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Modeling the money launderer: Microtheoretical arguments on anti-money laundering policy

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ABSTRACT

The existing literature treats the criminal – who generates criminal proceeds – and the launderer – who converts the 'dirty' dollars into 'clean' ones – as one and the same. And with good reason: it is clear from the evidence that such 'standard' vertically integrated launderers exists. Because professionals and institutions are also routinely prosecuted for money laundering transgressions, however, it appears that the market for money laundering is also supplied by third party, 'professional' launderers, whose core business lies outside the criminal sector, but who chooses to spend time supplying the market for money laundering.

In this paper we introduce the professional launder to the literature, and consider the process by which the launderer and the criminal bargain, to agree on a price for the money laundering service. We then consider the effects of three anti-crime, or anti-money laundering measures – namely, (1) increasing the probability that the criminal is caught, (2) increasing the probability that the launderer is caught, and (3) increasing the probability that the bargaining process itself is detected – on the way in which the negotiation is concluded. Of the various combinations available to the policy maker, we conclude that more resources should be spend on specialized police-units to tackle money laundering and, when the budget is fixed, less should be spent on financial scrutiny. Current approaches, we find, do not deter money launderers from supplying the market, but simply increase the profitability of money laundering and decrease the profitability of legitimate business.

1. Introduction

Money laundering is the process by which criminals attempt to "conceal or disguise the nature, location, source, ownership or control" of their ill-gotten gains.[1]

Innocuous as it sounds, money laundering is said to have the potential to "shake the very foundations of society"[2] for at least two reasons. First, and by design, money laundering attempts to subvert the 'crime-stopping efforts' of governments, and enables crime to remain profitable (Gnutzmann et al., 2010). Crime must be tackled, however, not only because it is "wrong", "deviant", and "injurious" (Ormerod, 2005), but because the proceeds it creates typically benefit the individual less than they damage society; estimates from the US place the net cost of crime in the region of $1 trillion per annum (Reuter and Truman, 2004). Research suggests that as much as 80% of criminal proceeds are laundered (Unger, 2007), and hence without money laundering, crime would be dramatically less profitable, and the supply of crime would suffer an

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[1] See Stages of the Money Laundering Process, A Report to Congress in Accordance with §356(c) of the USA PATRIOT Act, December 2002. Within the European legal framework the: (1) conversion or transfer of property; (2) the concealment or disguise of the true nature, source, location, disposition, movement, rights with respect to property; or (3) the acquisition, possession or use of property, knowing that such property is derived from criminal activity, are all activities which, when committed intentionally, are considered to be acts of money laundering. See Council Directive 91/308/EEC of 10 June 1991 on prevention of the use of the financial system for the purpose of money laundering.

[2] Directive 2005/60/EC of the European Parliament and of the Council, of 26 October 2005 on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing.

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adverse shock. Second, and as a significant but unintended consequence, money laundering damages the economy, and undermines the stability of the state. Money laundering is not only said to multiply crime, but to increase corruption, bribery and terrorism, to distort prices, consumption, saving and investment rates, to impact the demand for money, interest and exchange rates, as well as the availability of credit, to damage the solvability and liquidity, as well as the reputation and profitability of the financial sector, and to endanger the continuance of foreign direct investment (Unger, 2007).

So who supplies the market for money laundering? The 'standard' scenario, upon which the literature has been built, suggests that the criminal – who generates the criminal revenue – and the launderer – who converts the 'dirty' dollars into 'clean' ones – are one and the same individual. And with good reason: money launderers are criminals and criminals often launder money. The term 'money launderers', in fact, was originally used to describe those criminals – the Mafia – who, in the 1920s, bought laundromats and other outwardly legitimate businesses to hid the source of their illegitimate incomes (Unger, 2007). And indeed the mafia today is known to remain heavily invested in the market for money laundering.[3]

But clearly, this is not the full story. 'Standard' launderers exist, but the evidence is that third party professionals, whose core business lies outside the criminal sector, also choose to spend time supplying the market for money laundering. As we will see in later sections, recent US investigations have not only seen organized criminals charged with money laundering , but also dozens of professional bankers, lawyers, executives, and directors, three rabbis and even one US congressmen. If the 'standard' scenario is of a vertically integrated criminal launderer, the 'professional' scenario that we aim to introduce in the first part of this paper is of a third party agent, to whom criminal outsource their money laundering needs.

In the second part of this paper, we develop a bargaining model, to analyze the way in which the criminal and the professional money launderer interact. We then use this model to examine how different policy options impact the willingness of the 'professional' launderer to launder. We consider measures to: (1) increase the probability that the criminal is caught, that is, increasing the investment in traditional crime fighting; (2) increase the probability that the launderer is caught, that is, increasing the investment in anti-money laundering police units; and to (3) increase the probability that the bargaining process between the criminal and the launderer is detected, that is, increasing the level of scrutiny required of the banks and other financial players. Of the various policy combinations available to the regulator, we conclude that more resources should be spend on specialist police-units – which directly tackle money laundering – and, when the budget is fixed, fewer resources should be spent on financial scrutiny. In Germany where the costs of financial scrutiny to the banking sector come to € 775 million per year (IW Consult, 2006), the suggestion from our model is that those funds would better be spent on traditional policing efforts, aimed at catching and punishing professional money launderers. This suggestion is contrary to current policy, but in line with Takáts (2009) who – using a very different approach – also calls for a reduction on the burden of the banking sector.

In doing so, this paper makes a number of contributions. First, and by introducing the 'professional' launderer, we create a more realistic and more complete picture of the market for money laundering. Second, we show the limitations of current approaches to tackling money laundering. And finally, and most importantly, by distinguishing between the 'standard' and 'professional' launderers, we invite further research on measures that might allow for a more targeted and more efficient approach to tackling money laundering.

The paper proceeds as follows. In the next section we consider the existing literature on money laundering, and present the evidence that 'professional', third-party money laundering account for a non-negligible share of the market. In Section 3 we then analyze the ways in which the criminal might interaction with such a money launderers, using a bargaining model. We start by briefly introducing Rubinstein (1982) and Muthoo (1999)'s work on bargaining models, and then apply it to money laundering in mathematical terms. Before we conclude, we discuss the results, and the implications from a policy perspective in Section 4, and give an outlook to future research on this topic. Related literature is discussed in the respective sections.

2. 'Standard' and 'professional' money launderers

2.1. The market for money laundering

Crime is inevitable (Gnutzmann et al., 2010): it is the consequence of human ambition, and the flip-side of an entrepreneurial spirit (Baumol, 1990).

In observing that some crime is rational and profit motivated, the level of crime, however, can be reduced. Rational individuals choose to spend time earning an income in the legitimate or criminal sectors. They choose to invest in crime when the costs and benefits of investing in the criminal sector is found to be the more profitable. In the legitimate sector the costs include taxes and charges, while in the criminal sector the costs traditionally include fines, damages and physical detention. Rational individuals can therefore be deterred from investing in crime by, for example, increasing the probability of capture, or the duration and the severity of the punishment (Ehrlich, 1973; Blumstein and Nagin, 1977; Wolpin, 1978; Cornwell and Trumbull, 1994). This is the central suggestion of the literature that builds upon Becker's 1968 contribution.

Distinguishing between 'clean' money – earned legitimately – and 'dirty' money – generated in the criminal sector – is another way in which regulators can reduce the profitability of crime (Masciandaro, 2005; Unger, 2007). 'Clean' money can be consumed, converted and invested, while 'dirty' money can only be consumed. Dirty money, thus, has fewer uses, and it is therefore worth less. And so, by distinguishing between clean and dirty money, regulators can encourage legitimate activity over criminal activity.

As an unintended consequence, however, distinguishing between 'clean' and 'dirty' money creates a new market – the market for money laundering – and a new criminal: the money launderer. Money launderers are those individuals that help criminals to "conceal or disguise the nature, location, source, ownership or control" of their ill-gotten gains",[4] and as such the money launderer is the life-line that permits crime to remain profitable. Estimates suggest that as much 80% of criminal proceeds – a figure estimated by the UN to be in the range of US$1600 billion UNODC (2011) worldwide – are thought to pass the money launderers desks on a annual basis (see Fig. 1). Identifying and understanding the money launderer, therefore, is central to tackling crime.

[3] A 2013 report by Europol noted that the Italian Mafia was, however, 'going green', and turning to wind-farms and EU subsidies to launder their money.

[4] See Stages of the Money Laundering Process, A Report to Congress in Accordance with §356(c) of the USA PATRIOT Act, December 2002.

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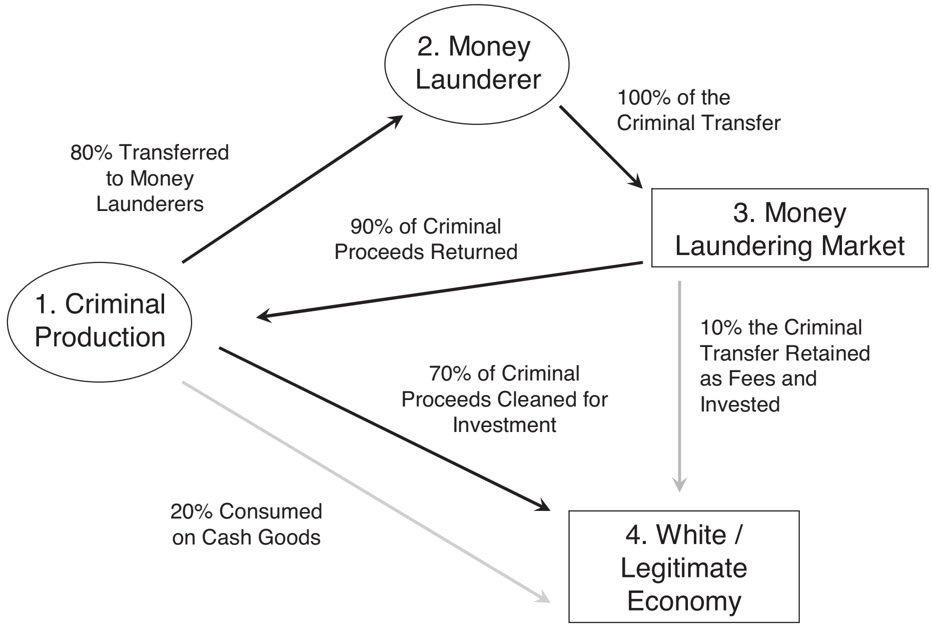

Fig. 1. Money laundering market. Numbers taken from Unger (2007).

2.2. *Distinguishing between 'standard' and 'professional' money launderers*

The 'standard' assumption of the existing literature is that criminal organizations vertically integrate the laundering process, and house the two functions – that is, crime 'production' and money laundering – in the same agent. And with good reason: money launderers are criminals and criminals often launder money. In fact, dozens of organized criminals have been convicted of money laundering transgressions by US authorities since 2000.

In the 'standard' scenario there is, therefore, no market for money laundering outside of the criminal organizations. But this is far from the full story. Recent investigations have seen dozens of professional bankers, lawyers, executives, and directors, three rabbis and even one US congressmen, charged with money laundering.[5] Table 1 lists several examples. Take, for instance, the case of Frankline Jurado, the Harvard-educated banker who, in 1996, pleaded guilty to laundering $36 million for Jose Santacruz-Londono, the head of the Cali Columbian drugs cartel. Jurado designed and operated a sophisticated scheme – which involved routing monies from Panama to a number of European shell companies, and back to Columbia, via more than 100 bank accounts in 68 countries – but Jurado was never involved in actually generating criminal revenues. He was a financier, and as such, quite a different animal to the more traditional criminal Santacruz-Londono.[6] And in this Jurado is far from unique. At the institutional level, banking giants like Llyods TSB (2009), ABN-Amro (2010), Barclays (2010), Wachovia (2010), Standard Chartered (2012), Credit Suisse (2012), ING (2012), the Vatican's Bank (2012) – officially known as the Institute for the Works of Religion – and HSBC (2012) have recently been accused of independently laundering billions; the latter was found to have laundered up to $15 billion, including $7 billion for Mexican drug cartels.

Thus, while it is clear that the 'standard' vertically integrated launderers still exists, it is just as clear that individuals and institutions whose core business lies outside the criminal sector often spend time supplying the market for money laundering. The individuals and institutions are responsible for a non-negligible share of the total market for money laundering, and thus treating the criminal – who generates the criminal proceed – and the launderer – who turns dirty dollars into clean ones – as one and the same individual cannot fully describe the market.

In this paper we introduce the 'professional' launderer to the literature for three reasons. First, because the scenario of professional launderers supplying the market for money laundering reflects reality: not all criminals are launderers, and not all launderers are criminals. And even if the literature does not currently recognise this distinction, policy makers, as we will see in this next section, do. Second, because the professional launderer is the weakest link in the criminal chain. Having invested in the criminal sector, neither a criminal nor a integrated launderer can be easily dissuaded from laundering; both face significant sunk costs. A professional launderer, however, who has a legitimate job, a reputation, a career, lower/no sunk costs, and a set of outside opportunities, is much more likely to be dissuaded from laundering. Take, for example, the case of Lucy Edwards – an executive at the Bank of New York – who, in 2006, was convicted of laundering $10 billion for the Russian Mob, for a commission of $1.8 million. Having generated $10 billion, the Mob has a significant sunk cost, and – had it decided to launder its own revenues – is unlikely to respond to subtle tweaks to the anti-money laundering provisions. Having a legitimate, and a well-paid position at the Bank of New York, however, Edwards is more vulnerable and, more easily discouraged from supplying the market for money laundering. Finally, we distinguish between the 'standard' and 'professional' launderers, because doing so allows regulators a more targeted and more efficient approach to tackling money laundering.

2.3. *Current approaches to tackling money laundering*

Even though the academic literature does not distinguish between 'standard' and 'professional' launderers, anti-crime/anti-money laundering policy makers do. And recognising that the

[5] See www.irs.gov for a list of recent money laundering investigations in the US.

[6] Jurado was sentenced to seven and a half years in prison, in 1996, for his services. Jose Santacruz-Londono headed the Cali Cartel which, for a time, was thought to have supplied 70% of the United States and 90% of the European cocaine market. Santacruz-Londono was killed in 1996 while attempting to flee the police

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Table 1
Recent money laundering cases.

	Individuals
1	Patrick Robert Simon, a Dallas lawyer, was sentenced to 24 months, in 2013, for conspiring to launder.
2	Shawn Rice, a Las Vegas rabbi and lawyer, was sentenced to 98 months, and 3 years supervision in 2012, after being found guilty of laundering $1.3 million of criminal monies, generated from theft and forgery.
3	Robert George, a Boston attorney, convicted in 2012 for helping clients to launder criminal proceeds.
4	Marco Manuel Luis, a real-estate agent from San Diego, was convicted in 2012 for helping clients to launder.
5	Mordchai Fish, the principle rabbi of Congregation Sheves Achim, in New York, and his brother, Rabbi Lavel Schwarts, Brooklyn, were sentenced in 2012 for 15 and 10 counts of money laundering, respectively. Fish and Schwarts routed criminal proceeds through series of purported charities, for a 10% commission.
6	Brian Eads, an investor in Indiana, was sentenced to 30 months in 2012 for money laundering.
7	Jessica Harper, then head of online security at Lloyds Bank, was convicted in 2012 of money laundering.
8	Jerry Jarret, a criminal defines attorney, was sentenced to 37 months, in 2011, for laundering drugs proceeds
9	Lucy Edwards, an executive at the Bank of New York, and her husband, Peter Berlin, were convicted in 2006 for laundering $10 billion, generated by Russian mobsters, for a fee of $1.8 million.
10	Frankline Jurado, a Harvard trained economist and banker pleaded guilty in 1996 to laundering $36 million on behalf of the Colombian drugs lord Jose Santacruz-Londono.
	Institutions
1	HSBC, a British bank, admitted laundering $15 billion from Russia, and other high risk regions in 2012, including $7 billion from Mexico, and agreed to pay a fine to the US Government a fine of $1.9 billion.
2	Standard Chartered, a British bank accused of laundering $250 billion for Iran and Lybia, settled with US regulators in 2012 and agreed to pay $340 million for violating US anti-money laundering laws.
3	Credit Suisse, a Swiss bank accused of laundering in Iran, Lubya, Sudan, Myanmar and Cuba, settled with US regulators in 2012 and agreed to pay $536 million for violating US money-laundering laws.
4	ING Bank NV, a Dutch Bank, agreed to pay a fine of $619 million in 2012, for laundering money originating in Cuba and Iran, in violation of US money-laundering laws, and for deleting the evidence.
5	ABN-Amro, a Dutch bank, settled with US regulators in 2010 and agreed to pay a fine of $500 million for helping individuals in Iran and Lybia to channel money through the US, over a ten-year period.
6	Barclays, a British bank, settled with the US Government in 2010, and agreed to pay a fine of $298 million, for breaching US anti-money laundering laws relating to client payments in Cuba, Sudan, and other places.
7	Wachovia, a US bank, settled with US regulators in 2010 and agreed to pay a fine of $160 million for having laundered $373 billion – a sum equivalent to 1/3rd of Mexico's GDP – on behalf of a Mexican drugs cartel.
8	Llyods TSB Group agreed to pay $350 million in fine in 2009 for laundering Iranian and Sudanese funds.
9	The Institute for the Works of Religions – the Vatican's Bank – was accused of laundering $218 million. Ettore Gottie Tedeschi, the Head of the Bank, and a Professor of Ethics at the University of Turin, was dismissed as Head of the Vatican bank in 2012 for his role in the scandal.
10	American Express, an American multinational involved in financial services, agreed in 2007 to pay US Regulators a fine of $65 million, for failing to adhere to US anti-money laundering laws.

market is composed of 'criminals', 'standard', and 'professional' launderers, anti-crime authorities have created three types of instruments:

1. Measures to deter crime: (denoted by p_C in the next section)
   This category includes those measures that increase the probability that criminals are caught, reducing the supply of criminal proceeds. These are typical 'tough on crime, tough on the sources of crime' measures, as the British Government once put it: more police, and more resources for police. These measures target both the 'criminal', who produces the criminal proceeds, and the 'standard' launderer. They are, for example, aimed at catching criminals, like Jose Santacruz-Londono.
2. Measures to deter money-launderers: (p_M)
   This category of policy instrument includes those measures that decrease the probability that the launderer is willing to launder. These measures are aimed at reducing the supply of money laundering services, and are, as such, supposed to deter 'professional' launderers from supplying the market for money laundering. By doing so, these measures increase the costs of laundering, and reduce the profitability of crime. Investing in this category sees authorities funnel resources to specialist anti-money laundering bodies. The result is that more money launderers are caught, fined, fired, 'named-and-shamed' and imprisoned. In other words, this set of measures is aimed at deterring people like Franklin Jurado and Lucy Edwards.
3. Measures to detect the money laundering process: (q)
   This category, implicitly, recognises the existence of the professional launderer, and is designed to catch people like Franklin Jurado, in the business of laundering Jose Santacruz-Londono's money. Here, however, the authorities do not invest in anti-money laundering measures, but typically shift the burden of tackling crime / money laundering to the private-sector. The law, for example, requires banks and financial institutions to scrutinize large transactions (that is, transactions in excess of US$10,000 in the US, CA$10,000 in Canada, and € 10,000 in the EU); failing to comply makes the bank itself liable for anti-money laundering fines. We model this category as the probability that the bargaining process between the criminal and the professional launderer is detected, increasing the costs of money laundering and, consequently, lowering the crime level.

In all cases, the objective of the policy maker is to fight crime as efficiently, and as effectively as possible, given budget limitations. Of course, the optimum investment is achieved where the marginal effect of a dollar spent on the crime level is identical for each category. But without knowing the elasticities this does not help much. So which policy is the most effective in deterring professional money launderers? This question has not yet been explored by the existing literature, but in the next section we introduce a theoretical model which explores the way in which the criminal and the professional money launderer interact, and as such allows us to evaluate the different policy options.

3. Interacting criminal and professional launders

3.1. Bargaining theory

We model the interaction between the 'traditional' criminal and the 'professional' money launderer using a traditional bargaining model. In doing so, we intend to introduce the notion of bargaining, in a relatively simple setting which, at the same time, is flexible enough to be incorporated in larger models of economic behavior, or to be extended along several lines. We follow the alternating-offers procedure set out in Rubinstein (1982). Here, two players bargain over the division of a fixed surplus. During any bargaining round, one player makes an offer to split the surplus, while the other can either accepts or rejects the offer. In case of rejection, the second player can make a counteroffer in the next bargaining round. The number of rounds is infinite, and the surplus is divisible. This setting is both a general and plausible description of economic exchange between two rational agents.[7] We apply this setting to the market for money laundering, following the description of the alternating-offers procedure set out by Muthoo (1999), to whom we refer for an excellent overview of different bargaining models.

3.2. *Modeling the interaction between criminals and money launderers*

Consider now two players. The first is the ordinary Becker-Ehrlich criminal (player C), and the second a money launderer (player M). Both are rational utility maximizers, and both are open to deterrence, by changing the parameters in their utility functions. The utility functions of both agents are interdependent by the price the criminal pays for his proceedings to be laundered.

We model the interdependence between the criminal and the money launderer using a bargaining game. The relevant outcome is the price the launderer charges for laundering the criminal's proceedings from crime. This price can be viewed as a payment from the criminal to the money launderer in exchange for the money laundering service. The surplus is denoted by π, which is of course a function of the time spent in the illegal sector; that is, π equals the laundered monetary equivalent of criminal proceedings. We follow the alternating-offers procedure set out in Rubinstein (1982). The timing of the game is as follows:

1. The criminal chooses the level of activity in the legal and illegal sectors, l_1 and l_2,
2. With the investment in crime sunk, the criminal comes to the launderer. The money launderer proposes a price of $x \in (0, \pi)$ for his services.
3. The criminal can either accept the price, yielding him net rewards $\pi - x$, or can reject the offer and propose a new price $y \in (0, \pi)$ during the next bargaining round.
4. The money launderer can accept the new price, or can reject and return to step 2.

The bargaining game ends when an offer by either party is accepted by the other party. However, there is a positive probability, q, that the game is detected by the monitor. If this happens, the bargaining game ends, and both players are forced to pay a fine. For simplicity, we abstract from time discounting,[8] but note that rejecting offers is costly in terms of allowing the game to be detected.[9] Moreover, in this paper we assume that labor supply decisions by both players are pre-determined, which rules out outside options. The payoffs, focusing on the case where the criminal accepts the launderer's proposed price, are depicted in Table 2. The other case, when the launderer accepts the criminal's proposal, is of course a mirror image.

Table 2
Payoffs after the launderer's proposal is accepted.

State	Probability	Payoff criminal	Payoff launderer
Breakdown	q	$w_1 l_1^C - f_C$	$v_1 l_1^M - f_M$
Agreement	$1 - q$	$w_1 l_1^C + \pi - x$	$v_1 l_1^M + x$

q is the probability that the bargaining process is detected, w_1 is the legal wage rate, l_1 is the level of the activity in the legal sector, f_i is the fine for the launderer and the criminal in case of detection, π is the amount of money to be laundered, x is the price the criminal pays to the launderer for his services.

Henceforth, we will use the notation b_i to denote the utility of player $i = C, M$ when bargaining breaks down.

Suppose each player always rejects any offer made to him. Then, the utility to the criminal equals

$$qb_C \sum_{t=0}^{\infty} (1-q)^t = b_C$$

and the money launderer has utility of b_M. Since never agreeing on any offer is a feasible strategy, the criminal and the money launderer will receive a utility at least as big as b_i, $i = C, M$. This outcome is known as the impasse point of the bargaining game. Thus, x_M^*, the equilibrium payoff to the money launderer, is at least as large as $v_1 l_1^M - f_M = U_M^{-1}(b_M)$. Moreover, the equilibrium payoff needs to satisfy $\pi - x_M^* \geq U_C^{-1}(b_C)$, for otherwise gains from cooperation would not exist. Of course, never agreeing is not the optimal strategy.[10] The unique subgame-perfect equilibrium (SPE), which is due to Rubinstein (1982), has the property that the criminal is indifferent between accepting and rejecting the money launderer's equilibrium offer, and vice versa. We can formulate this as

$$U_C(\pi - x_M^*) = qb_C + (1-q)U_C(x_C^*) \tag{1a}$$

$$U_M(\pi - x_C^*) = qb_M + (1-q)U_M(x_M^*) \tag{1b}$$

$$x_M^* \geq U_M^{-1}(b_M) \tag{1c}$$

$$x_C^* \geq U_C^{-1}(b_C) \tag{1d}$$

$$\pi - x_M^* \geq U_C^{-1}(b_C) \tag{1e}$$

$$\pi - x_C^* \geq U_M^{-1}(b_M) \tag{1f}$$

The intuition behind condition (1a) is as follows. With probability q, bargaining breaks down, yielding b_C to the criminal. With probability $1 - q$, the criminal has the chance to reject the money launderer's offer x_M^*, and to propose his own equilibrium offer, yielding $U_C(x_C^*)$. The best offer the launderer can propose is to make the criminal indifferent between accepting the offer x_M^* and the expected utility of the criminal's equilibrium strategy. To see this, note that offering more would reduce the launderer's own utility, while offering less would be rejected by the criminal. In equilibrium, neither player has the incentive to deviate from their strategies, yielding Eqs. (1a) and (1b). Uniqueness of this equilibrium follows from Rubinstein (1982).

[7] Despite the simplicity of the setup, the solution to this type of bargaining problem was not fully understood until Rubinstein (1982)'s treatment of the subject, the reason being that any split of the surplus is a Nash equilibrium. In particular, the player can commit to rejecting any offer less than, say, 60% of the surplus, and to always offer 40% to the opponent. The best response to such a strategy is to offer the 60% immediately. By varying the thresholds, any outcome can thus be a Nash solution. Rubinstein showed that most of such strategies involve incredible threats, and that only 1 equilibrium is also subgame-perfect once bargaining is costly for at least one player. Suppose that the surplus shrinks over time, either in real terms or due to discounting future utility, by 1% each round. In this case, the committed player is better off accepting an offer of 59.5% in any round, despite being committed to rejecting offers less than 60% of the surplus. In other words, always rejecting "too low" offers cannot be part of an equilibrium strategy. Extending this line of reasoning leads to a unique subgame-perfect equilibrium where the outcome depends on the relative costs of delay for both players.

[8] Allowing for time discounting is possible, but will not change the qualitative conclusions of the game. Ignoring discounting forgoes the opportunity to investigate interactions between the risk of breakdown and discounting.

[9] We thus assume that the detection risk increases with increasing bargaining time.

[10] The players could have chosen not to play the game at all.

What does the equilibrium partition look like? Combining Eqs. (1a) and (1b), we know that the equilibrium proposal satisfies

$$G_M(x_M)=U_C(\pi-x_M)-qb_C-(1-q)U_C(\pi-U_M^{-1}(qb_M+(1-q)U_M(x_M)))=0$$

The function $G_M(x_M)$ has the following properties (see Appendix A):

1. $G_M(\pi)<0$.
2. $G_M(U_M^{-1}(b_M))>0$.
3. By continuity of the utility functions and uniqueness of the SPE, G_M is strictly decreasing on the interval $x_M \in (U_M^{-1}(b_M), \pi)$.

Therefore, the equilibrium outcome satisfies $U_M^{-1}(b_M) < x_M^* < \pi - U_C^{-1}(b_C)$. The same line of reasoning for the criminal yields $U_C^{-1}(b_C) < x_C^* < \pi - U_M^{-1}(b_M)$. The launderer proposes first, leaving him with a payoff of x_M^* while the criminal obtains $\pi - x_M^*$. Three characterizations of the equilibrium are immediate:

1. Agreement is reached during the first round of bargaining, and is therefore efficient. Delaying agreement would shrink the surplus due to the possibility of breakdown.
2. As G_M increases in b_M and decreases in b_C, the breakdown point matters: ceteris paribus, increasing the money launderer's legal wage or decreasing the criminal's legal wage increases the launderer's share of the surplus. His bargaining strength increases as he has less to gain from laundering if his legal wage is high, and vice versa for the criminal.
3. The launderer has a first-mover advantage: if the utility functions and breakdown points are identical between both players (so $U_M=U_C=U$ and $b_C=b_M=b$), then both would offer the same amount in equilibrium, $x_M^*=x_C^*=x^*$. From Eq. (1a), we know that $U(\pi-x^*)=qb+(1-q)U(x^*)$. As $x^*>U^{-1}(b)$, this implies $U(x^*)>b$ and thus $U(\pi-x^*)<U(x^*)$. It follows that $x^*>\pi-x^*$, and therefore the first proposer obtains the larger share. This is intuitive, since the only asymmetry between players when their utility functions and breakdown points are the same is the order of proposals.

The effect of the probability of arrest on the share going to each player is an important tool for analyzing deterrence. However, this effect is not straightforward to obtain. Intuitively, this is because an increase in q will decrease the expected time until breakdown occurs, and therefore will increase the present value of the breakdown payoff. On the other hand, a player becomes more impatient, and impatience is typically bad for the share obtained in equilibrium. These two forces work in opposing directions, the first increasing the share of the surplus, and the second decreasing the share of the surplus. Mathematically, we can find the effect of q on x_M using

$$\frac{\partial x_M}{\partial q}=-\frac{\partial G/\partial q}{\partial G/\partial x_M}$$

As $\partial G/\partial x_M<0$ (see property 3 above), the sign of $\partial x_M/\partial q$ coincides with the sign of $\partial G/\partial q$. This expression equals

$$\frac{\partial G}{\partial q}=U_C(\pi-U_M^{-1}(qb_M+(1-q)U_M(x_M)))-b_C+(1-q)U_C'(\pi-U_M^{-1}(qb_M+(1-q)U_M(x_M)))\left(\frac{b_M-U_M(x_M)}{U_M'(U_M^{-1}(qb_M+(1-q)U_M(x_M)))}\right)$$

For notational convenience, define $Z=U_M^{-1}(qb_M+(1-q)U_M(x_M))$ to be the launderer's expected payoff from the bargaining game. The first line, $U_C(\pi-Z)-b_C$ is obviously positive, while the second line is negative, since $b_M<U_M(x_M)$, and hence the sign is ambiguous. Some more insight can be derived as follows:

1. Since the launderer proposes in the first round, his share of the surplus will be the larger one, and therefore his marginal utility will be lower than the criminal's marginal utility. Therefore, presumably, $U_C'(\pi-Z)/U_M'(Z)>1$.
2. Suppose that $(1-q)U_C'(\pi-Z)/U_M'(Z)\approx 1$. Then, $\partial G/\partial q \approx (U_C(\pi-Z)-b_C)-(U_M(x_M)-b_M)$.
3. If $b_M \gg b_C$, then $\partial G/\partial q>0$. Alternatively, if $b_M \ll b_C$, then $\partial G/\partial q<0$.

Under these assumptions, we have shown that increasing the probability of detection increases the share of the money launderer when his breakdown value is high, but decreases his share if his breakdown payoff is low, relative to the breakdown payoff of the criminal. The intuition behind this result is natural: with a high breakdown payoff, the launderer has relatively little to gain from the bargaining game, while the criminal has much to gain. Increasing the probability of detection only increases the impact of the breakdown payoffs on the final outcome, and hence the launderer is better off.

Example: risk-neutral players. Suppose that both players are risk neutral. Then Eqs. (1a) and (1b) have the following solution:

$$x_M^*=b_M+\frac{1}{2-q}(\pi-b_M-b_C) \tag{2a}$$

$$x_C^*=b_C+\frac{1}{2-q}(\pi-b_M-b_C) \tag{2b}$$

For this particular utility function, we confirm the main properties characterized above: the share going to the launderer is increasing in his breakdown payoff, decreasing in the criminal's breakdown payoff and increasing in the probability of breakdown, q.

3.3. Interpretation of the results

Our model, while being stylized and abstract, can be used to understand the payoffs to both criminals and launderers. The payoff to the launderer:

- increases when his legal wage rate increases
  The first prediction shows that better outside options, in the sense of having a higher legal wage rate, will increase the bargaining power of the launderer. The intuition is that bargaining power is highest for the party that has the least to gain from the exchange. If the legal wage rate is high, earning extra monies by engaging in money laundering is less attractive than if the wage rate was low. In our setup, the launderer has to weight the benefits of extra income and the costs of potentially being arrested and convicted, and foregoing legal income. Clearly, higher legal wage rates tip the balance in favor of staying out of laundering activities.
- increases when the criminal's legal wage rate decreases
  The second prediction is more indirect: what matters for the bargaining power of the launderer is not just the level of his wage rate, but his wage rate relative to that of the criminal. After all, the party with the highest outside option has the most bargaining power, and will obtain the highest share of the surplus. Decreasing the criminal's wage rate simply leads to less bargaining power for the criminal (a mirror image of the first prediction) and hence more power to the launderer.
- most likely increases when the probability of detection increases

The last prediction is due to the equilibrium of the bargaining model. Recall that the best offer the launderer can propose is to make the criminal indifferent between accepting the offer, and the expected utility of the criminal's equilibrium strategy. This is due to the fact that offering more would reduce the launderer's own utility, while offering less would be rejected by the criminal. The expected utility of the criminal's equilibrium strategy is low when the detection probability is high. Hence, the launderer needs to offer less, and in equilibrium obtains the highest share of the surplus. This is most clearly shown in the example with risk-neutral players, though the principle remains the same with risk-averse agents.

We have analyzed the equilibrium in a bargaining model between a criminal and a money launderer. We have derived the share of the surplus going to the launderer under general utility functions, and have characterized the determinants. In the next section, we discuss the implications for policy of these findings

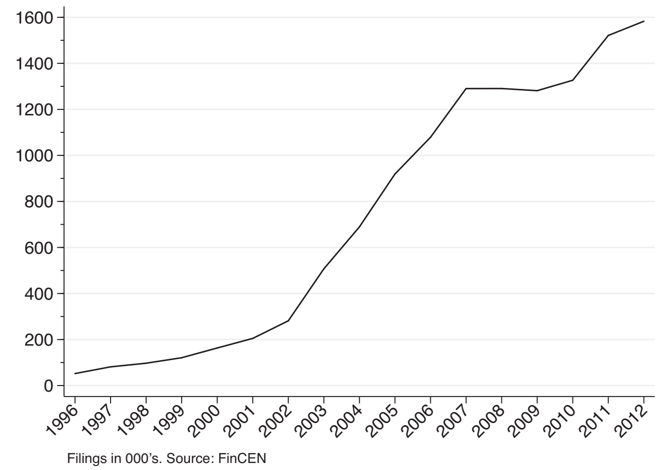

Fig. 2. Defensive filings.

4. Discussion

4.1. Discussion

The existing literature treats the criminal – who generates criminal proceeds – and the launderer – who converts the 'dirty' dollars into 'clean' ones – as one and the same.

In this paper we describe the real-world situation in which the money launderer is often a third-party, specialist individual. We introduce the professional launderer, in Section 2, and then model the ways in which the criminals and the launderer interact, in Section 3, to consider the effects of three anti-crime, or anti-money laundering measures – namely, increasing the probability that the criminal is caught (p_C), that the launderer is caught (p_M), and that the bargaining process itself is detected (q) – on the way in which the negotiation is concluded. In all cases, we document spillover effects: increasing p_C reduces the supply for crime, and the supply of proceeds to the launderer; increasing p_M reduces the supply of money laundering services, increases the price of the money laundering which, in turn, reduces the profitability of crime; and increasing q increases the share of the proceeds that go to the launderer, and reduces the profitability of crime in the process.

Of the various combinations available to the policy maker, we find that more resources should be spent on (p_M), in the form of specialized police-units to tackle money laundering and, when the budget is fixed, less should be spent on financial scrutiny (q). This, however, is contrary to the current policy, where only very few resources are spent on p_M. According to the UN as little as 0.1% to 0.3% of money laundering is detected UNODC (2011). Under the current regime, the money launderer's expected fine, therefore, is nearly zero, while the profits remain astronomical: launderers are thought to earn 5–50% of the US$1600 billion in criminal proceeds UNODC (2011) that cross their desk on an annual basis.

Current anti-money laundering efforts are focused on q: the government externalises, or outsources, its anti-money laundering efforts, and through regulation, it places the burden of detection upon private financial institutions. According to anti-money laundering practitioners, this approach works: notifications by banks and financial institutions are responsible for more than 90% of money laundering investigations.[11] Such measures, however, come with significant costs – for German banks alone, the costs of compliance with anti-money laundering directives is in the region of € 775 million per year IW Consult (2006) – and are of questionable efficiency. Takáts (2009) demonstrates, in another way, the inefficiency of current approaches to burdening the banks. He shows, formally, that fining banks for failing to report money laundering has encouraged banks to 'file defensively' (FinCEN, 2005), which has, in turn, exploded the number of reports that regulatory authorities have had to process. Fig. 2 plots an overview of the number of Suspicious Activity Reports (SARs) filed with the Financial Crimes Enforcement Office (FinCEN) of the United States Department of the Treasury, obtained from the FinCEN website, in the period 1996–2012, and shows a distinctly upward trend in the number of filings. The result has not only been a dilution of the information – a phenomenon that Takáts compares to 'the boy who cried wolf' – but has led too to the misreporting of otherwise innocent activities. As an example of the latter, Takáts (2009) reports how the Wall Street Journal covered the case of the falsely reported former presidential candidate and Senate majority leader Bob Dole (The Wall Street Journal, 2004). Takáts concludes that the problem of crying wolf might be remedied by reducing the fines levied on banks for failing to report suspicious transactions. The corroborating implication from our model is that the detection probability will not reduce the level of money laundering, but will simply increase the profitability of money laundering. In other words, rather than reducing the supply of money laundering services, q may have the effect of increasing the supply of money laundering services.

That the government does not invest in p_M is understandable but not sensible: the return to investment on p_M is not directly observable, and the effects of money laundering – in terms of its distortionary effect on the price system – seem distance and abstract. Our results, however, suggest that the authorities must invest in p_M, because an investment (only) in q is far from efficient. On the basis of our findings, we: (1) advocate an expansion in the number of anti-money laundering specialists employed by national and international level; and (2) call for a enhanced communication and collaboration between the existing intelligence units, for example by setting up an international database to increase the effectiveness of the current anti-money laundering specialists.

4.2. Future research

Much work needs to be done in the economics of money laundering. And further efforts at the modeling and estimation of the money laundering market are to be welcomed. In general, we would like to see: (1) scholars and practitioners adopt the distinction between criminals and launderers proposed in the paper; (2) more empirical applications of the current theoretical research, in particular, using theory to identify and measure money laundering in

[11] We thank the money laundering expert, Sebastian Fiedler (not related to the third author), for this note.

the data; and from a theoretical perspective, we would like to see the model developed in this paper enriched, and expanded, so as to provide a deeper insight in the behavior of the money launderer.

5. Conclusion

In this paper we identify the professional launderer, as a rational criminal agent, and consider the process by which the launderer and the criminal bargain to agree on a price for the money laundering service. We then consider the effects of three anti-crime, or anti-money laundering measures – namely, (1) increasing the probability that the criminal is caught, (2) increasing the probability that the launderer is caught, and (3) increasing the probability that the bargaining process itself is detected – on the way in which the negotiation is concluded. Of the various combinations available to the policy maker, we conclude that more resources should be spend on specialized police-units to tackle money laundering and, when the budget is fixed, less should be spent on financial scrutiny. Current approaches, we find, do not deter money launderers from supplying the market, but simply increase the profitability of money laundering. In doing so, our contribution is to be found in the fact that by introducing the 'professional' launderer we create a more realistic picture of the market for money laundering, but more importantly, and by distinguishing between the 'standard' and 'professional' launderers, we invite further research on measures that might allows for a more targeted and more efficient approach to tackling money laundering.

Appendix A. On the function G_M

The function $G_M(x_M)$ is defined as

$$G_M(x_M)=U_C(\pi-x_M)-qb_C-(1-q)U_C(\pi-U_M^{-1}(qb_M+(1-q)U_M(x_M)))$$

For $x_M = x_M^*$ (the equilibrium), we have seen that $G_M = 0$. We can derive the following properties:

$$G_M(\pi) = U_C(0) - qb_C - (1-q)U_C(\pi - U_M^{-1}(qb_M + (1-q)U_M(\pi)))$$

Note that $EU_M^{\max} \equiv qb_M + (1-q)U_M(\pi)$ is the maximum expected utility the launderer could possibly get, that is, when he gets the entire surplus. Then, $U_M^{-1}(EU_M^{\max})$ denotes the corresponding monetary payoff, which is surely less than the surplus, π. Therefore, the above expression simplifies to

$$G_M(\pi) = U_C(0) - qb_C - (1-q)U_C(\pi - U_M^{-1}(EU_M^{\max}))$$

For any utility function that satisfies $U_C(0) \leq 0$, which can always be ensured by rescaling it, this expression is negative, the desired result.

For the second property, note that $U_M(U_M^{-1}(b_M)) = b_M$ and $qb_M + (1-q)b_M = b_M$. Evaluating G_M at $U_M^{-1}(b_M)$ give

$$\begin{aligned}
G_M(U_M^{-1}(b_M)) &= U_C(\pi - U_M^{-1}(b_M)) - qb_C \\
&\quad - (1-q)U_C(\pi - U_M^{-1}(qb_M + (1-q)b_M)) \\
&= U_C(\pi - U_M^{-1}(b_M)) - qb_C - (1-q)U_C(\pi - U_M^{-1}(b_M)) \\
&= q(U_C(\pi - U_M^{-1}(b_M)) - b_C) > 0
\end{aligned}$$

The last step follows from constraint (1e).

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