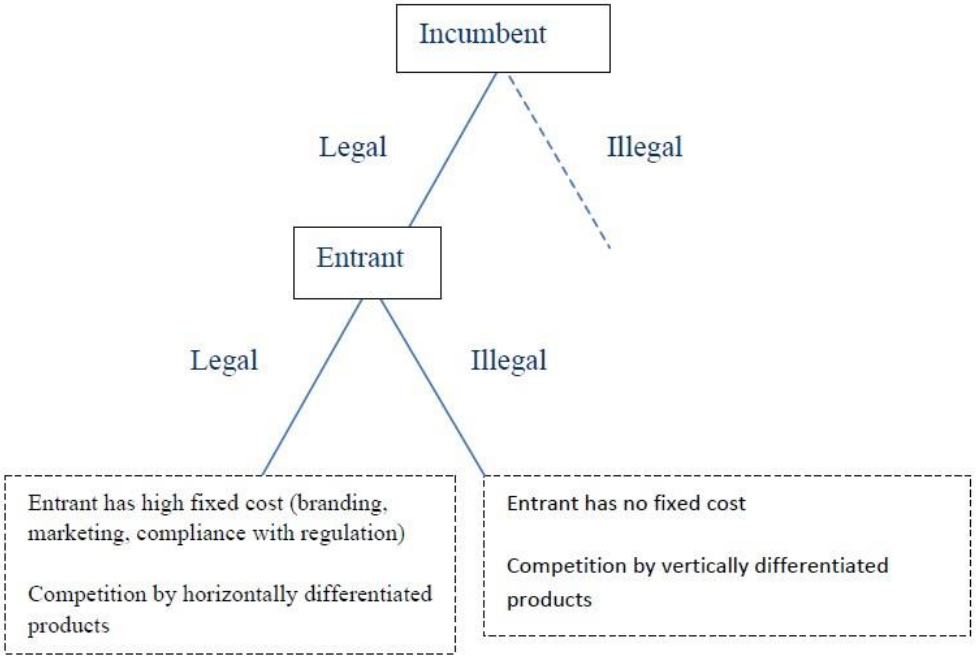
If the entrant chooses to enter legally, she has to incur some high entry or fixed cost – indeed a sunk cost – to start her business. Becoming a legal firm requires bureaucratic activities and tests to ensure compliance with the all the regulation in place. This includes compliance to pesticides limits, sanitary control of ingredients etc. in the case of cigarettes and all sorts of capital, deposit, risk etc. requirements in the regulated banking sector. Going legal also requires some considerable investment in promoting its new brand, totally unknown from the public. The new brand being introduced has to be advertised for competing against the already established trademark owned by the incumbent.

On the other hand, by entering legally, player 2 joins a monopolistic competition setup à la Chamberlain, which ensures each firm some positive profit. Although brands do compete fiercely, since they hold horizontally differentiated products, each firm maintains some market power over its own brand.

If the entrant decides to enter illegally, she faces no sunk cost but, since it will not meet the regulatory requirements, it will be perceived by every consumer as of lower quality. The type of competition taking place then will be embedded by vertical differentiation.

The particularity of our model, thus, is that the type of competition to take place in the market is determined by the mode of entry chosen by the entrant. The following table summarizes the game and the market structure we propose.

Table 1: Simplified strategic form game



4.3. Main result

This subsection introduces the first results of our model. They are quite general, as they do not depend on any further structure of the model, i.e. do not require any additional assumption. In the setup shown in Table 1 just above, it is straightforward to check the following results.

Lemma 1: Any regulatory measure increasing barriers to entry in the legal segment increases the attractiveness of the illegal option.

This is a very general result, in the sense that it does not require any further assumption on the model. In particular, no assumption has to be made on the demand structure, on the choice variables of the firms, nor their precise payoff functions. Any increase in the fixed cost associated with entering legally would foster the black market and make consumers worse off.15 The net effect on welfare, though, is undetermined.

This is the case when restrictions are imposed on advertisement, for example, as has recently been the case of many regulatory rules in the cigarettes market making propaganda harder and more expensive in the sector. This definitely increases the cost an entrant would have to face if it decides to enter legally and have to invest in advertisement where brand loyalty is already in place and not much space is available for advertising a new product. As for the

[15] There is actually a tradeoff for consumers involved. They will pay less for the product in the black market which will grant them a higher consumer surplus, but at the cost of consuming a potentially harmful product. The net effect on consumers can, however, be assumed to be negative when the black market expands. In any case, even if it is positive, the net effect on total welfare is definitely negative, as other externalities affect total welfare, such as the lower tax revenue when the black market is fostered. What we claim here should not be that surprising: society is better with a smaller or no black market.

incumbent, it would allow it to take advantage of the experience good nature of the products – i.e., consumers learn about the product as they use it – so that there would be no additional incentive to leave the legal market.

This result holds as long as a small but strictly positive amount of advertisement will keep entrants at bay: in other words, entrance is only profitable when entrants may overcome the incumbent's initial advantage, which only happens if they may spend a lot in advertisement so as to build a strong brand. Small expenditures are only relevant when they are coupled with a strong brand. This is akin to assuming large sunk costs in brand building, or increasing returns in advertisement.16

A totally different situation would take place in the case advertisement in cigarettes or in banking were completely banished, as seen below.

Lemma 2: Abolishing an activity required to enter a market legally decreases barriers to entry in the legal segment, decreasing the attractiveness of the illegal option.

This is also a very general result. There is a strong argument in favour of abolishing advertisement in the cigarettes market in our setup, for example.17 Advertisement in the cigarettes market is mainly persuasive – which the literature recognizes as socially wasteful, because firms engage in some propaganda race where only the difference between the firms' expenses matter. As in a patent race, firms in such race spend more than the socially desirable amount in advertisement. Even if advertisement here were informative, the result would hold.

What our modelling strategy does is to add up a new argument in favour of abolishing advertisement in the cigarettes market, or any other practice that favours incumbents. If the government abolishes propaganda by tobacco companies, this will clearly diminish the costs of becoming a legal firm. Such disappearance would eliminate a costly activity from the set of activities a cigarette firm has to perform if she decides to go legal. It would therefore reduce the entry cost, i.e. some sunk cost the firm has to incur if she decides to go legal, thus facilitating legal entry. The same applies to marketing in any other regulated sector, such as the banking one. Notice that we are implicitly assuming that without any amount of advertisement, brand loyalty is not sufficient to differentiate entrants and incumbents indefinitely – which is backed by the observation that even well-established brands keep on advertising even in markets with little competition. In other words, the past history of advertisement becomes irrelevant in the long run in the complete absence of advertisement.

The following proposition comes straightforward from Lemmas 1 and 2.

Proposition:

[16] This may be generalized to allow for competition in the legal market. In this case, a cap on advertisement would reduce the coordination problem among incumbent firms – advertisement expenditures are inefficient from the point of view of incumbents as they enter a non-cooperative game similar to the prisoner's' dilemma.

[17] The reader should remember the market size is fixed, by assumption. In such way, our result relies on the fact that advertisement in the model is not a tool to increase total demand, only market share.

There is a discontinuity in public policy towards activities such as: restricting it fosters the black market while abolishing it reduces it, increasing total welfare.

Such discontinuity is a striking feature. Abolishing is usually – and correctly – thought as the limit of restricting, i.e. as restricting in the limit. It would be natural for one to abolish advertisement after having imposed an increasing number of restrictions. In the limit, one abolishes[18]. However, what our model offers is the opposite claim. Restricting propaganda has the opposite effect of abolishing it, in terms of the incentives to go legal. While the former increases the entry cost, the latter reduces it as the elimination of an instrument favouring incumbent's advantage makes entry more attractive by increasing its payoff.

When more (legal) entry happens, there is a variety of sources of efficiency gains: not regulated (thus possibly harmful) illegal products are not available, at the same time as a broader choice of legal (and safe) products are available to consumers – both increasing consumers' welfare. Also, governmental budget improves, since more taxes will be raised as a higher proportion of the products consumed will be those produced and commercialized in the legal market, thus subject to taxation. At the same time, the government will need to spend less on fighting the illegal market, in the case of truly illegal black markets. In the limit, if there is no illegal market – as in our model of two firms when the entrant chooses to go legal – there shall be no expense on border control, prosecution of smugglers etc.

Basically, much restricted advertisement concedes a first-mover advantage to the incumbent firm, as brand loyalty will play a bigger role. Entry barriers shall be higher as there will be not much space to convince consumers to switch from the incumbent's product to the entrant's product. Even if it will be cheaper to enter, it will be harder to compete after entry, and the potential entrant knows it. With no advertisement at all allowed, the brands have their importance mitigated, as well as brand loyalty, which favour legal entry.

5. Concluding remarks

It is crucial for the effectiveness of any new legislation to be enacted to incorporate into the analysis – or Regulatory Impact Analysis (RIA), as commonly called – the possible side effects of the novelty. Sectoral regulation does not escape such rule. An important side effect of any restrictive measure on the trade of a good – especially common for the so-called sin goods, but not only for them – is the increase in the attractiveness of an illegal alternative.

Our main claim is that when implementing some public policy aimed at regulating the legal segment, one has to take into account the possibility of creating or fostering a black market. In other words, rather than a market failure, black markets commonly emerge as a regulation failure.

The present paper intended thus to contribute in filling the existing gap between the economic literature on regulation and reality – for markets subject to black market emergence.

[18] This gradual path seems to be one followed in the real world by most countries. Australia is the first country apparently reaching the limit, since it has since December 2012 introduced standardized grayish packaging. The only space which was left by then for cigarettes propaganda was its own packaging and this channel was closed.

We did this by endogenizing the firm's decision between going legal or illegal and its impacts. The particularity in the sketch of a theoretical model presented – which focused a priori on the cigarettes market and on shadow banking – was that such decision by a potential entrant determined the type of product differentiation and thus competition taking place afterwards. Thus, our setup assumes there is a relevant illegal market opportunity and that the entrant firm chooses precisely how she wants to compete against the incumbent firm. The way the entrant's product will differentiate from the incumbent's product precisely determines how their products will compete for consumers in the market. And this choice of the entrant firm is highly influenced by the profits she can obtain from both the legal and the illegal options.

On the other hand, those payoffs to firms after each type of competition takes place are affected asymmetrically by regulatory measures. Those measures – which range from limitations to advertisement to minimum prices or capital requirements or risk regulation – only impact the payoffs of legal firms. Such asymmetric regulation impacts firms' choices, consumers' decisions and equilibrium outcomes. Our main message is that the illegal option has to be made less attractive, but not only.

A striking result shows that policies such as advertisement regulation have an important discontinuity. While restricting advertisement benefits the black market alternative – as it only impacts legal firms – abolishing all advertisement strengthens competition in the merits and the importance of quality (instead of brands), and thus reduces the attractiveness of the black market.

On theoretical grounds, we could show that tax increases can be effective only if coupled with an increased border control that limits the asymmetry among choice sets available for consumers, in the case of cigarettes or other regulated products commonly smuggled. Hence, there is a clear case for integrated policies: tax policy must be coupled with border controls.

An underlying message from the paper is the need for complementarity of the regulatory policies independently implemented by different governmental bodies in the presence of a non-negligible black market, not compliant to any regulation.

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