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SQUEALER DEALERS: THE MARKET FOR INFORMATION IN FEDERAL DRUG
TRAFFICKING PROSECUTIONS

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ABSTRACT – Federal data on drug trafficking sentences are used to determine factors that affect market quantities of providing information against other defendants (i.e., defendant probabilities of receiving testimony-related sentence reductions) and market prices of information (i.e., the sizes of such sentence reductions). Women and better-educated defendants experience high demand (higher quantities and prices) for information. Blacks, Hispanics, and non-U.S. citizens experience low demand. Defendants expecting longer sentences have higher supply of information. Conditional on expected sentence, crack dealers, high-level dealers, and dealers with long criminal histories experience low demand, while low-level dealers experience high demand. Women of all races experience high demand for information.

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Never rat on your friends and always keep your mouth shut.

Jimmy Conway, *Goodfellas*

Citing his “invaluable” aid in the war against the Mafia, a Federal judge yesterday rewarded a once-powerful mob figure who became a major Government informer by sentencing him to just five years in prison, despite his admitted involvement in 19 murders.

The New York Times, September 27 1994¹

I. Introduction

Since the seminal theoretical work of Becker (1968), the economics of crime has developed an extensive empirical literature.² This paper adds to that literature by studying markets for information in federal prosecutions of drug trafficking conspiracies. In these markets, law enforcement demands information that can help prosecute and imprison suspected drug traffickers, while other drug traffickers supply the information.³ The price over which demanders and suppliers higggle is the size of an informer’s sentence reduction.⁴

Mustard (2001), using federal sentencing data, found that different demographic groups have different rates—*relative quantities*—of providing “substantial assistance” (the federal legal term meaning “information”) against other defendants.⁵ This paper adds to Mustard (2001) by using federal sentencing of convicted drug traffickers to uncover whether different demographic groups have different *relative prices* for their information, i.e. whether different groups receive larger sentence reductions (higher prices) or smaller sentence reductions (lower prices) when providing substantial assistance. Then, in a simple manner similar to well-known examinations

¹ Fried (1994), regarding the sentencing of Salvatore “Sammy the Bull” Gravano of the Gambino crime family.

² See, for example, Levitt (1998), Kessler and Levitt (1999), Di Tella and Schargrodsky (2004), Klick and Tabarrok (2004), Ayres and Levitt (1998), Freeman (1999), Grogger (1998), Machin and Meghir (2004), Fishback, Johnson and Kantor (2010), Gould, Weinberg, and Mustard (2002), Shavell (1992), and Marvell and Moody (2001).

³ Weinstein (1999) refers to deals with informers as taking place in “the market for snitches.”

⁴ The famous prisoner’s dilemma (Luce and Raiffa 1957) is an example of information being treated as a market good. Prisoner’s dilemma games have been empirically tested in experiments involving students (Frank, Gilovich, and Regan 1993; Andreoni and Miller 1993), game-show contestants (List 2006), and the hiring of attorneys (Ashenfelter and Bloom 1993).

⁵ Mustard (2001, Table 10) makes this claim when combining the receipt of substantial assistance departures and the receipt of judicially-imposed “downward departures” into one “guideline departure” variable. Departures are discussed more thoroughly in Section II of this paper.

of the returns to education in the 1970s and 1980s (Murphy and Welch 1989, Levy and Murnane 1992), price and quantity determine whether certain groups experience different *relative demand* or *relative supply* for their testimony. Groups experiencing high relative demand have their information highly sought by law enforcement, and therefore have high rates (quantities) of providing substantial assistance and large sentence reductions (prices) when doing so. Those with low relative demand have low quantities and low prices. Groups with high relative supply of substantial assistance have high quantities but low prices, while those with low relative supply have low quantities and high prices.

This paper further adds to the literature by going beyond demographic factors and examining what criminality-related factors—e.g., criminal history, role in a criminal conspiracy, and type of drug dealt—affect supply and demand for information, and by examining supply and demand conditional on expected prison sentence.

Results show that women and better-educated defendants experience high relative demand for information while blacks, Hispanics, and non-U.S. citizens experience low relative demand. Groups facing long prison sentences—dealers of harder drugs, those with long criminal histories, and high-level dealers—have high relative supply, while those facing short sentences—primarily low-level dealers—have low relative supply. When controlling for expected sentence, crack dealers, high-level dealers, and dealers with long criminal histories experience low demand. Race-specific estimations show that women of all races experience high relative demand for information.

The rest of this paper is organized as follows. Section II discusses the federal criminal justice system, emphasizing reforms established by the Sentencing Reform Act of 1984 and the Anti-Drug Abuse Act of 1986. Section III discusses the data and provides summary statistics. Section IV discusses my empirical methodology. Section V shows results and Section VI attempts to explain them. Section VII discusses results from race-specific estimations and Section VIII concludes.

II. Federal criminal sentencing

Through most of the 1980s and before, federal judges possessed near-total discretion in determining sentences for criminals convicted of violating federal statutes (e.g. Stith and Cabranes 1998; Anderson, Kling, and Stith 1999). This system was altered in the 1980s by two pieces of legislation. The Sentencing Reform Act of 1984 abolished parole for federal crimes committed after November 1, 1987 (though it allowed up to 15% of a sentence to be waived for inmates exhibiting good behavior while in custody) and gave much control over criminal sentencing to the newly-established United States Sentencing Commission (USSC).⁶ The USSC established a guideline system that determined a defendant's criminal sentence according to two factors: offense severity and past criminal history. The system remains to this day.

Offense severity is captured by the *offense level* or *final offense level*, a score between 1 and 43.⁷ More severe offenses have higher offense levels. The offense level is determined by three separate considerations: the *base offense level*, *adjustments*, and *specific offense characteristics*. The *base offense level* is an offense level that corresponds with the specific crime of which a defendant has been convicted beyond a reasonable doubt.⁸ In drug trafficking crimes, the base offense level is related to the amount of drugs a defendant conspired to deal. *Adjustments* are crime-related characteristics determined by a judge at the sentencing hearing. Categories of adjustments include whether the defendant obstructed justice (by, for example, lying to a judge or attempting to escape from custody) and whether the defendant accepted responsibility for his crime. The concatenation of separate counts of conviction into a “combined adjusted offense level”—designed to ensure that defendants do not receive excessive sentences

⁶ For a thorough history of the considerations that led to the passage of the Sentencing Reform Act, see Stith and Kuo (1993).

⁷ The analysis here is taken from Chapters 2-6 of the *United States Sentencing Commission Guidelines Manual*, 2003 edition.

⁸ Insider trading, for example, has a base offense level of 8. Racketeering has a base offense level of 19. Treason has a base offense level of 43.

after being convicted of multiple similar counts—also falls under adjustments.⁹ *Specific offense characteristics* are similar to adjustments, but can only apply to specific crimes.

One adjustment category, which plays an important role in this paper, details the defendant’s role in a conspiracy. The guidelines state that a defendant who “was a minimal participant in any criminal activity” receives a -4 adjustment to his offense level; a defendant who “was a minor participant” receives a -2 adjustment; and a defendant who played a role “falling between” minimal and minor (hereafter referred to as “Minimal/Minor”) receives a -3 adjustment. Adjustments for high-level conspirators are more complicated. According to USSC §3.B.1,

- (a) If the defendant was an organizer or leader of a criminal activity that involved five or more participants or was otherwise extensive, increase [offense level] by **4** levels.
- (b) if the defendant was a manager or supervisor (but not an organizer or leader) and the criminal activity involved five or more participants or was otherwise extensive, increase by **3** levels.
- (c) If the defendant was an organizer, leader, manager, or supervisor in any criminal activity other than that described in (a) or (b), increase by **2** levels.

[Emphasis in original.] The +4 role adjustment (hereafter “Aggravating +4”) thus represents leaders of large drug trafficking conspiracies and Aggravating +3 represents their lieutenants. Aggravating +2 represents leaders and lieutenants of smaller drug-trafficking conspiracies.

An offender’s *final offense level* is the sum of his base offense level, specific offense characteristics, and adjustments. A final offense level of less than 1 is amended to 1; one of greater than 43 is amended to 43.

The defendant’s *criminal history category* is formed by assigning point values to previous criminal convictions and periods of incarceration.¹⁰ Points are summed and assigned to categories, where Category I is the least severe criminal history and Category VI is the most severe. The final offense level and criminal history category are mapped to a range of potential

⁹ Other adjustment categories include the nature of the victim (victimizing those who are unusually vulnerable or acting in an official capacity will increase an offense level, as will restraining a victim in the course of a crime), whether the defendant abused trust by committing his crime, and whether the defendant’s crime was related to terrorism.

¹⁰ Each prior prison sentence of at least 13 months is assigned 3 points. Each prior prison sentence of between 2 and 13 months, and each offense committed on parole, probation, or under court supervision, is assigned 2 points. Most other convictions are assigned 1 point.

months of imprisonment using the USSC Sentencing Table (Table 1). Defendants with a final offense level of 24 and a criminal history category of I, for example, are to be sentenced to somewhere between 51 and 63 months, inclusively, in federal prison. The actual sentence is a specific number of months within the guideline range.¹¹

Until January 2005, the sentencing guidelines were deigned “mandatory,” but federal judges were permitted to depart from them in certain situations.¹² When a judge felt the guidelines mandated a level of imprisonment that inadequately reflected the defendant’s criminal conduct, he could impose a *downward departure* (sentence a defendant to less than the minimum guideline sentence) or an *upward departure* (more than the maximum guideline sentence). Such departures had to be explained by the judge in writing, could not be justified by the defendant’s race, creed, sex, education, or socioeconomic status, and were not permitted to be justified by factors already covered by the base offense level, specific offense characteristics, or adjustments.

Defendants could also receive a reduced sentence through a *substantial assistance departure*. USSC §5K1.1 states,

Upon motion of the government stating that the defendant has provided substantial assistance in the investigation or prosecution of another person who has committed an offense, the court may depart from the guidelines.

That is, if government prosecutors informed a judge that a particular defendant had cooperated with the government and provided evidence against at least one other individual, a federal judge could sentence a defendant to any sentence beneath the guidelines, perhaps even giving a sentence of no incarceration (Weinstein 1999).

¹¹ Defendants in Zone A of the Sentencing Table are permitted to receive no period of imprisonment. Defendants in Zone B must receive at least one month of imprisonment, and defendants in Zone C are permitted to serve up to half their sentence via house arrest or in a halfway house.

¹² In January 2005, the U.S. Supreme Court ruled 5-4 in *U.S. vs. Booker* and *U.S. vs. Fanfan* that mandatory sentencing guidelines unconstitutionally violated a defendant’s right to a jury trial because judges, not juries, determined whether specific offense characteristics and/or adjustments applied to convicted defendants. The Supreme Court ruled that the guidelines were to be advisory rather than mandatory (Mauro 2005).

The Anti-Drug Abuse Act of 1986 created mandatory minimum terms of imprisonment—usually 5 or 10 years, but also possibly 20 years or life without parole—for defendants convicted of violating specific drug laws.¹³ The 1986 act made it illegal for a judge to sentence a defendant below a mandatory minimum term of imprisonment in the absence of a prosecutor’s substantial assistance motion. For example, were a defendant convicted of a statute mandating 60 months of imprisonment, and were the defendant’s offense level and criminal history to map to a guideline sentence of 70-87 months of imprisonment, the sentencing judge could legally impose a downward departure, but could not impose a sentence of fewer than 60 months in prison unless the government provided a substantial assistance motion. With a substantial assistance motion, the judge could impose a sentence of fewer than 60 months.

At least partially in response to concern over lengthy drug-related sentences (Schumer 1994), a “safety valve” provision in 1994 weakened the “mandatory” nature of mandatory minimum sentences.¹⁴ Defendants with no more than one criminal history point and no violent history, who had not played a high-level role in a criminal conspiracy, and who had cooperated with the government—even if that cooperation did not provide new information that aided in the prosecution of another—were eligible for sentences below a mandatory minimum term of imprisonment.

¹³ The act was passed in response to the increasing national presence of crack cocaine (Grogger and Willis 2000, Fryer et al 2010) and the June 1986 fatal cocaine overdose of college basketball star Len Bias (Walsh 1986, Baum 1997).

¹⁴ A substantial law-review literature (e.g. Stith and Cabranes 1997, Weinstein 1999 & 2003, Yaroshefsky 1999, Simons 2002) has developed concerning mandatory minimum sentences and substantial assistance departures. Such laws have received attention from more mainstream publications and television programs (e.g. Bikel 1999, Bradley 2004, Saunders 2005, Caher 2006). Much of the mainstream attention has been negative, consisting of two general lines of complaint. The first is that drug sentences, especially mandatory minimums, are excessively punitive. The second concern is the “cooperation paradox” (e.g., Weinstein 1999) which states that the combination of high mandatory sentences, substantial assistance departures, and federal conspiracy laws—under which a defendant can be held criminally responsible for drugs trafficked by others—can lead to prison sentences that are negatively correlated with criminal activity. This happens when devious, manipulative, and high-level defendants who are involved in a huge number of crimes receive substantial assistance departures because they possess knowledge leading to convictions of many low-level defendants. Low-level defendants, meanwhile, lack such information, and are stuck with mandatory minimum sentences after failing to receive substantial assistance departures.

A potentially large sentence reduction, especially when a mandatory minimum sentence is involved, provides strong incentive for an individual charged with trafficking drugs to provide information to federal prosecutors.¹⁵ But defendants face uncertainty regarding whether doing so will yield a sentence reduction. Prosecutors are under no legal obligation to request substantial assistance departures for defendants whose information they acknowledge has led to the arrest and conviction of another (Weinstein 1999).¹⁶ Defendants also face uncertainty from judges: there is no legal obligation for a judge to grant a substantial assistance reduction even if the government requests one.

III. Data

Two datasets are used in this paper. The primary dataset is Monitoring of Federal Criminal Sentences (MFCS), published every fiscal year by the USSC. For each defendant convicted of a federal crime, the dataset collects a substantial amount of information, including demographics, the specific sentence imposed (including imprisonment, probation, supervision, and fines), the offenses of which a defendant has been convicted, the defendant's criminal history, the type of departure (upward, downward, or substantial assistance) from the sentencing guidelines (if any) the defendant received, whether the defendant was convicted at trial, the federal district in which the defendant was sentenced,¹⁷ and more. Mandatory minimum sentences are also recorded, even if the defendant avoided such a sentence via a substantial assistance departure or safety-valve reduction. This paper's sample consists of drug traffickers who were sentenced in the fiscal years 1997-2003. Observations where a defendant receives a statutory sentence of life-without-parole or time served are dropped, as are observations where

¹⁵ The incentive is so strong that the judiciary for a time ruled in *U.S. vs. Singleton* that substantial assistance reductions were in violation of federal witness-bribery statutes (Biskupic 1998).

¹⁶ Maxfield and Kramer (1998) found that over 60 percent of defendants who provided some form of assistance to the government did not receive a substantial assistance departure.

¹⁷ There are 94 federal districts distributed among the 50 states plus the District of Columbia, Puerto Rico, Guam, the U.S. Virgin Islands, and the Marianas. No district covers terrain in multiple states or territories. Each state/territory possesses between 1 and 4 districts. New York, Texas, and California are the only states with 4 federal districts.

defendants avoided mandatory minimum life-without-parole sentences by receiving substantial assistance departures. Defendants whose final offense level was 43 are also dropped—Table 1 shows that these defendants can only avoid life sentences by receiving either a downward departure or a substantial assistance departure. I retain in the sample defendants receiving parametric sentences that are effectively life sentences.¹⁸ The final sample of drug traffickers from MFCS totals 145,399 observations.

The empirical investigation is limited to drug traffickers for a few reasons. Drug sales are by their nature criminal conspiracies, and therefore drug traffickers are members of “felony society” (Conlon 2004 p. 15). They are likely to know of other members of felony society (i.e., people with whom they have dealt drugs) and possess information which can be used to prosecute another in exchange for a sentence reduction. In the federal system, for example, drug traffickers are much more likely to receive substantial assistance departures than other defendants.¹⁹ Additionally, drug trafficking charges may be less endogenous to the receipt a substantial assistance departures than other kinds of federal criminal charges. For example, defendants charged with fraud who receive substantial assistance departures often plead guilty to lesser crimes that have statutory maximum terms of imprisonment, such as 5 years or 10 years (e.g. Flood et al 2004). Drug trafficking defendants, by contrast, often face indeterminate sentences (e.g. 5-years-to-life, 10-years-to-life) even when receiving substantial assistance departures. Another benefit of limiting the sample to drug trafficking crimes is that the weight of drugs which a defendant has been found to have trafficked, which is recorded in the MFCS, has been used as a plausibly exogenous measure of expected sentence in drug trafficking crimes (Boylan and Long 2005).

¹⁸ Sentences are top-coded at 990 months.

¹⁹ In fiscal year 2003, 26.9 percent of federal drug trafficking sentencings involved defendants who received substantial assistance departures; only 15.0 percent of defendants sentenced for other offenses received substantial assistance departures.

Table 2 contains summary statistics of relevant MFCS variables. In the full sample, 28% of defendants receive substantial assistance departures and 5% are convicted at trial. Hispanics comprise 43% of the dataset, while blacks comprise 29% and whites (the omitted category) 25%. Substantial assistance departures are more common among whites than blacks and, especially, Hispanics. Defendants who receive substantial assistance departures earn an average of 56 months in prison, those who plead guilty without receiving substantial assistance receive 69 months, and those convicted at trial receive 177 months. Sentences are longer for blacks than whites and Hispanics. Hispanics who receive substantial assistance departures receive only 5 fewer months in prison than those who plead guilty without providing substantial assistance.

Females comprise 13 percent of all defendants, and are more common among whites than blacks or Hispanics. Hispanics are much less likely than whites or blacks to be American citizens. Approximately half of all defendants are at least high school graduates, and Hispanics are much less educated than whites or blacks.

Data regarding the type of lawyer retained does not appear to be complete, and the omitted category in Table 2 is “unreported.” Given this limitation, it appears that Hispanics are more likely than whites or blacks to use either court-appointed counsel or federal public defenders, which are the two forms of representation given to indigent defendants (Iyengar 2007).

The plurality of observations are of marijuana dealers. The majority of blacks are crack dealers and whites are overrepresented among methamphetamine and other-drug dealers. The share of defendants that receive Aggravating +2, +3, or +4 role in the conspiracy adjustments is small across all races. Blacks are much less likely to receive Minor -2 adjustments than whites or Hispanics. Hispanic defendants are less likely to have used a weapon than whites or blacks, and have less extensive criminal histories than whites or, especially, blacks.

Table 3 shows the share of defendants facing mandatory minimum sentences. Approximately 30% of each race’s defendants face a 5-year minimum sentence. Over 40% of black defendants face a 10-year mandatory minimum, probably because the majority of black

defendants are crack dealers.²⁰ Very few defendants of any race face mandatory minimums of 20 years or more.

MFCS contains information regarding convicted and sentenced defendants, but not defendants who were acquitted at trial. Data from Federal Court Cases, an Administrative Office of U.S. Courts dataset archived to ICPSR by the Federal Judicial Center, provides information on acquitted defendants. This dataset is more parsimonious than MFCS. It includes district and criminal charge of indictment, but does not include demographic information, offense level, or expected period of imprisonment, and generally does not include the specific drug(s) a defendant was accused of trafficking. I limit my use of Federal Court Cases to observations in fiscal years 1997-2003 in which a defendant was found not guilty of drug trafficking after a trial. Following Leipold (2005), I count as an acquittal all observations in which the defendant was found not guilty of his most severe charge. This totals 1542 acquittals, which comprises 1.1% of the final dataset and 18.1% of cases that proceed to trial. Individual observations from this dataset cannot be matched to MFCS.

This paper's dataset has limitations. It does not contain defendants who, by providing substantial assistance, avoided federal charges altogether or had drug trafficking charges reduced to other federal charges (e.g. Rankin 2004). It does not detail the identities or number of people that a defendant's information helped convict. It does not identify defendants that provided information but were not granted a substantial assistance departure. (For simplicity's sake, the wording in the remainder of this paper assumes that a defendant receives a substantial assistance departure if and only if he cooperates with prosecutors.) Lastly, markets for information in the federal system may differ from other criminal justice systems, because federal convictions are a nonrandom portion of overall criminal convictions (Glaeser, Kessler, and Piehl 2000).

²⁰ Sentencings in this paper took place when the federal 100:1 provision mandated that trafficking 5g of crack netted a defendant the same 60-month mandatory minimum as trafficking 500g of cocaine, and trafficking 50g of crack resulted in the same 120-month mandatory minimum as trafficking 5kg of cocaine (Blumstein 2003). The ratio was changed to 18:1 in August 2010 (Liptak 2012).

IV. Estimation strategy

I separate MFCS observations into three separate groups based on *case disposition*: defendants who received a substantial assistance departure ($c = \text{SUBASST}$), defendants who pleaded guilty but did not receive a substantial assistance departure ($c = \text{PLEAD}$), and defendants who were convicted at trial ($c = \text{TRIAL}$).²¹ Versions of the following equation are then estimated separately for each of these three groups:

$$S_{idtc} = \Phi(F_{idtc}) + \gamma_c X_{idtc} + \lambda_c Z_{idtc} + \theta_{dc} + \eta_{tc} + \varepsilon_{idtc} \quad (1)$$

where i is the individual being sentenced, d is the federal district of his sentencing, and t is his fiscal year of sentencing. S_{idtc} , the dependent variable, is months imprisonment imposed by the sentencing judge upon the offender. Since a fair amount of defendants—especially those who provide substantial assistance—receive sentences of zero months imprisonment, I use a maximum likelihood Tobit analysis to estimate Equation (1) when the dependent variable is months imprisonment.²² I also estimate Equation (1) in specifications where S_{idtc} is log months imprisonment. For these equations, estimations are OLS and sentences of zero months imprisonment are recorded as one-day sentences. These estimations of Equation (1) assume selection-on-observables.

$\Phi(F_{idtc})$ captures the severity of the crime of which defendant i was convicted. I use four different specifications of $\Phi(F_{idtc})$ in this paper. All four omit controls for judicially-imposed downward and upward departures, which are not possible for defendants who provide substantial assistance and which I assume are unknown *ex ante*.

²¹ Defendants who plead *nolo contendere* are categorized as pleading guilty. I do not discern between being found guilty via jury trial or via bench trial. A small number of observations of defendants who both received substantial assistance departures and were convicted at trial (e.g. Mayko 2003) are removed from the dataset.

²² Approximately 10.2 percent of defendants who provide substantial assistance receive no prison sentence, as do 3.8 percent of those who plead guilty but provide no cooperation. Fewer than 1 in 150 defendants convicted at trial receive zero months imprisonment.

The most parsimonious specification of $\Phi(F_{idtc})$ includes only the weapon dummy, which is assumed to be exogenous to case disposition.²³

The second, the *mandatory minimum specification*, adds dummy variables representing the mandatory minimum sentence a defendant faces (5-year, 10-year, or 20-or-more year) interacted with a dummy indicating safety-valve receipt.

The third, the *baseline cell* specification, takes the mandatory minimum specification and adds dummy variables representing the interaction of base offense level and criminal history category. This is similar to Mustard (2001), except that instead of using the final offense level, which may be correlated with case disposition, it uses the base offense level (Nutting 2013, Schanzenbach 2005, Schanzenbach and Tiller 2007).²⁴ Base offense level is calculated via the weight of drugs determined to have been trafficked,²⁵ which Boylan and Long (2005) argue is an exogenous control for drug trafficking crime. Criminal history category is not identified in this specification, because it is fully interacted with base offense level.

Finally, the *final guideline cell* specification replaces baseline cells with dummies for each of the interactions of final offense level and criminal history, i.e. the 258 Table 1 guideline cells. This is the same specification as Mustard (2001), though it adds the mandatory minimum controls and weapons dummy. Since some offense level adjustments are strongly correlated with case disposition, this specification cannot be considered exogenous to a defendant's choice of

²³ Prosecutors have the capacity to charge a defendant with separate criminal counts for drug-related weapons possession, and such charges have been demonstrated to increase a defendant's sentence by as much as 660 months (Madigan 2004). Anecdotal evidence suggests that stiff sentences associated with weapons offenses are effective means by which police and prosecutors can encourage criminals to cooperate with law enforcement (Alvarez 2004 p. 28).

²⁴ For defendants convicted of multiple counts, base-offense level is equal to combined adjusted offense level (see Section II).

²⁵ Regressing the log of marijuana-equivalent weight—an MFCS variable translating the amount of drugs a defendant was determined to have dealt into the amount of marijuana a defendant would have to have dealt in order to face the same prison sentence—on a vector of base-offense level dummy variables results in an R^2 of 0.91.

whether to provide substantial assistance, plead guilty without providing assistance, or go to trial.²⁶ As in the baseline cell specification, criminal history category is not identified.

Z_{idtc} in Equation (1) represents defendants' demographic characteristics. These include controls for the defendant's race, sex, age, citizenship status, number of dependents (upper bounded at 6), education level, and type of lawyer retained. Previous researchers have found that demographic factors are significantly correlated with sentence outcomes, even in the strict federal guideline regime that proscribes judges from letting such matters affect a defendant's sentence (e.g. Albonetti 1997, Steffensmeier and Demuth 2000, Mustard 2001, Everett and Wojtkiewicz 2002, Schanzenbach 2005, Sorensen et al 2014).

X_{idtc} consists of controls for criminality-related factors that can affect a defendant's term of imprisonment. These include dummy variables for the primary drug a defendant dealt (cocaine, crack, heroin, marijuana, methamphetamine, or other drug),²⁷ a linear control for the number of different drugs a defendant dealt, dummies representing role-in-the-offense adjustments, and dummies for criminal history category. All of these are assumed to be exogenous to case disposition. (This assumption will be discussed more later in the paper.)

The vectors θ_{dc} and η_{tc} are fixed effects parameters that capture federal-district effects and fiscal-year effects, respectively.²⁸ Random error is represented by ε_{idtc} , which is normally distributed when Equation (1) is a Tobit estimation. The method by which estimations of

²⁶ The acceptance of responsibility adjustment, totaling a reduction in two or three offense-level points, is effectively an offense level reduction for defendants who plead guilty. Of defendants convicted at trial, 5.8 percent receive the acceptance-of-responsibility adjustment. Of guilty pleas, 96.9 percent of cooperators and 94.1 percent of non-cooperators receive it. The obstruction of justice offense level increase occurs more frequently among defendants who are convicted at trial than defendants who plead guilty, presumably because one method by which a defendant can be found to have obstructed justice is by lying on the witness stand during a trial. Over 16.5 percent of convicted-at-trials receive a two-level obstruction-of-justice enhancement. Only 1.9 percent of cooperators and 3.3 percent of non-cooperating guilty pleas receive one.

²⁷ Preliminary estimations revealed that using dummies for only the primary drug dealt yielded stronger results than using dummies representing whether a defendant trafficked a particular drug at all.

²⁸ Fiscal-year effects help account for the impact of the 2003 Feeney amendment, which restricted judges' ability to issue downward departures and significantly reduced the issuance of downward departures (Freeborn and Hartman 2010).

Equation (1) are used to predict substantial assistance prices will be explained further in the next section.

The second stage of estimations examines which defendants receive substantial assistance departures. I estimate versions of the logit equation

$$P(c_{idt} = \text{SUBASST} \mid X_{idt}, Z_{idt}, \hat{S}_{idt(c=\text{PLEAD})}) = \frac{e^{\Psi(\hat{S}_{idt(c=\text{PLEAD})}) + \mu_j X_{idt} + \delta_j Z_{idt} + \lambda_d + \phi_t}}{1 + e^{\Psi(\hat{S}_{idt(c=\text{PLEAD})}) + \mu_j X_{idt} + \delta_j Z_{idt} + \lambda_d + \phi_t}} \quad (2)$$

where $\hat{S}_{idt(c=\text{PLEAD})}$ is i 's expected sentence of pleading guilty without cooperation. $\hat{S}_{idt(c=\text{PLEAD})}$ is constructed by using coefficients from estimations of Equation (1) on the population of $c = \text{PLEAD}$ defendants. For each i , different expected sentences are constructed from the results of both the *mandatory minimum* and the *baseline cell* Tobit specifications of Equation (1).

$\Psi(\hat{S}_{idt})$ in Equation (2) represents the functional form of the expected sentence control, which is cubic.²⁹ Z_{idt} is the vector representing the defendant's criminality—type of drug dealt, role-in-the-offense, and criminal history category. X_{idt} is a vector of demographic controls. Fixed effects for district and fiscal year of sentencing are respectively represented by λ_d and ϕ_t .

Because $\hat{S}_{idt(c=\text{PLEAD})}$ is a predicted value, standard errors to Equation (2) estimations are adjusted in the form advocated by Murphy and Topel (1985).³⁰

Observations of acquitted defendants from the Federal Court Cases database are included in Equation (2). Most right-hand-side variables in Equation (2) are not present in Federal Court Cases, so are not observed for defendants who are acquitted. To address this, acquitted defendants are separated by federal district and assigned variable values equal to district-specific means of defendants convicted at trial.

²⁹ Preliminary estimations of multinomial logit models with three choice outcomes (provide substantial assistance, plead guilty without substantial assistance, or go to trial) were in violation of the independence of irrelevant alternatives assumption.

³⁰ The exact methodology is outlined in the Appendix.

V. Results

For brevity, results from the baseline cell specification are removed from this paper. They are quite similar to the results using the mandatory minimum specification, and are available from the author upon request.

a. Sentences

Table 4 shows results of Tobit estimations where months imprisonment is the dependent variable. Columns 1-3 show results when omitting all controls for mandatory minimum sentence and offense level for defendants who receive substantial assistance departures (Column 1), defendants who plead guilty without receiving substantial assistance (Column 2), and defendants who are convicted at trial (Column 3). In all three columns, coefficients on black, Hispanic, non-U.S. citizen, age, number of dependents, private attorney, hard (non-marijuana) drugs, Aggravating role, and criminal history category are significantly and substantially positive. Coefficients on female, mitigating roles, and federal public defender are significantly and substantially negative. Better-educated defendants receive shorter prison sentences when providing substantial assistance (Column 1), but their results are more ambiguous when pleading guilty without cooperation (Column 2).

Columns 4-6 repeat Columns 1-3 but control for the severity of i 's crime using the mandatory minimum specification, i.e. adding controls for mandatory minimum and safety valve. Many of the coefficients in Columns 1-3 retain their signs and significances but fall in absolute value, indicating that much of the reason that (for example) black dealers and dealers of hard drugs receive longer prison sentences is because they face stiffer mandatory minimum sentences. The coefficients on female fall in absolute value, indicating females receive shorter prison sentences partially because they face less stiff mandatory minimum sentences.

When final cell dummies are added to the right-hand-side (Columns 7-9), many coefficients weaken further. The findings in Columns 7-8 that black defendants receive significantly longer sentences even after controlling for sentence-related factors is consistent with

results of previous researchers (e.g., Albonetti 1997, Steffensmeier and Demuth 2000, Mustard 2001, Everett and Wojtkiewicz 2002, Sorensen et al 2014). Blacks convicted at trial receive significantly shorter sentences than whites (Column 9).³¹

Coefficients in Table 4 are used to create prices in the market for information. To illustrate, take the coefficients on the black dummy variable in Columns 1-2. Blacks who receive substantial assistance departures receive 9.5-month longer sentences than whites, while blacks who plead guilty without receiving substantial assistance receive 6.3-month longer sentences than whites. That means that blacks receive a $(9.5 - 6.3 =)$ 3.2-month *smaller* sentence reduction than whites when providing substantial assistance. That is, they receive a *lower price for their cooperation* when selling their information to prosecutors. Along the same lines, women receive a $(14.1 - 11.4 =)$ 2.7-month *larger* sentence reduction than men, i.e. a higher price for their cooperation when selling their information to prosecutors.

Table 5 shows *prices* in the market for information. Prices are $\hat{\gamma}_{PLEAD} - \hat{\gamma}_{SUBASST}$, the differences between coefficients when pleading guilty without cooperation and coefficients when providing substantial assistance.³² Column 1 shows prices when not controlling for mandatory minimums. Column 1 implicitly assumes that the application of mandatory minimums can change for defendants who provide substantial assistance. Females, better-educated defendants, dealers of hard drugs, Aggravating-role dealers, and some defendants with longer criminal histories receive significantly larger sentence reductions. Blacks, dealers represented by court-appointed counsel or federal public defenders, and low-level dealers receive smaller sentence reductions.

Column 2 shows prices when using the mandatory minimum specification, i.e. when assuming that application of mandatory minimum sentences is exogenous to a defendant's receipt of a substantial assistance departure. The high Column 1 prices received by dealers selling harder

³¹ The black dummy is also significantly negative in the baseline cell specification.

³² Standard errors are equal to $[\text{s.e.}(\hat{\gamma}_{PLEAD})^2 + \text{s.e.}(\hat{\gamma}_{RAT})^2]^{0.5}$.

drugs, playing Aggravating roles, and with longer criminal histories are substantially weakened, and for heroin the sign is actually reversed. These results suggest that much of harder-drug dealers' high prices when providing substantial assistance are gained through the reduction of mandatory-minimum charges.

Columns 3-4 repeat Columns 1-2 but show prices in terms of log months imprisonment instead of months imprisonment.³³ When omitting controls for mandatory minimums (Column 3), blacks receive 18% ($=\exp(-0.20)-1$) lower prices than whites, Hispanics receive 21% lower prices than whites, and illegal aliens receive 27% lower prices than whites. Women receive 40% higher prices than men, and college graduates receive 17% higher prices than high school dropouts.

For harder-drug dealers, Aggravating +2 dealers, and dealers with longer criminal histories, log sentence reductions are significantly negative in Column 3 even though sentence reductions in Column 1 were significantly positive. These defendants get significantly more time shaved off their sentences when cooperating only because they face longer sentences in the first place. Conversely, low-level dealers receive large log sentence reductions (Column 3) but small sentence reductions (Column 1) because they face shorter sentences in the first place.

Column 4 shows log sentence reductions when controlling for mandatory minimums. Black defendants receive 18% smaller reductions when not controlling for mandatory minimums (Column 3) but only 10% smaller log sentence reductions when controlling for them (Column 4). This suggests that blacks are less likely than whites to have mandatory-minimum related charges reduced when providing substantial assistance.³⁴ High-level dealers and dealers with long criminal histories receive smaller log sentence reductions in Column 3 than in Column 4, suggesting that high-level and career-criminal dealers are *more* likely than mid-level dealers to receive reductions of mandatory-minimum-related charges when providing substantial assistance.

³³ Appendix Table 1 shows results from the underlying OLS log imprisonment estimations.

³⁴ Starr and Rehavi (2012) find that federal prosecutors are twice as likely to file mandatory-minimum charges against black defendants as white ones.

To summarize Table 5: blacks, Hispanics, non-U.S. citizens, and dealers represented by court-appointed counsel tend to have small substantial-assistance related sentence reductions and small log sentence reductions, i.e. low prices of selling their information. Females and better-educated defendants tend to have larger sentence reductions and larger log sentence reductions, i.e. higher prices of selling their information. Aggravating-role dealers, harder-drug dealers, and dealers with longer criminal histories have large sentence reductions but their log sentence reductions are small because they face especially long sentences in the first place. Mitigating-role dealers experience small sentence reductions but large log sentence reductions because they face shorter overall prison sentences.

b. Probability of providing substantial assistance

Before discussing the probability of a defendant receiving a substantial assistance departure, it is important to discuss the endogeneity in Equation (2) regarding the control for expected sentence of pleading guilty without cooperation. In the mandatory minimum specification, expected sentence is identified by a weapons enhancement plus mandatory minimum dummies interacted with a safety valve dummy.³⁵ Table 5 has suggested, though, that much of the method by which defendants receive sentence reductions via cooperation is by getting mandatory minimum charges reduced, presumably through the plea-bargaining process (e.g. Reinganum 1988, Schulhofer and Nagel 1997). Therefore, results of Equation (2) could show a spurious negative relationship between expected sentence and probability of receiving a substantial assistance departure, because mandatory minimum charges are reduced for defendants who receive substantial assistance departures. As it stands, however, this paper finds a monotonically positive relationship between expected sentence of pleading guilty without cooperation and probability of providing substantial assistance. This can be interpreted, then, as a

³⁵ In estimations of Equation (2) where expected sentence was identified solely by a weapons dummy, a linear control for expected sentence was insignificant.

lower bound of a clearly positive relationship between expected sentence length and a drug trafficking defendant's cooperation with prosecutors.

Table 6 shows marginal effects on the probability of receiving a substantial assistance departure.³⁶ Column 1 omits controls for expected sentence. Black, Hispanic, other-race, non-U.S. citizen and age controls receive substantial assistance departures at significantly lower rates. Female defendants, defendants with better educations, and those with more dependents receive them at significantly higher rates. Defendants who retain private attorneys receive significantly more substantial assistance departures, and those represented by federal public defenders receive significantly fewer. Harder-drug dealers receive substantial assistance departures significantly more often than marijuana dealers (the omitted drug type category). Lower-level dealers, especially those with a Minimal -4 adjustment, receive fewer substantial assistance departures and Aggravating-role dealers, especially Aggravating +3 dealers, receive more.³⁷ Defendants with longer criminal records receive significantly more substantial assistance departures.

Column 2 adds a cubic control for defendants' expected sentence of pleading guilty without cooperation, where expected sentence is created from the mandatory minimum specification of Equation (1). Coefficients on expected sentence are not reported (all three coefficients are significant), but Figure 1 shows that defendants are monotonically more likely to receive a substantial assistance departure when facing longer expected sentences of pleading guilty without cooperation. A defendant facing a four-year sentence has a 24% probability of receiving a substantial assistance departure, one facing a fifteen-year sentence has a 40% probability, and one facing a 30-year sentence has a 65% probability.

Controlling for expected sentence does not change the signs or significances of marginal effects on most demographic controls, though the positive coefficient on court-appointed counsel becomes significant. Black and Hispanic dealers, non-U.S. citizen dealers, and dealers

³⁶ Marginal effects are calculated at the mean values of right-hand-side variables.

³⁷ Maxfield and Kramer (1998), using an admittedly small sample size, found that "high-level" dealers were less likely to receive substantial assistance departures than almost all other types of drug traffickers.

represented by federal public defenders still receive significantly fewer substantial assistance departures, while women, better-educated defendants, and defendants represented by private attorneys still receive significantly more.

Marginal effects related to type of drug dealt, role in the offense, and criminal history change substantially in Column 2 because these factors are substantially correlated with expected prison sentence. Crack dealers become significantly less likely to cooperate, and heroin and methamphetamine dealers no more likely to cooperate, when controlling for expected sentence. Cocaine and other-drug dealers still cooperate significantly more often than marijuana dealers, but their marginal effects become less intense. Minor -2 defendants now provide substantial assistance significantly more often, and Minimal/Minor -3 and Minimal -4 dealers no less often, than mid-level dealers. Aggravating +2 and Aggravating +4 dealers now cooperate significantly less often than mid-level dealers. Aggravating +3 dealers, however, still cooperate significantly more often. Longer criminal histories also become correlated with fewer substantial assistance departures.

c. The market for information

Table 5 established that different groups of defendants receive different *prices* when providing substantial assistance. Table 6 showed that different groups have different *quantities* of providing substantial assistance. Tables 7-8 combine this price and quantity information to illustrate relative supply and relative demand differences in the market for cooperation.³⁸ Table 7 shows the market when prices—as measured by *log sentence reductions*—omit all controls for mandatory minimums and offense levels, and quantities—as measured by *probabilities of receiving substantial assistance departures*—omit controls for expected sentence. Groups with

³⁸ Since underlying supply and demand are unobservable, only relative supply and demand can be stated with some level of certainty. For example, that women have high demand relative to men does not preclude them from having higher supply than men, but makes clear that high demand overwhelms any supply differences.

high (low) prices have significantly positive (negative) signs in Table 5 Column 3, and those with high (low) quantities have significantly positive (negative) signs in Table 6 Column 1.

Groups in Table 7 exhibiting high relative supply—low prices and high quantities—are defendants expecting long sentences if they don't provide information. These include harder-drug dealers, dealers with extensive criminal histories, and Aggravating +2 dealers. Those with low relative supply are low-level dealers, who face shorter sentences. Groups with high relative demand for cooperation—high prices and high quantities—are females and defendants with at least a completed high school education. Groups with low relative demand are Blacks, Hispanics, other races, and non-U.S. citizens.

Type of attorney also affects a defendant's position in Table 7. Clients of federal public defenders experience significantly lower quantities but insignificantly different prices, while clients of private attorneys experience significantly higher quantities but insignificantly different prices. Indigent clients of court-appointed counsel receive significantly lower prices, but not significantly different quantities.

Table 8 shows the market for cooperation where quantity is conditional on the mandatory minimum specification of expected sentence (Table 6 Column 2). Since this specification assumes mandatory minimums are exogenous to case disposition, prices are adjusted to those acquired from estimations using the mandatory minimum specification (Table 5 Column 4). Relative demand becomes low for crack dealers, Aggravating +2 and +4 dealers, and dealers with extensive criminal histories. Conversely, Minor -2 dealers had low relative supply in Table 7 but high relative demand in Table 8. In Table 8, only cocaine dealers, other-drug dealers, Aggravating +3 dealers, and dealers represented by court-appointed counsel have high relative supply of substantial assistance, and no groups have low relative supply.

VI. Explaining differences in the demand and supply for substantial assistance

Tables 7-8 show substantial differences between race, gender, citizenship and education-level groups in law enforcement's demand for their substantial assistance. It is possible that these

differences reflect discrimination in the criminal justice system. Schanzenbach (2005), for example, shows strong evidence that male judges discriminate in favor of female defendants during criminal sentencings. If male federal agents and prosecutors similarly favor female defendants, it could account for the high demand for testimony of females observed in this paper.³⁹ Antonovics and Knight (2004) and Donohue and Levitt (2001) show evidence of racial biases among white police officers. If such biases extend to white federal agents and prosecutors, it could explain the low demand for testimony for black, Hispanic, and non-U.S. citizen defendants.

Demand-side discrimination could also conceivably be related to biases of juries. Anwar, Bayer, and Hjalmarsson (2012) find that adding a small number of black citizens to a jury pool, let alone a sitting jury, eliminates a significant and substantial conviction rate between white and black defendants. If white-dominated juries value testimony more from white witnesses than black and Hispanic witnesses, prosecutors facing more heavily white jury pools may demand more substantial assistance from white defendants.

Observed demand differences may not be related to discrimination, however. The differences in demand could reflect between-group differences in underlying characteristics that are valued by the criminal-justice system but are unobserved in the MFCS dataset. Defendants with higher cognitive ability may be better at revealing the inner workings of criminal organizations to prosecutors and jurors (Pileggi 1986), and cognitive ability is correlated with years of education (e.g. Neal and Johnson 1996). This would make better-educated defendants more productive witnesses, increasing their demand. Prosecutors and juries may also value remorse when demanding substantial assistance (Eichenwald 2000 p. 480, Simons 2002), and remorse may be heterogeneously distributed among different groups. Women, for example, may exhibit more remorse over drug trafficking than men.

³⁹ Some anecdotal evidence suggests that male criminals assume women have high relative supply in the market for information (e.g. Sullivan 2003 p. 182, Brown 2005 p. 28).

Table 7 shows that relative supply differences in the market for cooperation are strongly associated with expected sentence. It seems probable that drug dealers facing long stretches in prison are more willing to supply substantial assistance to shorten their sentences, while those facing shorter stretches in prison are less willing. Another possibility is that dealers facing long sentences possess extensive knowledge of the criminal activities of others, so their cost of producing substantial assistance is low, raising their supply. Conversely, low-level dealers and dealers without criminal records may wish to provide substantial assistance, but be too ignorant of others' criminality to do so, giving them low supply. (This is the "cooperation paradox" mentioned in Footnote 14.) It is also possible that low-level dealers have low supply because they fear retaliation if they provide evidence against higher-level dealers (Kahn 2007).

That demand conditional on expected sentence (Table 8) is high for Minor -2 dealers and low for dealers with long criminal records and Aggravating +2 and +4 dealers suggests that judges, prosecutors, and juries value testimony from defendants with less criminal culpability, even if such defendants are less willing or able to supply it (Table 7). Perhaps using the testimony of lower-level defendants to help convict and imprison high-level and career-criminal defendants fits within the moral framework of prosecutors and juries. Lower-level dealers may also exhibit more remorse over drug trafficking than higher-level and career-criminal dealers.

The high supply of Aggravating +3 dealers, even conditional on expected sentence, is at odds with other high-ranking dealers. Recall that Aggravating +3 dealers are explicitly not "organizers or leaders" of large drug conspiracies, but are "managers or supervisors." Their high supply could be explained by their possession of information that gives them an especially low cost of producing testimony that can be used to convict the highest-level Aggravating +4 dealers for whom they work (e.g., Fried 1994).

That Table 8 shows higher demand conditional on expected sentence for Minor -2 dealers, but not Minimal/Minor -3 or Minimal -4 dealers, may reflect endogeneity issues. Schulhofer & Nagel (1997) show that prosecutors occasionally manipulate a defendant's role-in-

the-offense adjustment in order to reduce his prison sentence. Under the mandatory guidelines system, such mitigation of role-in-the-offense adjustments would have been more necessary for defendants not receiving substantial assistance departures, whose final offense levels were strongly determinant of prison sentence. Thus there could have been reverse causality: some defendants may have received Minimal/Minor -3 and Minimal -4 adjustments precisely because they did not receive substantial assistance departures. This may account for why, in Table 8, Minimal -3 and Minimal/Minor -4 defendants do not receive higher quantities of substantial assistance than mid-level defendants, even though Minor -2 defendants do.⁴⁰

That cocaine and other-drug dealers exhibit higher supply of substantial assistance even after controlling for expected sentence may indicate differences in the expected costs of conviction. If, for example, cocaine dealing is an especially remunerative practice, cocaine dealers may have accumulated large amounts of assets that they wish to keep after undergoing prosecution. They may sell substantial assistance in exchange for asset retention rather than sizeable sentence reductions.⁴¹ Another possibility is that dealers of drugs such as LSD (Rosenfeld 2001) and steroids (Dorman & Llosa 2006) have skills that are more transferable to more legitimate professions, making them more willing to supply substantial assistance because their opportunity costs of an extended prison sentence are higher. *Ceteris paribus*, for the same time spent in prison, high-income convicts lose more than low-income convicts (Lott 1992).

Results regarding attorney type may reflect different incentive structures facing different attorneys. Court-appointed attorneys, for example, are paid by the government at an hourly rate. Iyengar (2007) theorizes that such an incentive cause court-appointed counsel to proceed to trial on cases that are weaker from the defense standpoint (Iyengar 2007, Anderson and Heaton 2011). Hourly-rate incentives may similarly result in a higher supply of substantial assistance in Table 8,

⁴⁰ The author has a work-in-progress showing that, under mandatory sentencing guidelines, defendants received significantly more Minimal/Minor -3 and Minimal -4 adjustments when they faced higher base offense levels, as long as they did not also receive a substantial assistance departure.

⁴¹ I thank Randy Fortenberry for pointing this out.

because representing a testifying witness may result in more billable hours than representing a client who remains silent and quickly pleads guilty. Private attorneys may have similarly high quantities of substantial assistance among their clients because they wish to extend their representation of clients paying hourly rates. But private attorneys may receive significantly higher prices of information for their defendants than court-appointed attorneys because they are more capable defense attorneys or represent defendants whose testimony is more valuable to prosecutors.

Defendants represented by federal public defenders have low rates of providing substantial assistance but receive insignificant price differences. This may reflect a long-run equilibrium where federal public defenders provide low supply of substantial assistance because they have less financial incentive to extend their representation of a particular client or have a more adversarial attitude towards the prosecution (e.g. Deutsch et al 1990). Prosecutors respond by lowering their demand for substantial assistance from clients of public defenders.

VII. Race-specific results

Appendix Tables 2 and 3 respectively show substantial assistance prices and quantities separately for white, black, and Hispanic drug trafficking defendants,⁴² and Appendix Figure 1 shows, for each race, how expected sentence correlates with probability of providing substantial assistance.

Tables 9-11 summarize race-specific results by showing, by race, which characteristics are in high relative demand, low relative demand, high relative supply, and low relative supply. Among white dealers (Table 9), women, high school graduates, and those with some college are in high relative demand regardless of specification. When expected sentence is controlled for,

⁴² Results from the underlying race-specific OLS estimations and Tobit estimations are available from the author upon request. In the logit estimations, expected sentences are created via race-specific Tobit estimations of Equation (1). The race-specific logit estimations also include acquitted defendants. For each district, I calculate the share white, black, and Hispanic of defendants who were convicted at trial, and assume that defendants acquitted at trials have the same shares. Each acquitted defendant is assigned right-hand side variable values equal to means of same-district, same-race defendants who were convicted at trial.

Minimal -4—the lowest-possible role in an offense—experiences high relative demand and non-U.S. resident defendants experience low demand. Also when controlling for expected sentence, crack dealers, aggravating-role dealers, and dealers with extensive criminal histories are in low relative demand, indicating that prosecutors are less willing to cut substantial assistance deals with more morally repugnant white defendants. Cocaine dealers and dealers represented by court-appointed counsel have high supply of cooperation even when controlling for expected sentence.

Noticeably fewer factors are significant when turning the focus to black defendants (Table 10). Females experience high relative demand in both specifications, and Minor -2 dealers experience high relative demand when controlling for expected sentence. Aggravating +2 dealers experience low relative demand when controlling for expected sentence. There is no significant relationship between education level and relative demand among black defendants. Like whites, black dealers with longer criminal histories have high relative supply of cooperation when omitting expected sentence controls but low relative demand for cooperation when including them. Court-appointed counsel results in a high relative supply of cooperation in both specifications.

Among Hispanic defendants (Table 11), women and defendants with some college experience high relative demand, and non-U.S. citizens experience low relative demand, whether controlling for expected sentence or not. Minor -2 dealers have low relative supply in both specifications, and defendants who deal multiple kinds of drugs have high relative supply. Defendants with long criminal histories again have high supply when omitting sentence controls and low demand when including them.

For all races, then, women experience high relative demand for substantial assistance.⁴³ Better-educated white and Hispanic defendants experience high relative demand, but not better-

⁴³ Relative demand for women appears to be highest among Hispanics and lowest among whites. When controlling for expected sentence using the mandatory minimum specification, Hispanic women receive 55

educated black defendants. There is more evidence that prosecutors demand substantial assistance from low-level dealers among whites and blacks than among Hispanics. Among all races, defendants with long criminal histories have high relative supply of substantial assistance, but low relative demand after controlling for expected sentence. White and black dealers represented by court-appointed counsel have higher relative supply of substantial assistance.

VIII. Conclusion

This paper examines the market for information—“substantial assistance”—in federal drug prosecutions. Using detailed data regarding prison sentences imposed in federal court, estimations show defendant demographics, the defendant’s role in a drug conspiracy, and the defendant’s legal representation yield significant and substantial differences in both the size of sentence reductions associated with providing evidence against others and the probability of receiving such sentence reductions. Women and better-educated defendants experience significantly larger sentence reductions and more frequent substantial assistance departures. This translates into them experiencing high relative demand from law enforcement for the information they provide. Blacks, Hispanics, and non-U.S. citizens all experience smaller sentence reductions and less frequent substantial assistance sentence reductions; i.e., relatively low demand for their information. Defendants facing long prison sentences—dealers of harder (non-marijuana) drugs, high-level dealers, and dealers with extensive criminal histories—have high relative supply of information, while lower-level dealers have low relative supply. Conditional on expected sentence, though, crack dealers, high-level dealers, and dealers with extensive criminal histories experience low relative demand, and minor-role dealers experience high relative demand.

Many differences in supply appear to result from defendants being more willing or able to provide substantial assistance when facing longer sentences. That crack dealers, high-level dealers, and/or dealers with long criminal records experience lower relative demand for their

percent higher prices than Hispanic men and receive sentence reductions 50 percent more often. Among whites, prices are 25 percent higher for women and sentence reductions 27 percent more likely. Among blacks, prices for women are 40 percent higher and sentence reductions 39 percent more likely.

information conditional on expected sentence suggests that prosecutors would rather not grant substantial assistance departures to more morally repugnant defendants.

Separating markets by race shows that women of all three races experience high relative demand for cooperation. Lower-level white and black, but not Hispanic, dealers experience high relative demand. Better-educated white and Hispanic, but not black, defendants experience higher relative demand. Among all races, dealers with long criminal records have high relative supply that turns into low relative demand after controlling for expected sentence.

Some of the speculation in this paper regarding the causes of demand and supply differences across different defendants could be tested with more detailed data. Whether females receive higher relative demand because they are perceived to possess more remorse could be tested with detailed information of comments at sentencing hearings. Seeing how many convictions resulted from defendants' substantial assistance, or the resultant prison sentences of their substantial assistance, could assist in determining whether better-educated defendants provide more productive testimony.

Better data could also help determine whether different structures of criminal organizations yield differences in the demand for substantial assistance. For example, if the government prosecutes a conspiracy where information is known by all conspirators, each defendant's information would be easily substitutable, so prosecutors could reduce demand for substantial assistance. But in conspiracies where information is more tightly controlled (e.g. Breslin 2008), certain defendants would possess less substitutable information, increasing demand for their substantial assistance. Furthermore, if drug trafficking conspirators of different demographic backgrounds tend to organize their conspiracies differently, it could explain some of the demographic differences in demand shown in Tables 7-8.

APPENDIX

Murphy and Topel (1985) provide a method of correcting standard errors when using a predicted value as a right-hand-side variable. Hole (2006) demonstrates how, using Stata, Murphy-Topel can be applied by calculating the score value from first-stage maximum likelihood estimation.

A complication in this paper is that the predicted value—expected sentence if plead guilty without cooperation—is constructed by estimating an equation on only part of the population used in the second-stage estimation. Defendants who receive substantial assistance departures or are convicted at trial do not have calculable score values pertaining to the expected sentence of pleading guilty without cooperation.

I create score values for these defendants using a method outlined by Juhn, Murphy, and Pierce (1991 and 1993). For each set of populations c (SUBASST, PLEAD, TRIAL) I estimate first-stage Tobit equations and establish score values. I assign each observation's score a within- c percentile value from 0 to 99. SUBASST and TRIAL observations in percentile n of their own-population score functions are assigned the median score function of percentile n in the PLEAD population when correcting standard errors. Defendants who were acquitted at trial are assigned a percentile equal to the within-district median percentile among defendants who were convicted at trial.

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