Pricing Conflict:

Legal Regimes, Uncertainty, and Prices in Medical Marijuana Markets

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Abstract

Prices are central to market functioning. But how do sellers set prices in markets that are rife with uncertainty engendered by conflict among national, state, and local legal regimes? Although much research in economic sociology has recognized that states create markets, very little has explicitly recognized that many states are federalist systems, with nested levels of government, and even less has studied how legal regimes (federalist or unitary) affect prices in markets. We build on sociological and legal scholarship to develop a theory of how legal regimes at multiple levels of federalist government affect prices. We argue that conflict between levels of government increases uncertainty for sellers, which affects prices by increasing costs and hindering the development of market norms. We apply this theory to a critical battleground for federalism: state-level legal markets for medical marijuana in the U.S. Consistent with this theory, we find that legal conflict between state-level and federal-level legal regimes, and between state-level and local-level legal regimes, results in higher and more dispersed marijuana prices. We conclude by considering how multi-level models of legal regimes might be applied to other markets.

States construct markets by creating rules (legislation, administrative regulations, and judicial decisions); the resulting legal regimes make markets legally calculable and market activities predictable (Weber 1927 [1981]; 1978). Legal regimes produce material incentives and penalties that encourage some activities and forms of organization, and deter others; they also foster the development of cultural understandings of which products, forms of organization, and practices are normal and celebrated, and which are deviant and deprecated (e.g., DiMaggio 1990; North 1990; McAdams 2015). There are two primary mechanisms by which legal regimes affect market practices: by impelling or impeding the development of market norms, and by supporting or suppressing the actions of organizations that buy or sell in the market.

Although we have a wealth of sociological research concerning the impact of legal regimes on markets, very little of this work has recognized that many states are federalist systems, with nested levels of government (for exceptions, see Dobbin 1994; Schneiberg and Soule 2005). Therefore, most work has assumed implicitly that the legal regimes created by different levels of government are aligned. Yet tension inheres in federalist systems, as a centripetal pull toward a single political center is countered by a centrifugal push away from the center toward political subunits, and different levels of a federation can create distinct, possibly conflicting legal regimes to govern a particular market. For example, if one level of government authorizes the sale of a product but a second level bans it, then conflict, contradiction, and stalemate is likely to ensue (Campbell and Lindberg 1990). In the current political climate, conflict between different levels of the American federalist system is becoming more common; witness California's Sanctuary State law (S.B. 54 2017) and New York's Liberty Act (A03049 2017) prohibiting state authorities from co-operating with federal authorities to flag undocumented immigrants. We argue that conflict between levels of government in a federalist system generates great uncertainty, and consider the impact of such uncertainty on economic action, specifically prices for products subject to such conflict.

We focus on prices because they are central to market behavior (Uzzi and Lancaster 2004; Beckert 2011). Prices are co-ordinating mechanisms that align buyers' and sellers' preferences and actions; even more basic, prices both affect and reflect preferences. Prices also determine the distribution and allocation of wealth and goods, and thus shape inequality. In turn, prices are determined by both technical factors (supply and demand) and social factors (networks, institutions, and norms). The vast majority of contemporary sociological work on prices has involved statistical analysis of price distributions based on social networks (e.g., Podolny 1993; Uzzi and Lancaster 2004; Askin and Bothner 2016) or ethnographic and interview-based analysis of how prices are derived from social norms (e.g., Smith 1989; Velthuis 2005; Fourcade 2011); far less has been done to understand how institutions (e.g., legal regimes) determine prices, through either qualitative inquiry of pricing processes or quantitative inquiry of price distributions (Beckert 2011: 766-768).

In this paper, we focus on institutions and their impact on the prices charged by organizations selling goods and services. We argue that the uncertainty generated by conflict between different legal regimes (created by different levels of a federalist system) makes it difficult for sellers to plan, which impedes operations and increases costs, driving prices higher. We further argue that such uncertainty hinders the development of widely shared, stable valuation norms, which makes it harder for sellers to settle on similar prices for products, generating price dispersion. Moreover, uncertainty makes it difficult to develop norms about effective and appropriate forms of organization, increasing the variety of organizations operating in a market; in turn, organizational heterogeneity increases variation in operating costs, increasing price dispersion. Finally, we probe causal mechanisms by explicitly two possible mediators: for (mean) price, we investigate form of organization; for price dispersion, we investigate the heterogeneity of organizations near the focal seller.

We test this theory in a critical battleground for federalism: markets for medical marijuana in the United States (Mikos 2009; Schwartz 2013; Chemerinsky et al. 2015), where possession and sale of marijuana for medical use is legal at the state level but illegal at the

federal level. We study markets in seven states (Arizona, California, Colorado, Michigan, Oregon, Nevada, and Washington) that together constitute over 95 percent of state-legal medical marijuana sales in the United States in 2015. The products traded in these markets are morally charged and legally contested, so states' and municipalities' legal regimes are likely to exhibit considerable variation, which facilitates examining the impact of legal institutions on price. But this site has advantages beyond its importance for understanding federalism and markets. State-legal markets for marijuana are growing rapidly, with sales rising from $2.7 billion in 2014 to $6.9 billion in 2016 (ArcView Market Research 2015, 2017). In 2014, the most recent year for which nationally representative survey data are available, 13 percent of American adults reported using marijuana (Compton et al. 2017). Although we cannot predict the federal government's future actions, a majority of Americans support legalizing marijuana for adult recreational use (60 percent in 2016, up from 34 percent in 2001) (Gallup 2016), so state-legal marijuana markets are likely to continue to grow, even in the face of federal opposition.

We begin by reviewing research on states and markets from economics, sociology, and legal studies, which yields a single-level theory of how legal regimes affect prices. We then explain the complexities of federalist government systems and develop a multi-level theory of how conflict between legal regimes at different levels of federalist systems affects prices. Next, we review the history of laws concerning marijuana in the United States, and describe how we conducted research to test predictions from both theories. After summarizing our empirical results, we consider the implications of our analysis for research on pricing in other markets.

Law, Markets, and Prices

States construct markets by creating rules (legislation, administrative regulations, and judicial decisions) that determine what can be produced and sold, and under what circumstances; who can own, produce, buy, and sell products; whether anyone can profit from selling them; and under what circumstances and in what ways they can be sold (e.g., Polanyi

1944; North 1981, 1990; Campbell and Lindberg 1990; Fligstein 2001). By making markets legally calculable and economic action predictable, law makes it possible for markets to function (Weber 1927 [1981]; 1978). Legal regimes – the array of state-created rules governing markets – affect markets in three ways. Most fundamentally, legal regimes *constitute* or *generate* markets by defining categories of economic actors and actions, thus determining what kinds of organizations and products are recognized as permitted or prohibited (Edelman and Suchman 1997). This impact of legal regimes is most apparent when markets are in flux – either when new markets emerge or when existing markets are transformed by legal, cultural, economic, or technological change – and almost invisible (taken for granted) in stable markets (Róna-Tas and Guseva 2014). After they emerge and as they stabilize, markets are shaped by legal regimes in two other ways (Edelman and Suchman 1997). Legal regimes *facilitate* market exchange by creating tools and forums buyers and sellers use to accomplish their goals, such as contracts, lawsuits, and mediation. Legal regimes also *regulate* market exchange, through substantive edicts concerning acceptable strategies, forms of organization, and practices, in terms of such things as workers' rights, customer relations, pollution, pricing, and cooperation.[1]

Legal regimes, especially legislation and administrative regulations, express the beliefs and values of state authorities who created them; in doing so, legal regimes signal public attitudes concerning regulated practices and products, and the risks associated with them (e.g., Cooter 1998; McAdams 2015). This is most likely to occur when laws are passed in response to direct democracy (referenda or ballot initiatives), when laws and regulations are well-publicized, and when they affect the public directly. But it is may also occur when laws and regulations are initiated by legislators and executives, even in the face of concentrated interests such as lobbyists, to the extent that legislators and executives must appeal to "the median voter" to be re-elected. As signals of public attitudes, these aspects of legal regimes shape

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[1] The distinction between legal regimes' generative function and their facilitative and regulatory functions parallels the distinction North (1981: 203) drew between *constitutional* rules, "the fundamental underlying rules designed to specify the basic structure of property rights and control of the state," and *operating* rules, which "specify terms of exchange within constitutional rules."

people's perceptions of what is normal and aberrant, right and wrong, and thus create social norms that regulate economic activity. When a legal regime prohibits a product or practice (e.g., alcohol, marijuana, abortion, or gay marriage), it reveals public disapproval of that product or practice, which can lead people to condemn it. But when a legal regime allows a formerly prohibited product or practice (e.g., alcohol or marijuana) or requires a new product or practice (e.g., child safety seats or privacy notices), it reveals positive changes in public attitudes toward that product or practice, which can lead people to consider it more positively. Even when legal regimes do not express the beliefs and values of state authorities, they can still shape public attitudes and behavior in several ways (Lessig 1995; Geisinger 2002). Legal regimes can tie a new social meaning to a practice or product; e.g., by making it legal and symbolically tying it to already legal, and thus socially accepted, practices or products. Legal regimes can also prompt behavior by making it seem natural.

As this discussion reveals, state-created legal regimes have profound effects on markets at both the micro level (buyers' and sellers' understandings of acceptable and unacceptable actions, and the consequences of those actions, and thus their ability to calculate costs and benefits) and the macro level (the number and nature of buyers and sellers, their exchange relations, and their prevailing valuation and evaluation schemes). At both levels, legal regimes affect buyers and sellers in two fundamental ways: (1) they produce technical-material incentives and penalties that encourage some activities and forms of organization, and deter others; and (2) they foster the development of cognitive-cultural understandings of which products, forms of organization, and practices are normal, celebrated, and rational, and which are deviant, deprecated, and inappropriate.

Most basic are laws governing *property rights*, which define who can use things (usufruct) and exclude others from using them (excludability), as well as who can transfer things from one owner to another (alienability) (Alchian and Demsetz 1973; Weber 1978: 44, 130-150; Carruthers and Ariovich 2004: 24). Property-rights law determines the technical possibilities of and limitations on markets by defining the rules that govern ownership and control over the

means of production, the products themselves, and modes of exchange. Thus, property-rights law determines the resources property owners possess and the incentives they face (Campbell and Lindberg 1990; Fligstein 2001). Property-rights law also creates cultural opportunities for and constraints on markets: new cognitive schemas concerning the roles buyers, sellers, and other market participants play, novel understandings of their power vis-à-vis exchange partners, and innovative conceptions of the nature of their exchanges (e.g., Edelman, Uggen, and Erlanger 1999; Dobbin and Dowd 1997; Fligstein 2001). Because property-rights laws make it clear who is risking what and who gets rewarded for taking risks (Fligstein 2001: 33), they make it possible to classify economic actors, facilitating rational calculation and planning (Guseva and Róna-Tas 2001; Carruthers 2013). Thus clear property rights make it possible to enforce contracts between buyers and sellers, reducing uncertainty.

But laws can instead cloud property rights or deny them outright. If legal regimes are ambiguous about property rights or contain conflicting directives, then buyers' and sellers' property rights are not secure. At the extreme, laws can make particular products illegal, which denies buyers and sellers property rights in those products, most notably trade in morally contested goods and services, such as narcotics, sex work, sperm, ovaries, and human organs (e.g., Healy 2004; Almeling 2011). When property rights are unclear (or at the extreme, non-existent), buyers and sellers cannot enforce contracts through formal legal channels (Beckert and Wehinger 2012). While actors with clear property rights can take disputes to mediation or court, those without clear property rights (or, at the extreme, any property rights) must instead avoid conflict by building trust via informal social ties and norms, or adjudicate disputes with violence (Hillmann 2013). The lack of non-violent enforcement mechanisms increases uncertainty, making planning more difficult and investment riskier (Portes and Haller 2005).

Laws focused on *forms of organization* also influence buyers' and sellers' structures and practices (Edelman and Suchman 1997; Fligstein 2001; Schneiberg and Soule 2005). Such laws may set standards of accountability vis-à-vis the public, employees, and customers (e.g., Edelman 1990), and mandate, allow, or forbid horizontal expansion or vertical integration (e.g.,

Dobbin and Dowd 1997). Such laws can also define specific types of organization, such as laws constructing limited-liability corporations (e.g., Seavoy 1982; Kaufman 2008), and approve or forbid specific forms, such as non-profit versus for-profit organizations (e.g., Schneiberg and Soule 2005). In toto, such laws determine the nature, number, location, and practices of buyers and sellers, as well as the formal requirements for organizations, in terms of licenses, permits, and fees. These laws also engender shared understandings of acceptable forms of organization. Even more basically, these laws elaborate the underlying logic of legal rationality (Weber 1978), legitimating market participants that meet the law's requirements.

Laws focused on forms of organization can either decrease or increase uncertainty, by authorizing or prohibiting certain types of organization. Uncertainty is low in when laws explicitly authorize particular forms of organization, typically by licensing and regulating them. Organizations that fit within the parameters of licensing laws have clear property rights and face no legal uncertainty about their operations. In contrast, uncertainty is high when laws explicitly prohibit a particular form of organization. Organizations of that form are denied property rights outright, and can be fined or prosecuted just for operating. In-between are laws that legally authorize organization to operate, but do not determine through licensing or regulation which forms of organization are acceptable. In such cases, particular forms of organization are neither clearly prohibited nor clearly approved by state authorities, and uncertainty is intermediate.

The clearer the property rights in a product or a form of organization, the less the uncertainty surrounding that product or form of organization, and the easier it is for buyers and sellers to plan. Planning smooths operations and reduces costs, leading to lower prices. Thus, we predict:

> **Hypothesis 1**: In markets where uncertainty is greater due to the lack of clear property rights, prices will be higher than in markets where uncertainty is less due to the existence of clear property rights.

There is an obvious counter-argument. Although property-rights laws reduce uncertainty for state-approved forms of organization, they also increase costs, in terms of fees, time, and effort expended. Managers must interact with state authorities, prepare documentation to satisfy formal legal requirements, pay staff to deal with compliance with those requirements, and develop and monitor routines to guarantee workers' and customers' welfare. Increased operating costs will reduce the supply of organizations selling in the affected market and reduce competition, which will also tend to increase prices. This counter-argument reduces our chances of finding support for hypothesis 1. In the statistical analyses shown below, we separate out the effect of supply (and the resulting level of competition) with explicit statistical controls, thus revealing the net effect of legal regimes on uncertainty.

In addition to affecting prices per se (their central tendency), legal regimes can affect (dis)agreement about prices (their dispersion). Setting prices requires categorizing products, comparing them within and across categories, and commensurating them in terms of monetary value (Fourcade 2011). Categorization, comparison, and commensuration is more consistent when it is guided by clear and widely shared norms because norms obviate subjective judgment (Hsu, Roberts, and Swaminathan 2012). For example, in markets for art, products that are difficult to compare in terms of objective criteria, dealers follow two valuation norms: (1) prices for works from any artist increase with size, and (2) prices remain stable over time, even if sales are slower than anticipated (Velthuis 2005). Setting prices also requires sellers to comprehend and thus react in a coherent fashion to competitors' production and pricing strategies (White 1981); in turn, comprehension and coherent reaction are facilitated by the existence of clear, widely shared norms.

The clearer property-rights law is concerning products and forms of organization, and thus the lower the uncertainty in markets, the easier it is for sellers to develop clear and widely shared understandings of what products are valuable and why (i.e., to develop *valuation norms*), and thus to react coherently to competitors' strategic pricing actions. The clearer and more widely shared valuation norms are, the easier it is for sellers to settle on similar prices for

similar products, which should lead to price convergence. In contrast, the more ambiguous and narrowly shared valuation norms are, the more sellers will diverge in their expectations about how to price similar products, which should lead to price divergence. For example, in markets for wine, sellers' prices are more likely to converge when the basis for critics' evaluations are clearer (Hsu et al. 2012). In addition, the clearer the property rights about products and forms of organization and thus the less the uncertainty about acceptable strategies and structures, the easier it is for sellers to develop clear and widely shared understandings about strategy and structure (i.e., *organizing norms*). The clearer and more widely shared organizing norms are, the more similar organizations are likely to be. Similarity of structure and strategy should lead to similarity of operating costs, which also yields convergence in the prices set for similar products. Therefore we predict:

> **Hypothesis 2**: In markets where uncertainty is greater due to the lack of clear property rights, price dispersion will be greater than in markets where uncertainty is lower due to the existence of clear property rights.

Federalism Complicates Matters

Although much research has analyzed the impact of legal regimes on industries and markets, only a few sociological studies have paid attention to the fact that many nations, such as Brazil, Canada, Germany, India, Mexico, Russia, and the United States, have federalist governmental structures (e.g., Dobbin 1994; Schneiberg and Soule 2005). Federalist governments have multiple, nested components, each of which can create distinct legal regimes to govern particular markets. One scholar famously described federalism as follows: "(1) two levels of government rule the same land and people, (2) each level has at least one area of action in which it is autonomous, and (3) there is some guarantee (even though merely a statement in the constitution) of the autonomy of each government in its own sphere" (Riker 1964: 11). Federations are negotiated compromises between those who seek central control over the full population and all territory, on the one hand, and those who seek local control over subpopulations and territorial subunits. Therefore, tension – a centripetal pull toward a

single political center versus a centrifugal push away from the center toward political subunits –
is inherent in all federal governments.

Federalist governments offer multiple targets for lobbying for changes in laws governing
markets, which may make them more open to change than unitary governments (Schneiberg
and Soule 2005; Djelic and Quack 2007). For example, industry lobbyists, union officials, and
social-movement activists can push for the expansion or restriction of markets – even the
creation of new markets or the closure of existing ones – by promoting local ballot initiatives
and referenda or by appealing to more easily approached local-level politicians and bureaucrats
(state or municipal), and ignoring more distant national government agents and more-
expensive-to-reach national publics. Such actions can lead to conflict between legal regimes
created by different levels of government, which generates uncertainty for organizations
operating in the affected markets.

By ignoring federalism, most previous research has implicitly assumed congruence
between legal regimes created by different levels of government, and co-operation between
legal authorities reporting to different levels of government. But different levels in a federation
can create distinct legal regimes to govern a particular market. For example, in the United
States, both federal and state governments can pass laws that define property rights and
acceptable forms of organization, although contract law lies in the hands of the federal
government (Riker 1964; Feeley and Rubin 2008). If multiple levels of government can pass
laws concerning property rights and forms of organization – e.g., one level authorizes the sale
of a product or a particular form of organization to sell that product, but a second level bans
the product or form of organization – then conflict, contradiction, and stalemate between
levels of government is likely to ensue (Campbell and Lindberg 1990).

To overcome the myopia caused by focusing on a single level of legal regime, we
propose a multi-level analysis that explicitly considers the extent to which legal regimes at
different levels (national, state, local) are congruent or in conflict. We argue that conflict
between legal regimes at different levels of government generates uncertainty in markets

because conflicting legal regimes provide political and social platforms for both proponents and opponents of markets. For example, if the national government prohibits a product but a state government authorizes it, national officials can seek to stop the sale of that product, while the state officials can provide legitimacy – even if state officials cannot, in the face of a conflicting national-level legal regime, provide full legal authorization. In such situations, buyers and sellers face greater uncertainty than in situations where state-level and national-level legal regimes are congruent. As in the single-level analysis above, we propose that when uncertainty concerning products and forms of organization is higher, prices will be higher and price dispersion will be greater:

> **Hypothesis 3**: In markets where uncertainty is greater because there are conflicting legal regimes, prices will be higher than in markets where uncertainty is lower because there are congruent legal regimes.

> **Hypothesis 4**: In markets where uncertainty is greater because there are subject to conflicting legal regimes, price dispersion will be greater than in markets where uncertainty is lower because there are congruent legal regimes.

Causal Mechanisms: Mediators

To probe causal mechanisms, we consider the features of selling organizations at two levels. First, at the level of the organization, we consider organizational form. Legal regimes vary in which forms of organizations, using which strategies, are acceptable. Some regimes specify one set of forms as acceptable, others specify other forms, and still others do not explicitly specify acceptable forms. Organizational form influences operating costs and the relationships sellers have with their customers and suppliers, both of which affect price. For instance, previous research has shown that sellers with stronger (more embedded) relationships with customers charge lower prices (e.g., Uzzi and Lancaster 2004). Thus, organizational form is determined by legal regime and organizational form affects price, so organizational form mediates the relationship between legal regime and (mean) price.

Second, at the level of the locality (the region around any focal organization), we consider the heterogeneity of organizations. If legal regimes determine sellers' choices of organizational form, then legal regimes will also influence the distribution of organizational forms in any locality. The greater the heterogeneity of organizations operating in a locality, the more difficult it will be for them to develop operating and valuation norms. The greater the heterogeneity of organizations (and so the less clear and widely shared these norms are), the greater the price dispersion. Thus, organizational heterogeneity mediates the relationship between legal regime and price dispersion.

The Evolution of Laws Regulating Marijuana in the United States

In this section, we put historical meat on the bones of our arguments by focusing on an important empirical case: laws regulating marijuana use and sale in the U.S., which are significant battlegrounds for federalist principles (Mikos 2009; Schwartz 2013; Chemerinsky et al. 2015). Our analysis encompasses three levels of government: national, state, and local.

Early history. Before the twentieth century, cannabis (as hashish and in liquid form) was widely used in the United States as an analgesic. Although there were concerns about accurate labeling and purity, state governments made only scattered attempts to restrict cannabis use. After the Mexican Revolution of 1910, increased immigration of Mexicans to the United States, many of whom smoked cannabis, spurred a racist and xenophobic outcry that relabeled cannabis as "marihuana," the name used in Mexico, and linked smoking it to an "alien," "criminal," and "deviant" subgroup; this outcry, in turn, provoked passage of a series of state laws outlawing cannabis (Bonnie and Whitebread 1970, 1974 [1999]).[2] In 1937, the federal government joined suit, passing the Marihuana Tax Act (26 U.S.C. §§ 4741-4753), which required transfer tax stamps to grow, import, give away, or sell marijuana – stamps that were

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[2] This is similar to the dynamic described by Gusfield (1986) in his analysis of the movement to outlaw the production and sale of alcohol in the United States in the late eighteenth and early twentieth centuries. In that case, linking alcohol to Catholic immigrants in urban areas bolstered support for the prohibition of alcohol among Protestant, native-born residents of small towns and rural areas.

far more expensive than marijuana itself, thus effectively banning the use and sale of marijuana in the United States. This law complemented the 1922 Narcotic Drugs Import and Export Act (21 U.S.C.A. § 176(a)), which made importing marijuana, among other drugs, illegal. For the next 60 years, federal and state government policies were aligned: at both levels, legal regimes prohibited the ownership, consumption, and exchange of marijuana for any purpose.

Although starting in the 1960s, marijuana became associated with the middle class (first youth, then older professionals), rather than poor Mexican immigrants, it remained illegal and authorities' concerns about marijuana did not diminish – instead, they intensified (Bonnie and Whitebread 1970, 1974 [1999]). In 1969, the Supreme Court ruled that the Marihuana Tax Act and the Narcotic Drugs Act were unconstitutional because complying with them would amount to self-incrimination (*Leary v. United States* 1969). In the wake of this decision, the federal government in 1970 passed the Controlled Substances Act (21 U.S.C. § 801 *et seq*.), which classified marijuana, along with heroin, ecstasy, and LSD, as a Schedule 1 narcotic with "a high potential for abuse," "no currently accepted medical or treatment use in the United States," and "no accepted safety for use … under medical supervision" (21 U.S.C. § 812(b)(1)).[3] Passage of this act marked the beginning of the "war on drugs," in which federal, state, and local governments escalated the arrest, prosecution, and incarceration of marijuana producers, distributors, and consumers. Despite repeated efforts by activists and national legislators to reclassify marijuana as a Schedule 5 drug, the least restrictive category, the federal government has remained obdurate.

States legalize marijuana for medical use. In the late 1980s, AIDS patients and their caregivers in San Francisco, the epicenter of the AIDS epidemic, discovered that smoking marijuana helped alleviate "wasting disease," a common symptom of HIV/AIDS, and the nausea that accompanied use of anti-retroviral medications (Grinspoon, Bakalar, and Doblin 1995). This discovery led to the formation of buyers' clubs, where activists distributed marijuana to

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[3] This Act classified marijuana as more dangerous than such Schedule 2 drugs as cocaine and morphine.

the seriously ill and dying. In this way, a market for the medical use of marijuana emerged from

the well-established black market for the recreational use of marijuana. Spurred by AIDS

activists, in November 1996 California voters passed Proposition 215, which was codified as the

California Compassionate Use Act (Cal. Health and Safety Code §§ 11362.5 *et seq.*). This law

exempted qualified patients and their primary caregivers from state criminal prosecution for

cultivation or possession of marijuana for medical use. It defined a primary caregiver as "the

individual designated by the person exempted under this section who has consistently assumed

responsibility for the housing, health, or safety of that person*"* (Cal. Health and Safety Code §

11362.5(B)(e)). While at the state level, this law provided legal protection for patients,

caregivers, and physicians in the form of an affirmative defense against criminal charges,[4] it had

two important gaps: it did not explicitly allow patients to exchange marijuana among

themselves, nor did it allow patients or their caregivers to establish organizations to cultivate,

distribute, or sell marijuana. Thus, it did not authorize the sale of marijuana or provide an

affirmative defense for anyone who did so. Moreover, as we explain in the next section, the

federal response to this law was swift and decisively negative.

Over time, medical applications for marijuana expanded from HIV/AIDS to include a

wide array of conditions, including (but not limited to) Alzheimer's disease, amyotrophic lateral

sclerosis, cancer, chronic pain, Crohn's disease, epilepsy, glaucoma, hepatitis C, multiple

sclerosis, and post-traumatic stress disorder, and an increasingly diverse array of activists

sponsored state ballot initiatives and lobbied state legislators to legalize marijuana use for

medical purposes. In hindsight, this was an effective use of direct democracy in an era when

the voting public viewed medical marijuana far more positively than did state authorities.

Pushed by activists, more and more states legalized marijuana for medical use. Between 1998

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[4] An affirmative defense is a claim (which must be proven by the defendant) justifying the conduct for which the defendant is on trial, even if that conduct is otherwise unlawful. In practice, this means the defendant admits to the conduct and uses the affirmative defense to limit liability for that conduct. Outside the case of marijuana, common examples of affirmative defense include pleading insanity, self-defense, or entrapment.

and 2008, 11 states passed laws to similar California's.[5] Most laws required patients to register

with the state and submit a signed recommendation from their physician; once their eligibility

was confirmed, states added patients to their registers and issued them identification cards.

And most laws limited the amount of marijuana patients and caregivers may possess, in terms

of the number of plants, ounces of flowers, or both.

These laws provided state-level exemption from criminal prosecution for qualified

medical marijuana patients, caregivers, and physicians, as well as exemption from civil

sanctions. Thus, while these laws provided an affirmative defense for patients, caregivers, and

physicians, most did not create clear property rights in the ownership of marijuana (Mikos

2009). Finally, most laws did not authorize or legally protect the sale of medical marijuana;

indeed, one state (Alaska) explicitly banned the sale of medical marijuana. Most states

neglected *in toto* the issue of how patients and caregivers were to gain possession of

marijuana, much less detail whether or how marijuana could be distributed or sold.

In the wake of these laws, many organizations – non-profit cooperatives and collectives,

as well as for-profit enterprises – were launched to distribute marijuana to medical patients.

Prominent examples include the Oakland (California) Cannabis Buyers' Cooperative (1995-

1998), the Colorado Compassion Club (Denver, 2004-2008), and the Emerald Cross (Seattle,

Washington, 1998-2015). These organizations operated in legal gray areas, as state laws

explicitly allowed individuals, not organizations, to provide marijuana, but they did not explicitly

ban organizations from doing so. Because marijuana-providing organizations were neither

clearly legal nor clearly illegal under these state-level legal regimes, industry analysts labeled

them "quasi-legal" (e.g., Samuels 2008; Ohlson 2013).

In 2003, with the passage of Senate Bill 420, California became the first state to

explicitly authorize the sale of medical marijuana and formally recognize that organizations,

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[5] These states were Alaska (Ballot Measure 8, 1999), Oregon (Ballot Measure 67, 1998), Washington (Initiative 692, 1998), Maine (Ballot Question 2, 1999), Colorado (Ballot Amendment 20, 2000), Hawaii (S.B. 862, 2000), Nevada (Ballot Question 9, 2000), Vermont (S.B. 76, 2003), Montana (Initiative 148, 2004), Rhode Island (S.B. 0710, 2006), and Michigan (Proposition 1, 2008).

rather than individuals as caregivers, could provide marijuana to patients. This law allowed medical marijuana patients to form co-operatives and collectives to buy and sell marijuana and to ask for "reasonable compensation" (S.B. 420 § 11362.765(c)), but required these organizations to be non-profits. Rather than actively regulate providers selling marijuana, this law merely gave them restrictive property rights and noted that only non-profits were acceptable forms of organization. And this law said nothing about how growers (who are concentrated in far northern California counties such as Humboldt and Mendocino) should get their products to providers and patients (who are concentrated in more southerly urban areas such as Los Angeles, San Diego, and San Francisco).

In 2007, New Mexico passed a law that not only authorized organizations to sell medical marijuana, but also regulated them by detailing the requirements to become "licensed producer[s] … qualified to produce, possess, distribute and dispense cannabis" (S.B. 523 § 3(D)). Between 2009 and October 2015, 10 states plus the District of Columbia followed suit.[6] These laws created state-regulated systems for the cultivation, distribution, and sale of medical marijuana. During this period, nine states that had previously passed affirmative-defense laws amended their legal regimes to create state-regulated systems for the cultivation and distribution of medical marijuana, although several of these laws (California, Hawaii, Washington) did not come into effect until after 2015, and one law (Nevada) was only partly in effect by then.[7] To facilitate comparisons between state-level legal regimes, and to trace how individual states' legal regimes varied over time, Figure 1 charts all states that legalized

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[6] The states were Arizona (Proposition 203, 2010), New Jersey (S.B. 119, 2010), Delaware (S.B. 17, 2011), Connecticut (H.B. 5389, 2012), Illinois (H.B. 1, 2013), Massachusetts (Ballot Question 3, 2013), New Hampshire (H.B. 573, 2013), Maryland (H.B. 1101, 2014), Minnesota (S.F. 2470, 2014), and New York (A. 6357/S. 9723, 2014). The D.C. statute was B18-622 (2010).

[7] The states were Maine (Question 5, 2009), Rhode Island (Edward O. Hawkins and Thomas C. Slater Medical Marijuana Act, 2009), Colorado (H.B. 1284/S.B. 109, 2010), Vermont (S.B. 17, 2011), Nevada (S.B. 394, 2013), Oregon (H.B. 3460, 2013), California (Medical Marijuana Safety Act, 2015), Hawaii (Act 241 H.B. 321, 2015), and Washington (S.B. 5052, 2015).

marijuana for medical use through 2015 and details how key features of their legal regimes evolved over time.[8]

[Figure 1 about here]

Each state law legalizing marijuana altered social norms about marijuana within the focal state, by legitimating the use of marijuana for medical purposes in that state (Lessig 1995; Geisinger 2002). State laws would have had stronger effects on social norms about marijuana than federal law because state laws reflected geographically concentrated local norms while federal law reflected more diffuse national-level norms, and because state laws were passed more recently than federal law, so they reflected more current norms (McAdams 2015). In combination, the many state laws had even stronger effects on norms about marijuana, as they repeatedly suggested that many state authorities – not just those in the state in which medical marijuana patients, growers, distributors, and sellers lived – perceived marijuana as medically safe and beneficial, not wicked and dangerous.[9]

The federal response to state action. Although by 2015, 23 states and the District of Columbia, home to 47 percent of the American population, had legalized marijuana for medical use, this drug remains illegal at the federal level. Marijuana continues to be classified as a Schedule 1 narcotic under the Controlled Substances Act and federal authorities continue to prosecute patients, providers, wholesale distributors, and growers in state-legal medical marijuana markets.

In the United States, there are three routes through which conflict between federal-level and state-level legal regimes might be resolved, relating to pre-emption, interstate

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[8] Because the data we analyze are from 2015, we do not list states that legalized marijuana for medical use in 2016 – Arkansas, Florida, and North Dakota.

[9] The situation recently became more complicated, as eight states – Colorado (2012), Washington (2012), Alaska (2014), Oregon (2014), California (2016), Maine (2016), Massachusetts (2016), and Nevada (2016) – and the District of Columbia (2014) passed laws legalizing marijuana for recreational use by adults. These legal regimes for markets for the recreational use of marijuana have many similarities: they repealed criminal penalties for possession of small amounts of marijuana, tasked state officials with developing regulations for these markets, and taxed the sale of marijuana. Because our empirical focus is on medical markets for marijuana, we do not discuss these in detail.

commerce, and co-operation. First, the pre-emption doctrine is based on the Supremacy Clause of the Constitution (Article VI, Clause 2), which grants federal law priority over state law when the two conflict. In some cases, pre-emption can be limited by claims of privilege based on other foundational legal documents, such as the First Amendment's guarantee of freedom of speech. A key test of the pre-emption doctrine came soon after California legalized medical marijuana: in a policy brief, federal authorities stated that they would continued to enforce the Controlled Substances Act holding that marijuana is an illegal substance with no medical use (McCaffrey 1997). A group of physicians, patients, and nonprofit retailers contested this policy, which ultimately led to a District Court ruling that the federal policy violated the First Amendment rights of physicians and patients who communicated with each other about the use of marijuana to treat disease (*Conant v. McCaffrey* 1997).

More generally, pre-emption in other markets has been limited by the anti-commandeering doctrine of the Tenth Amendment to the Constitution, which forbids the federal government from forcing states to enact laws or assist federal officials in enforcing federal law within any state (e.g., *Printz v. United States* 1995). The distinction between pre-emption and anti-commandeering is roughly the same as the distinction between federal authorities *preventing* states from acting (pre-empting) and *demanding* that states act (commandeering). Legal scholars have argued that under the commandeering doctrine, while states could legalize marijuana, they could not prevent federal authorities from prosecuting those who grew, bought, sold, or possessed marijuana – but state authorities did not have to assist federal authorities (Mikos 2009; Chemerinsky et al. 2015; for a contrary view, see Schwartz 2013). There is no decisive judicial ruling about this issue, indicating that state officials and medical marijuana buyers and sellers continue to face legal uncertainty about pre-emption.

Second, the Commerce Clause of the Constitution (Article I, Section 8, Clause 3) gives federal officials authority over interstate trade. It has long been interpreted by the courts as giving federal officials authority over *intrastate* trade, if they can demonstrate that trade

occurring entirely within the boundaries of one state "substantially affects" related trade in other states (Tribe 2000: 811-824). But as this phrase implies, such demonstrations may not always be possible. In 2005, the Supreme Court applied the commerce clause to marijuana, ruling that the federal government could prosecute those who cultivated and possessed marijuana in California, even when allowed under state law, because even if marijuana was not sold or transported across state lines, there could be an "indirect" effect on interstate commerce (*Gonzales v. Raich* 2005). Thus, application of the commerce clause to marijuana markets has generated uncertainty about their legal status.

Third, federal authorities can enforce federal law themselves. But effective enforcement may require assistance from state and local authorities, who may be reluctant to provide it and who can use the anti-commandeering doctrine to justify inaction. This is true for medical marijuana markets: while in theory federal authorities could enforce federal drug laws themselves, in practice federal enforcement has depended heavily on state and local officials, who have superior local knowledge and larger pools of resources (Mikos, 2009). In response to these constraints, pragmatic authorities in the Obama Administration developed a co-operative policy: when deciding whether to prosecute marijuana possession, they began to take into consideration the quality of state-level legal regimes (Kamin 2014; Chemerinsky et al. 2015). This policy waxed and waned over time. In 2009, federal authorities announced that they would conserve their scarce resources and not prosecute medical marijuana users "whose actions are in clear and unambiguous compliance with existing state laws" (Ogden 2009). But in 2011, federal authorities reversed that accommodation and recommenced active prosecution of marijuana providers, singling out "commercial operations cultivating, selling, or distributing marijuana" (Cole 2011). Two years later, after Colorado and Washington voted to legalize marijuana for recreational use by adults, the federal stance softened anew. Federal authorities declared they would not prioritize enforcement of federal law in states that had robust regulation of marijuana; prosecution was advised for a limited set of circumstances derived

from lax regulation (Cole 2013).[10] In an interview, this memo's author said: "If you don't want

us prosecuting [marijuana users] in your state, then get your regulatory act together" (Phelps

2014: A1). The federal government's co-operative stance vis-à-vis state-level legal regimes was

reinforced by several legislative efforts at the national level, which sought to limit federal

enforcement powers in states where medical marijuana is legal (Chemerinsky et al. 2015).

In sum then, it remains unclear whether the pre-emption or anti-commandeering

doctrine should resolve federal-state conflict in medical marijuana markets, or how intrastate

trade in marijuana should be constrained to regulate interstate commerce. But by 2013, the

application of pragmatic co-operation to medical marijuana markets had became clear: federal

officials would be less likely to expend federal resources enforcing the law in states with

comprehensive statewide licensing systems that ensured that marijuana would not be diverted

from the medical marijuana market to the recreational market. Under this co-operative

federalism policy, states that authorized organizations to sell marijuana but did not regulate

their forms and activities through comprehensive licensing were sites of the greatest conflict

between federal and state law. States that authorized organizations to sell marijuana *and*

regulated their forms and activities through comprehensive licensing were sites of limited (but

not zero) conflict between federal and state law because those state-level legal regimes were

deemed "reasonable" by federal officials. Finally, states that did not authorize organizations to

distribute marijuana were also sites of limited conflict between federal and state law, because

their markets were very small and the few organizations that did provide medical marijuana in

those markets were likely to evade federal scrutiny by, for example, not filing federal taxes.

Local responses to state action. Municipalities in many states opposed state legalization

of marijuana for medical use and banned marijuana providers. Some state laws explicitly

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[10] According to this memo, states could lower the likelihood of federal prosecution if they prevented: the distribution of marijuana to minors, the flow of revenue from the sale of marijuana to criminal enterprises or gangs, the distribution of marijuana across state lines, the use of marijuana markets as cover for other forms of drug trafficking or any other illegal activity, the use of firearms by marijuana buyers and sellers, drugged driving or other public-health problems, growing marijuana on public land, and the possession or use of marijuana on federal property.

addressed whether municipalities could prohibit marijuana providers: Arizona's law mandated acceptance of medical marijuana providers throughout the state, while Colorado's, Oregon's and Nevada's laws allowed municipalities to ban them. Other state laws were silent on this issue, giving municipalities legal leeway. Where they had leeway, many municipalities prohibited medical marijuana providers through ordinances; others used permissive zoning rules, which allowed municipalities to reject applications by medical marijuana providers.[11] Until last year, most of these ordinances focused on bricks-and-mortar stores and ignored delivery-only services, probably because the former are more visible than the latter. Despite such bans, many marijuana providers of both forms continued to operate in those markets, which likely reflects the black-market legacy of marijuana markets, confusion concerning local laws, and the weakness of local law enforcement. Local prohibitions on medical marijuana providers create additional sites for conflict between levels of the federalist system. When municipalities ban marijuana providers, they clearly increase the likelihood that municipal officials will raid or shutter providers, and so increase the uncertainty they face.

Summary. Table 1 shows the predictions concerning uncertainty for the single-level analysis of legal regimes versus the multiple-level analysis. It focuses on state-federal conflict and lists the states with each type of state-level legal regime.[12] Within each state (except Arizona, which prohibits municipalities from banning medical marijuana providers), municipal bans generate state-local conflict in the affected localities, further increasing uncertainty.

[Table 1 about here]

Research Design

Data sources

State-level legal regimes. As outlined above, different states followed different paths to legalizing marijuana. To assess whether states authorized formal organizations to sell

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[11] Permissive zoning rules are ones that list all land uses that are permitted; everything not specifically listed is prohibited.

[12] The research design section provides details on how we coded these state-level legal regimes.

marijuana to consumers and whether states licensed marijuana sellers, we analyzed each state's history, including ballot propositions, statutes, and court decisions about marijuana markets. We also visited the websites of the government agencies charged with overseeing medical marijuana markets to assess what on-the-ground guidelines had been implemented.

Medical marijuana providers. We gathered data on providers in state-legal markets, including location, product menu, and prices from Weedmaps, the oldest and largest online directory of marijuana providers in the United States, which lists more marijuana providers than any other online directory. We analyze data from 10 October, 2015, the day after California Governor Jerry Brown signed that state's Medical Marijuana Regulation and Safety Act (A.B. 266 2015; A.B. 243 2015; S.B. 643 2015), which gave municipalities four months to pass ordinances regulating or prohibiting medical marijuana if they wanted to maintain local control of those markets; during those four months, dozens of cities modified their medical marijuana laws, creating temporary chaos in this large market. On 10 October, 2015, Weedmaps listed 5,342 provider menus in the seven largest state medical marijuana markets. Figure 2 shows a screenshot from Weedmaps on this date, demonstrating the wealth of data available on that site.

[Figure 2 about here]

Using data from an online directory obviates one possible alternative explanation for hypotheses 1 and 2, namely that requiring providers to be licensed might increase transparency in the market. If so, price competition would be more intense, average prices would fall, and price dispersion would decrease. But this data source makes prices equally transparent to buyers and sellers alike in all three types of legal regime.

Our analysis covers the seven largest state-legal medical marijuana markets: Arizona, California, Colorado, Michigan, Nevada, Oregon and Washington. These constituted 99.9 percent of product observations and 99.2 percent of provider observations collected from Weedmaps. Figure 3 shows the estimated size of these markets in terms of sales revenue in 2015, and compares them to the 17 jurisdictions (16 states plus DC) we do not study.

[Figure 3 about here]

From Weedmaps, we gathered data on provider name, organizational form (bricks-and-mortar store or delivery-only service), location (city, state, zip code, and street address, if any), the date on which the provider last updated its menu,[13] number of page views, attributes of and price for each product in the menu. There is a wide variety of marijuana product types: flowers (smokeable and vaporizable plant), edibles (cookies, candies, crackers, etc.), concentrates (primarily hash and oil), pre-rolled joints, gear (pipes, paper, clothing, etc.), topicals (ointments and salves), seeds, and clones (saplings for home growing). As we explain below, we analyze prices for flowers, the largest product category.

Measures

Dependent variables: price.   We measured prices for each marijuana product sold by each provider in each market.[14] We focused on flowers, the most common form in which marijuana is sold in the United States. Providers typically sell marijuana flowers in 1 gram, 3.5 gram, and 28 gram increments. We limited our analysis to 3.5 grams of marijuana flowers because that is the most common amount sold by weight, enough to create four to seven joints. We log-transformed price because a one-unit increase from a low price (e.g., $20 to $21) has more impact than a one-unit increase from a high price (e.g., $80 to $81).

Explanatory variables: state-federal conflict. To measure the conflict between state and federal law, we first assessed state-level legal regimes on two key dimensions: whether or not they explicitly authorized organizations to sell marijuana for medical purposes, and whether or not they established licensing procedures and rules for such organizations. To measure state authorization of formal organizations, we created a dummy variable, *State Legal*, coded one if a state legal regime clearly and without contradiction articulated that formal organizations could

[13] This allows us to check that providers are still operating. Marijuana prices change frequently, so not updating frequently indicates an inactive site. We removed providers that had not updated their menus during the 30 days preceding the date of data collection.

[14] Prices do not include sales taxes charged by state or local authorities.

sell marijuana, and zero if it (a) did not explicitly declare that formal organizations could sell marijuana or (b) contained contradictory information about that issue. The first category we labeled "legal," as formal organizations are clearly allowed to be sellers in the focal market under state law; the second category we labeled "quasi-legal," as formal organizations are operating in legal gray areas. To measure state licensing and regulation of marijuana providers, we created a dummy variable, *State Licensed*, coded one if the state required marijuana providers to acquire specific licenses under a comprehensive statewide medical marijuana regulatory regime and zero otherwise. These measures were coded at the level of the focal organization as some states (Nevada and Oregon) with new licensing regimes were home to both licensed providers (legal under state law) and unlicensed providers (illegal under state law). When *State Legal* = 0 and *State Licensed* = 0, the regime is quasi-legal. When *State Legal* = 1 and *State Licensed* = 0, the regime is legal unlicensed, and when *State Legal* = 1 and *State Licensed* = 1, the regime is legal licensed.

Under the federal co-operative policy set by the 2013 Cole Memorandum, conflict between state-level and federal-level legal regimes is less in legal licensed markets than in legal unlicensed markets because in the former, providers are more likely to meet the seven requirements of the Cole Memorandum. Moreover state-federal conflict is less in quasi-legal markets than in legal unlicensed markets because in the former, providers tend to be few in number and small, so they can more easily "fly under the radar" of federal scrutiny. Therefore, uncertainty, which makes it difficult to plan and so raises operating costs, is greater in legal unlicensed markets than in legal licensed or quasi-legal markets. It is also likely that uncertainty is less in legal licensed markets than in quasi-legal markets.

Explanatory variables: state-local conflict. To code local-level legal regimes, we examined laws and zoning rules, as well as newspaper articles describing city council actions. We coded *Local Ban* as one if the focal municipality specifically prohibited the operation of organizations selling medical marijuana or had permissive zoning codes that did not list marijuana sale as permitted, and zero otherwise. As of January 2017, we have coded local laws

covering 87.9 percent of observations on products and 84.1 percent of observations on providers. These data cover 304 municipalities; of these, 101 have banned at least one form of marijuana provider, delivery-only service or bricks-and-mortar store. When we add local laws to the models, we drop 12 percent of provider-product observations. When we do so, we judge whether the results change materially (they do not). Because local bans were often specific to organizational form, the variable *Local Ban* is specific to each provider. We captured *state-local conflict* with an interaction variable between *State Legal* and *Local Ban*.

Probing causal mechanisms: organizational form and organizational heterogeneity. Medical marijuana providers can take two forms: bricks-and-mortar stores or delivery-only services. The former offer walk-in service; some also offer delivery service. The latter do not have a physical location accessible to the public, but rather have drivers bring products to customers. In models of mean price, we controlled for provider service form, with *Delivery Only* coded one if the provider offered *only* delivery service and zero if it had a physical location.

For the analysis of price dispersion, we controlled for organizational heterogeneity, calculated as follows:

$$OH_i = 1 - 2|0.5 - b_{ji_{10}s}|,$$

where $b_{ji_{10}s}$ is the proportion of brick-and-mortar providers within a 10-mile radius of provider i that operate within state s. The component inside the absolute value bars captures organizational *homogeneity*: if $b_{ji_{10}s}$ equals 0.5, this component equals zero (minimum homogeneity – half delivery-only, half bricks-and-mortar), but if $b_{ji_{10}s}$ equals 1 or 0 (both maximum homogeneity – all of one form and none of the other), this component equals 0.5. We multiplied this component by two so it would range from zero to one. We then subtracted the resulting number from one to create *Organizational Heterogeneity*.

Control variables: market structure. Economic theory holds that more intense competition between sellers will drive prices lower and reduce price dispersion. Competition creates incentives for sellers to take advantage of arbitrage opportunities; for example, if

entrepreneurs observe that providers in one area are selling products at high prices, they can offer products for less, forcing incumbents to lower prices to match or lose market share. To measure competition, we used Google's geolocation application program interface to determine the longitude and latitude of every medical marijuana provider based on its address. If a provider did not list a specific address, we used the centroid of the most specific geographic unit (zip code, city, county, etc.) listed. Following previous research (e.g., Sorenson and Audia 2000), we calculated *local competition* (*LC*) as the distance-weighted count of providers in the state:

$$LC_{is} = \sum_{js} \frac{1}{(1 + d_{ijs})},$$

where *i* indexes the focal marijuana provider, *j* indexes all other providers, *s* indexes the state, and d_{ijs} is the distance between providers *i* and *j* in state *s*. We limited this measure by state because it is illegal under all state-level legal regimes to sell medical marijuana across state lines. This count included recreational marijuana sellers in states that have both medical and recreational providers (Colorado, Washington, and Oregon) because medical patients can purchase recreational marijuana instead, so recreational marijuana sellers are competitors of medical marijuana providers. This variable was right-skewed, so we logged it to normalize it.

Control variables: provider characteristics. To take into account *provider age*, we measured days since the provider joined Weedmaps. This measure was left-censored for a few providers that operated before Weedmaps came online in July 2008. For such providers, we set date of joining as July 2008. We log-transformed this variable because its distribution was right-skewed. We controlled for provider reputation (*provider rating*) by using user reviews, analyzing overall rating on a scale of one to five stars. These ratings covered the vast majority of observations. We dropped from the analysis price observations on 414 providers that were not rated; most of these were very new or very small, so they accounted for only a small fraction of observations (7,735 of 100,765). We also controlled for the number of different flower products (*Flower Count*) sold by the provider. Including this variable helps us distinguish

between price variance due to product differentiation from price variance due to uncertainty. We log-transformed this measure because the difference between selling three and four products was greater than the difference between selling 33 and 34 products.

Control variables: product characteristics. We included two indicator variables to capture product type: *Indica* was set to one for products derived from pure strains of the *C. indica* species and zero otherwise, while *Sativa* was set to one for products derived from pure strains of the *C. sativa* species and zero otherwise. The reference group is *hybrids*, products derived from combinations of the two species. Although their physiological and psychological effects are debated, indica products tend to contain higher ratios of cannabidiol (CBD) to tetrahydrocannabinol (THC) than sativa products, and most marijuana users perceive indica products as relaxing and sedative, while they perceive sativa products as energizing and creativity-inducing.

Modeling strategy

To model both the mean and the dispersion of price, we used the multiplicative heteroskedasticity model, which is sometimes called the variance function regression model (Harvey 1976; Davidian and Carroll 1987). We broke the price of product *i* sold by provider *j* (p_{ij}) into two components, mean price (μ_{ij}) and price dispersion (σ_{ij}):

$$p_{ij} = \mu_{ij} + \sigma_{ij} + \varepsilon_{ij}$$

where ε_{ij} is the error term. We modeled each component as a function of explanatory variables, X_{ij} and Z_{ij}:

$$\mu_{ij} = E(p_{ij}) = \beta'X_{ij}$$
$$\text{and } \sigma^2_{ij} = Var(p_{ij}) = \exp(\gamma'Z_{ij}).$$

Because the first and second moments of a normal distribution (mean and variance, respectively) are independent, we maximized the likelihood function to obtain the estimates of the β and γ parameters separately, using the reghv command in Stata (Weesie 1998). We have

multiple observations per provider – one for each product sold. To deal with non-independence of observations on each provider, we clustered standard errors by provider.

Robustness checks. In results not shown here to save space, we assessed the robustness of our results to model specification. First, we estimated models of price variance that included mean price, in order to take into consideration the possibility that higher-priced products would have greater dispersion. Second, we estimated multi-level models of mean price, with products nested in providers. Both alternative specifications yielded results that were similar to those presented here.

Results

Table 2 presents descriptive statistics. Because the local ban variable is missing for about 12 percent of product observations, we used the pairwise deletion option in Stata to calculate correlations. Most are low or moderate, indicating that multicollinearity is not an issue. Among the moderate correlations, *State Legal* was positively correlated with competition (r=0.39) and the *Delivery-only* service form (r=0.21), while *State Licensed* was negatively correlated with competition (r=-0.36) and *Delivery Only* (r=-0.34). *Delivery Only* was positively correlated with *Local Competition* (r=0.49) and *Organizational Heterogeneity* (r=0.21). Interestingly, 43% of observations are from locations where the focal provider was banned locally, indicating that many providers operate in spite of local bans.

[Table 2 about here]

Tables 3 and 4 show results of the analysis of federal-state conflict. Table 3 presents results on mean price, table 4 on price dispersion. In Table 3, model 1 is a baseline containing provider and product characteristics, as well as local competition. Model 2 adds *State Legal* and *State Licensed* to distinguish among three state legal-level regimes. It shows that prices for marijuana sold by providers in legal unlicensed markets (state legal = 1, state licensed = 0) are substantially higher than prices for marijuana sold by providers both in legal licensed markets (both variables = 1) and quasi-legal markets (both variables = 0). Based on the parameters in

model 2, prices in legal unlicensed markets are 14.3% higher (exp[0.134]=1.143) than in quasi-legal markets, and prices in legal licensed markets are 12.4% lower (exp[0.134-0.266]=.876) than in quasi-legal markets. Thus, prices in legal licensed markets are 23.4% lower (exp[-0.266]=0.766) than those in legal unlicensed markets. These results are net of product type (indica vs. sativa vs. hybrid), provider characteristics (including product diversity), and local competition. These results support hypothesis 3 (derived from the multi-level theory) and fail to support hypothesis 1 (derived from the single-level theory).

This pattern suggests that uncertainty derived from conflict between legal regimes created by different levels of government, rather than uncertainty derived from legality under the legal regime created by any single level of government, that drives price. This pattern also suggests that if licensing adds to operating costs (relative to costs of operating in legal but unlicensed markets), that effect is trumped by the reduction in uncertainty created by aligning state-level and federal-level legal regimes. That prices for marijuana in legal licensed markets are lower than prices in quasi-legal markets suggests that while providers in quasi-legal markets may be few in number and may try to evade the notice of government authorities, their status is still tenuous and they are operating under more uncertainty than providers in legal licensed markets.

[Tables 3 and 4 about here]

Model 3 adds the *Delivery Only* indicator variable, to test whether service form mediates the relationship between legal regime and price. It shows that delivery-only providers have higher prices than providers with bricks-and-mortar stores, and that service form partly mediates the relationship between one aspect of legal regime and price: the negative effect of *State Licensed* is decreased substantially between models 2 and 3. The Sobel test for mediation (1982) indicates that 41.7 percent of the effect of *State Licensed* is mediated by *Delivery Only*. This may be due to two facts: delivery-only services tend to have less intimate connections to their clients than bricks-and-mortar stores, and delivery-only services tend to be younger than bricks-and-mortar stores (indeed, table 2 shows the correlation between *Delivery Only* and

Provider Age is -0.23). This pattern of results suggests that organizational form – delivery-only service versus bricks-and-mortar store – is one of the causal mechanisms underlying the relationship between legal regime and price, as legal regimes determine which forms of organizations, using which strategies, are acceptable.[15] This makes sense because several state-level licensing regimes do not allow for delivery-only service forms; indeed, the correlations table shows that delivery-only providers are more likely to operate in legal but unlicensed markets (r=0.21) than in legal and licensed markets (r=-0.34).

Another possible mediator is the mix of organizational forms operating nearby: a more heterogeneous mix may generate more uncertainty and thus raise prices. To test this, model 4 substitutes *Organizational Heterogeneity* for *Delivery Only*. But this speculation is not borne out: *Organizational Heterogeneity* has a negative effect on price, net of controls, and the effect of both aspects of state-level legal regimes are increased, not decreased, by adding *Organizational Heterogeneity*. Model 5 includes both *Delivery Only* and *Organizational Heterogeneity*, and shows similar results to those in models 3 and 4.

In results not shown here, we dropped the variable for provider reputation (provider rating), which allowed us to include in the analysis a small number of newer and generally smaller providers. These results are virtually identical to those shown here, demonstrating that the analysis is not sensitive to exclusion of the newest and smallest providers.

In Table 4, model 1 is a baseline that contains control variables only. Model 2 shows that the price dispersion of marijuana products sold by providers in legal unlicensed markets was greater than the price dispersion of marijuana products sold by providers in both quasi-legal and legal licensed markets. Price dispersion in legal unlicensed markets was twice as high as in quasi-legal markets (exp[0.717]=2.05), while price dispersion in legal licensed markets was the same as in quasi-legal markets (exp[0.717-0.735]=0.982, which is neither statistically nor substantively significant). Finally, price dispersion in legal licensed markets was half as great as

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[15] But the *Delivery Only* variable accentuates the effect of the other aspect of state-level legal regime, as the coefficient on *State Legal* increases, rather than decreases, between models 1 and 3.

in legal unlicensed markets (exp[-0.735]=0.480). These results are net of product type (indica vs. sativa vs. hybrid), provider characteristics (including product variety), and local competition. (In results not shown here, we added average price to the model and found a similar pattern of effects.) These results support hypothesis 4 (derived from the multi-level theory) and fail to support hypothesis 2 (derived from the single-level theory). They indicate that uncertainty, which makes it difficult to develop norms about how to set prices and how to organize, both of which lead to divergence in prices across providers, is greatest in legal unlicensed markets.

Model 3 adds the *Delivery Only* dummy and shows that price dispersion is much less for delivery-only providers than it is for bricks-and-mortar providers. This variable does not mediate the effects of state-level legal regime conflict; instead, it strengthens those effects, as the positive effect of *State Legal* and negative effect of *State Licensed* both become stronger. Model 4 substitutes *Organizational Heterogeneity* for *Delivery Only* and shows that it moderates the effects of both *State Legal* and *State Licensed*: their effect estimates decrease substantially. This indicates that as nearby competitors become more heterogeneous (a more even mix of delivery-only and bricks-and-mortar storefronts), it is more difficult to develop norms about pricing, so prices diverge. Model 5 includes both *Delivery Only* and *Organizational Heterogeneity* dummies, and shows similar results to those in Models 3 and 4.

Tables 5 and 6 add variables that capture state-local conflict to models that capture state-federal conflict. Model 1 of Table 5 replicates model 4 in Table 3, and shows the same pattern of results. This indicates that dropping the 12% of observations on providers in municipalities for which we have not yet coded local-level marijuana provider bans adequately replicates the earlier analysis. Model 2 adds the *Local Ban* dummy and shows that prices are higher in municipalities that ban the focal form of marijuana provider. (Despite such bans, many marijuana providers (38% of them) operate in those markets.) Model 3 adds the interaction between *State Legal* and *Local Ban* to capture conflict between state-level and local-level legal regimes. It shows that such conflict increases prices (exp[-0.047+0.100]=1.054), which supports hypothesis 3 (derived from the multi-level theory) and fails to support

hypothesis 1 (derived from the single-level theory). Again, this pattern of results suggests that

uncertainty derived from conflict among legal regimes created by different levels of

government, rather than uncertainty derived from legality or illegality at any single level of

government, drives price.

[Tables 5 and 6 about here]

In Table 6, model 1 replicates model 3 of Table 4. It shows a very similar pattern of

results, bolstering our conclusion that this analysis adequately replicates the earlier analysis.

Model 2 adds the dummy for *Local Ban*, which has no effect on price dispersion. Model 3 adds

the interaction between *State Legal* and *Local Ban*, and shows that price dispersion greater in

markets where local-level legal regimes conflict with state-level legal regimes, and a persistent

non-significant effect of *Local Ban*. This provides more evidence to support our argument that

price patterns are driven by uncertainty derived from conflict among legal regimes created by

different levels of government, rather than uncertainty derived from legality or illegality at any

single level of government.

Conclusion

Price is central to markets, so it is not surprising that price is the focus of a growing

number of sociological studies of markets. Most of this work examines relationships (social

networks) or cognitive-cultural understandings (social norms); far less has been done to study

how social institutions (legal regimes) determine prices (Beckert 2011). Here, we focused on

institutions because doing so has the greatest chance of yielding novel empirical and theoretical

insights. We noted that most economic sociology research on markets and state institutions

(this work generally did not study prices) has examined a single level of government, typically

the national level, and has ignored the fact that many states are federalist, with nested levels of

government (for exceptions, see Dobbin 1994; Schneiberg and Soule 2005; Djelic and Quack

2007). The neglect of federalism means that previous sociological research on states and

markets has assumed, implicitly, that legal regimes are aligned across all levels of government.

In this paper, we used sociological and legal research to lay out a single-level theory of legal regimes and pricing patterns, and then built a multi-level theory of conflict (or alignment) among nested legal regimes and its effect on pricing patterns. We went beyond most previous research on price by developing arguments based on both theories, not just about the central tendency of price, but also about price dispersion. We tested these theories on prices in one market that is a battleground for federalism in the United States: state-legal medical marijuana markets. We found support for the multi-level theory rather than the single-level theory, in terms of both mean price and price dispersion. Overall, our results provide strong evidence for the argument that price patterns are driven by uncertainty derived from conflict among legal regimes created by different levels of government, rather than by uncertainty derived from legality or illegality at any single level of government.

Although markets for medical marijuana are large and growing rapidly, as more states legalize marijuana for medical use and an increasing fraction of the population approves of marijuana legalization, and although these markets have been deemed critical battlegrounds for federalism in the United States (Mikos 2009; Schwartz 2013; Chemerinsky et al. 2015), there are many other markets that are affected by conflict between national-level and state-level legal regimes, as well as conflict between local-level and state-level legal regimes. Most of these markets are for goods and services that are contentious on moral, religious, or scientific grounds, because contention provides a solid basis for legal and social contestation. Current examples of contentious markets include those in "the sharing economy" (or, pejoratively, "the gig economy"), such as those for accommodations (e.g., Airbnb) and local transportation (e.g., Uber), as well as markets for "fracking" natural gas and for trading carbon dioxide permits and credits (Dokshin 2016); historical examples include the late nineteenth-century market for life insurance and early twentieth-century markets for fire insurance and electricity (Zelizer 1979; Schneiberg and Bartley 2001; Yakubovich, Granovetter, and McGuire 2005). In all these markets, many different kinds of actors (industry lobbyists, union officials, and social-movement activists) motivated by economics, ethics, religion, or science can push for market

expansion or restriction, even new market creation or existing market closure, by promoting

local (state or municipal) ballot initiatives and referenda; or by appealing to local-level

politicians and bureaucrats, and ignoring national state agents. Such actions can lead to conflict

between legal regimes created by different levels of government, which generates uncertainty

for organizations operating in the focal markets. Therefore, contentious markets are excellent

sites for applying our multi-level theory of legal regime conflict, to investigate price-setting and

other market practices.

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Figure 1: The Evolution of State (& DC) Legal Regimes Concerning Medical Marijuana
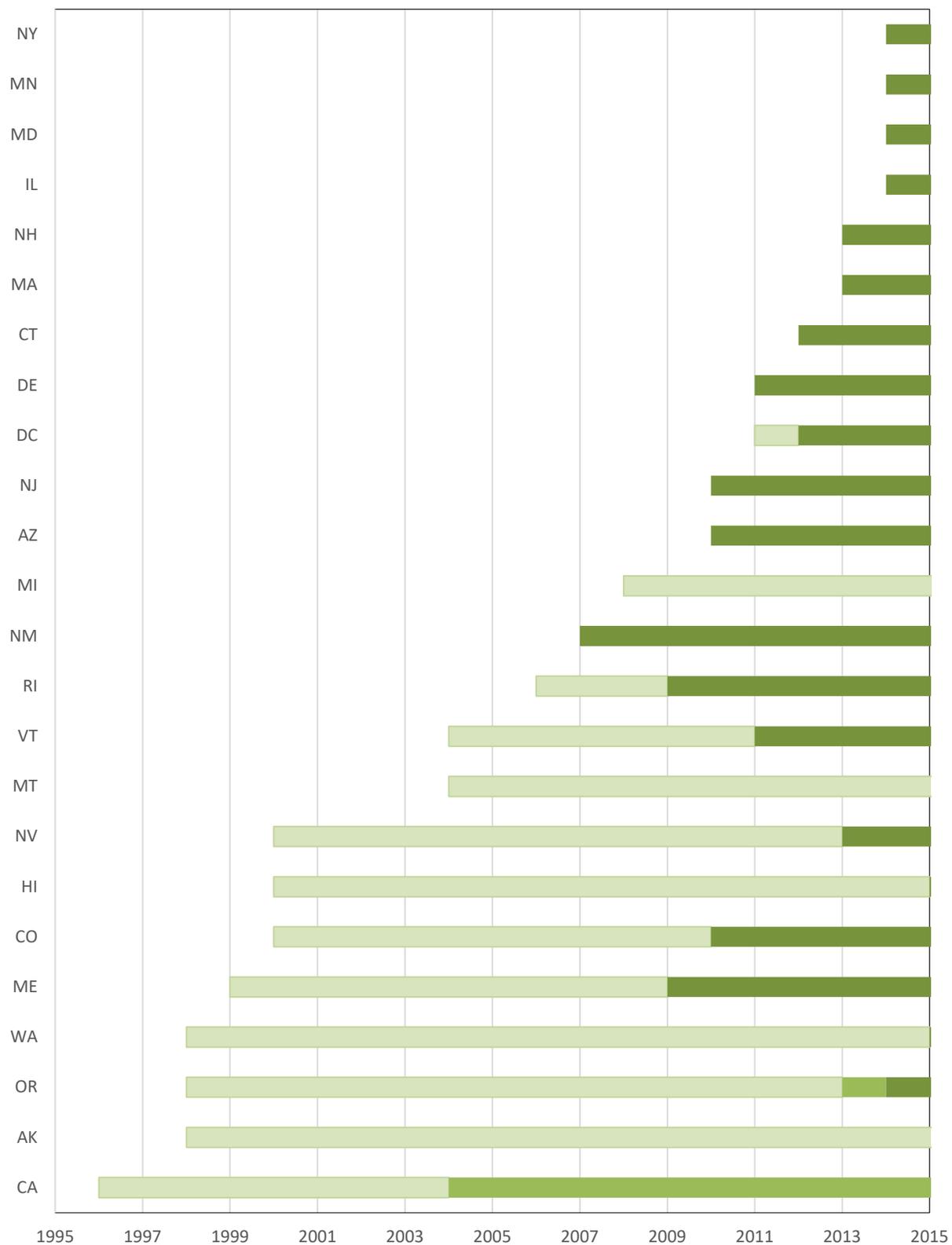
Figure 2: Screen Snapshot of Weedmaps Website for One Provider

Source: https://weedmaps.com/dispensaries/bpg-express, retrieved October 10, 2015)

Figure 3: Market Size (by Revenue) of the Sampled State-Legal Marijuana Markets in 2015
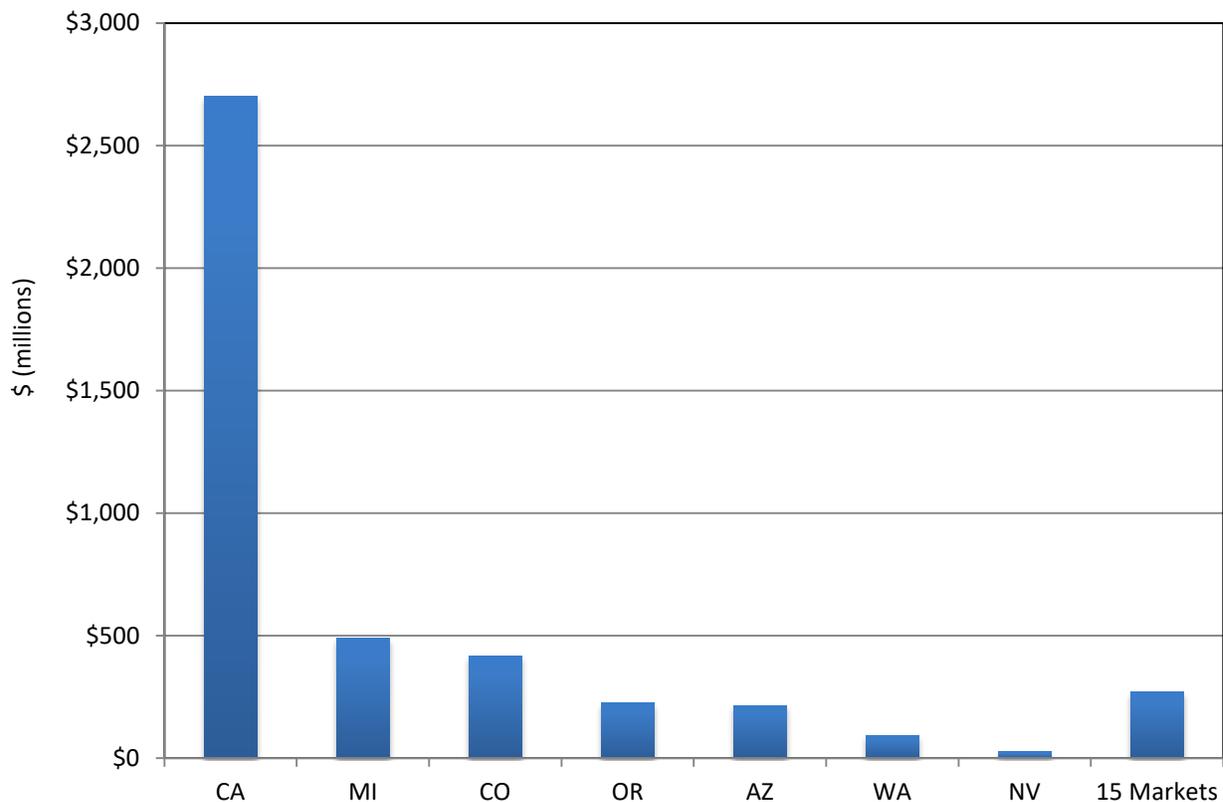
Note: The category "15 Markets" consists of medical marijuana markets in Alaska, Connecticut, District of Columbia, Delaware, Hawaii, Illinois, Maine, Massachusetts, Minnesota, Montana, New Jersey, New Mexico, New York, Rhode Island, and Vermont.

Table 1:
Predictions about Uncertainty from Legal Regime Theories
Applied to Medical Marijuana Markets

Legal Regime	Authorized Providers	Licensing of Providers	Single-Level Theory: Uncertainty	Conflict with Federal Law	Multi-Level Theory: Uncertainty	Jurisdictions
Quasi-legal	Individuals	No	High	Low	Low	AK, HI, MI, WA
Legal but unlicensed	Organizations	No	Medium	High	High	CA
Legal and licensed	Organizations	Yes	Low	Low	Low	AZ, CO, CT, DC,IL, MA, MD, ME, RI, NV, NH, NJ, NM, NY, VT

Note: This table refers to state-level legal regimes as of 2015. The assessment of conflict between state and federal law is based on the second Cole Memorandum (2013), which was still the federal government's stance in 2015. But that stance could change in the future.

Table 2: Univariate Statistics and Correlations

		1	2	3	4	5	6	7	8	9	10	11	12	13
	Mean	3.752	5.576	4.784	3.278	0.240	0.460	0.925	0.057	0.672	1.821	0.357	0.428	0.401
	Standard deviation	0.250	1.308	0.339	0.658	0.427	0.498	0.263	0.232	0.470	0.811	0.295	0.495	0.490
	Median	3.807	5.609	4.900	3.258	0.000	0.000	1.000	0.000	1.000	1.798	0.283	0.000	0.000
	Minimum	1.099	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	-3.503	0.000	0.000	0.000
	Maximum	4.500	7.864	5.000	4.905	1.000	1.000	1.000	1.000	1.000	3.533	1.000	1.000	1.000
	N. of observations	100765	100765	93030	100765	100765	100765	100765	100765	100765	100765	100765	88613	88576
1	Price (ln)	1.000												
2	Provider Age (ln)	-0.087	1.000											
3	Provider Rating	0.072	-0.150	1.000										
4	Flower Count (ln)	-0.066	0.042	-0.005	1.000									
5	Sativa	0.002	0.020	0.001	-0.012	1.000								
6	Indica	0.016	-0.032	0.024	0.061	-0.519	1.000							
7	State Legal	0.088	-0.029	0.036	0.064	0.025	0.062	1.000						
8	State Licensed	-0.258	0.160	-0.136	-0.079	0.010	-0.062	0.070	1.000					
9	Delivery Only	0.382	-0.227	0.144	-0.178	0.010	0.016	0.214	-0.337	1.000				
10	Local Competition (ln)	0.232	-0.166	0.144	0.101	0.024	0.064	0.388	-0.363	0.485	1.000			
11	Orgzl Heterogeneity	-0.084	-0.020	-0.038	0.164	-0.014	0.085	0.144	-0.202	-0.207	-0.008	1.000		
12	Local Illegal	-0.049	-0.129	0.036	0.161	-0.019	0.082	0.044	-0.227	-0.159	0.029	0.336	1.000	
13	State Legal x Local Illegal	-0.041	-0.140	0.037	0.185	-0.014	0.095	0.236	-0.215	-0.139	0.098	0.368	0.946	1.000

Table 3: The Legal Regimes on the (Mean) Price of 3.5g of Marijuana Flowers

	(1)	(2)	(3)	(4)	(5)
Provider Age (logged)	0.003*** (0.001)	0.004*** (0.001)	0.009*** (0.001)	0.004*** (0.001)	0.009*** (0.001)
Provider Rating	0.004 (0.002)	0.002 (0.002)	-0.002 (0.002)	0.002 (0.002)	-0.002 (0.002)
Flower Count (logged)	-0.024*** (0.001)	-0.025*** (0.001)	-0.008*** (0.001)	-0.024*** (0.001)	-0.008*** (0.001)
Sativa	0.005* (0.002)	0.005* (0.002)	0.005** (0.002)	0.005* (0.002)	0.005** (0.002)
Indica	0.014*** (0.002)	0.014*** (0.002)	0.015*** (0.002)	0.014*** (0.002)	0.015*** (0.002)
Local Competition (logged)	0.047*** (0.002)	0.045*** (0.002)	-0.001 (0.002)	0.044*** (0.002)	-0.001 (0.002)
State Legal		0.134*** (0.023)	0.165*** (0.022)	0.132*** (0.023)	0.163*** (0.022)
State Licensed		-0.266*** (0.015)	-0.156*** (0.015)	-0.307*** (0.016)	-0.187*** (0.015)
Delivery Only			0.154*** (0.002)		0.152*** (0.002)
Organizational Heterogeneity				-0.128*** (0.008)	-0.092*** (0.008)
Constant	3.549*** (0.082)	3.555*** (0.082)	3.375*** (0.080)	3.576*** (0.082)	3.392*** (0.080)
R^2	0.270	0.272	0.303	0.275	0.305

Note: * indicates $p<0.05$, ** $p<0.01$, and *** $p<0.001$, two-tailed t tests. All models are based on 93,030 provider-product observations and include fixed effects for municipality.

Table 4: The Effects of Legal Regimes on the <u>Price Dispersion</u> of 3.5g of Marijuana Flowers

	(1)	(2)	(3)	(4)
Provider Age	0.001	-0.028***	0.014**	-0.017**
(logged)	(0.006)	(0.006)	(0.006)	(0.006)
Provider Rating	-0.415***	-0.370***	-0.395***	-0.323***
	(0.021)	(0.022)	(0.022)	(0.022)
Flower Count	0.157***	-0.099***	0.085***	-0.102***
(logged)	(0.011)	(0.012)	(0.011)	(0.012)
Sativa	-0.274***	-0.318***	-0.277***	-0.316***
	(0.020)	(0.020)	(0.020)	(0.020)
Indica	-0.227***	-0.293***	-0.269***	-0.303***
	(0.017)	(0.017)	(0.017)	(0.017)
Local Competition	-0.381***	-0.113***	-0.277***	-0.084***
(logged)	(0.011)	(0.012)	(0.011)	(0.012)
State Legal	0.717***	0.807***	0.363***	0.618***
	(0.031)	(0.031)	(0.031)	(0.032)
State Licensed	-0.735***	-1.104***	-0.287***	-0.813***
	(0.035)	(0.036)	(0.036)	(0.038)
Delivery Only		-1.147***		-0.991***
		(0.019)		(0.020)
Organizational Heterogeneity			1.066***	0.552***
			(0.026)	(0.028)
Constant	-1.838***	-0.842***	-1.977***	-1.305***
	(0.122)	(0.158)	(0.122)	(0.123)

Note: * indicates $p<0.05$, ** $p<0.01$, and *** $p<0.001$, two-tailed t tests. All models are based on 93,030 provider-product observations and include fixed effects for municipality.

Table 5: The Effects of Legal Regimes on the <u>(Mean) Price</u> of 3.5g of Marijuana Flowers: Adding Local-State Conflict

	(1)	(2)	(3)
Provider Age	0.009***	0.012***	0.012***
(logged)	(0.001)	(0.001)	(0.001)
Provider Rating	0.000	0.001	0.000
	(0.002)	(0.002)	(0.002)
Flower Count	-0.009***	-0.009***	-0.010***
(logged)	(0.001)	(0.001)	(0.001)
Sativa	0.005**	0.005*	0.005*
	(0.002)	(0.002)	(0.002)
Indica	0.015***	0.015***	0.015***
	(0.001)	(0.002)	(0.002)
Local Competition	0.000	-0.001	-0.001
(logged)	(0.001)	(0.002)	(0.002)
State Legal	0.208***	0.219***	0.164***
	(0.019)	(0.026)	(0.029)
State Licensed	-0.211***	-0.166***	-0.182***
	(0.015)	(0.021)	(0.021)
Delivery Only	0.154***	0.167***	0.166***
	(0.002)	(0.003)	(0.003)
Organizational Heterogeneity	-0.100***	-0.098***	-0.101***
	(0.007)	(0.009)	(0.009)
Local Ban		0.052***	-0.047*
		(0.003)	(0.023)
State Legal x Local Ban			0.100***
			(0.023)
Constant	3.180***	3.524***	3.580***
	(0.117)	(0.033)	(0.035)
R^2	0.305	0.307	0.307

Note: * indicates $p<0.05$, ** $p<0.01$, and *** $p<0.001$, two-tailed t tests. All models are based on 81,967 observations. Model 1 includes fixed effects for municipality.

Table 6: The Effects of Legal Regimes on the <u>Price Dispersion</u> of 3.5g of Marijuana Flowers:
Adding Local-State Conflict

	(1)	(2)	(3)
Provider Age	-0.024***	0.026***	-0.023
(logged)	(0.007)	(0.007)	(0.007)
Provider Rating	-0.338***	-0.373***	-0.365***
	(0.024)	(0.024)	(0.024)
Flower Count	-0.135***	-0.163***	-0.166***
(logged)	(0.012)	(0.013)	(0.013)
Sativa	-0.291***	-0.304***	-0.303***
	(0.021)	(0.021)	(0.021)
Indica	-0.266***	-0.303***	-0.301***
	(0.018)	(0.013)	(0.185)
Local Competition	-0.166**	-0.168***	-0.173**
(logged)	(0.013)	(0.013)	(0.012)
State Legal	0.435***	0.407***	0.273***
	(0.034)	(0.034)	(0.042)
State Licensed	-0.858***	-0.745***	-0.728***
	(0.040)	(0.040)	(0.041)
Delivery Only	-0.829***	-0.789***	-0.760***
	(0.021)	(0.022)	(0.022)
Organizational Heterogeneity	0.609**	0.332***	0.313***
	(0.030)	(0.031)	(0.031)
Local Ban		0.264	0.044
		(0.018)	(0.057)
State Legal x Local Ban			0.348***
			(0.061)
Constant	-0.849***	-0.627***	-0.562***
	(0.135)	(0.135)	(0.136)

Note: * indicates p<0.05, ** p<0.01, and *** p<0.001, two-tailed t tests. All models are based on 81,967 observations. Model 1 includes fixed effects for municipality.