"Modelling the Impact of Recidivism on Worklife Expectancy"

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I. Introduction

The United States has the largest incarcerated population and the highest incarceration rate of any country. In 2010, there were 2.3 million inmates in prisons and jails in the U.S., which equals roughly 1 in every 100 adults. There has been a 300 percent increase in the U.S. incarcerated population since 1980 (Pew, 2010). These incarcerated persons cannot participate in the labor force. And once they exit prison, they face of the risk of recidivating. When a forensic economist is presented with a case involving a personal injury or a wrongful death case of an ex-prisoner it may be necessary to account for the probability of recidivism.

The purpose of this paper is to show how to model the probability distribution of recidivism for ex-prisoners and to use this information to adjust worklife probabilities. In the second section, a brief review of the literature will be given. In the third section, the assumptions of a Markov model and the data are described. In the fourth section, the model will be presented with tables giving probabilities of ex-prisoners being available to work (i.e., not in prison) for varying future years of possible lost earnings, conditioned on how many years an ex-prisoner has gone without recidivating. The final section will conclude the paper.

II. Literature Review

There has been a paucity of articles in the forensic economics literature on the employment possibilities of ex-prisoners. Needham and Shipp (2003, 2005) discuss some of the difficulties that ex-prisoners face in obtaining and keeping jobs. They note, based on a Bureau of Justice Statistics three year study (Langan et al., 2002) of prisoners released in 1994, that there is a relatively high probability of re-incarceration, with 51.8% of ex-prisoners being re-incarcerated

within three years of release. They provide good insight into some of the issues but do not model the conditional probabilities of recidivism.

The Bureau of Justice Statistics (BJS) (Durose et al., 2014) recently released the results of a more comprehensive study that collected sample data that tracked 412,731 ex-prisoners in 30 states for five years after their release in 2005 and drew a random sample of 68,597 persons. (In comparison, the 1994 study (Langan et al., 2002) tracked 272,111 ex-prisoners from 15 states for 3 years and randomly sampled 38,624 persons.) The BJS (Durose et al., 2014) analyzed six different measures of recidivism: arrest, adjudication, conviction, incarceration, imprisonment, and return to prison. The BJS notes that "returning to prison is probably the most common measure used in the field when studying the recidivism of released inmates" (Durose et al., 2014, p. 15). For the purpose of estimating the negative effect of recidivism on worklife, return to prison is the most important measure that a forensic economist can use because time in prison removes the person from labor market availability.

While the focus of this paper will be the effect of incarceration and recidivism on worklife probabilities, it is worthwhile noting that an incarceration record has other deleterious effects. The Pew Charitable Trust estimates that after controlling for age, education, and other factors, past incarceration reduced subsequent wages by 11 percent, reduced annual employment by nine weeks and lowered yearly earnings by 40 percent (Pew, 2014).

III. Assumptions and Data

Assumptions

There are large number of paths that an ex-prisoner can follow after release from prison. For example, at one extreme, the prisoner could remain out of prison for the rest of their life. At

the other extreme, the ex-prisoner might recidivate in the first year out of prison, go back to prison for perhaps five years, then repeat the process. Of course many other possible paths could be followed. For example, the ex-prisoner may not recidivate until four years out, then go to back to prison for perhaps five years, then be freed and never recidivate again. This process is a Markov process.

Given that the BJS (Durose et al., 2014) has tracked prisoners for a five year period, it is possible to model this process with a five period memory. For example, a person who has been out of prison for four years is much less likely to recidivate than someone who has been out of prison only one year. Another important factor to consider in this process is the length of the prison sentence that will be imposed on the recidivist. Sentences can vary according to the severity of the crime and past criminal offenses. In order to make this model reasonably tractable, several assumptions will be made.

First, it will be assumed that all prisoners receive a five year sentence. Although state prisoners face different sentences than federal prisoners, we will assume that the average length of a sentence is five years for both state and federal prisoners. According to a BJS study (Rosenmerkel, Durose, and Farole, 2009) the average length of a prison sentence for males in state courts in 2006 was roughly five years (61 months). And according to a Pew Charitable Trust report (2015) on federal prisoners, there has been a significant increase in the average length of time served from 1988 to 2010, rising from 17.9 to 37.5 months. For drug offenders, who represent nearly half of the federal prison population, the time served increased from less than two years to nearly five years. Pew (2015) reasons that the increase in lengths of sentence is due to sentencing reforms, federal parole elimination, and mandatory minimum penalties enacted by Congress. The Urban Institute (Courtney et al. 2017) reports that the average time

served in 44 states that reported data to the National Corrections Reporting Program was 4.22 years (and 4.36 years for states that reported data for 2014), compared to 3.39 years in 2000. Courtney et al. (2017) use a different approach to measure the average length of prison terms. The traditional measure of time served is the average length of prison terms served for all people released in a given year, but this only includes people released in that year and thus over represents persons serving shorter sentences. To counter this problem, Courtney et al. (2017) also include the length of the prison sentence that a currently imprisoned person has served to date. (This is not a perfect adjustment since it underestimates the total length that will ultimately be served.) They estimate that the average time served has been rising in all 44 states that reported data from 2000 to 2014. The rise has been greatest for those convicted of violent offenses.

Second, it is assumed that the probabilities of recidivism, discussed below, are the same for persons after the first and second time that they exit prison in our model. We make this assumption since there are no data currently available that provides different probabilities for persons returning a second time. It should be noted that we refer to a second return to prison when it occurs for a second time in our model. But for some of these prisoners it will be more than their second time in prison. The BJS (Durose et al., 2014) study estimates that the mean number of prior convictions per released prisoner is 4.9. (They do not give statistics on prior prison sentences, but convictions should serve as proxy for sentences.)

Third, it will be assumed that if a person goes to prison for a third time that they will never again have gainful employment. Although this paper does not assume that the offenses are necessarily as heinous as those offenses that apply to the "three strikes and you're out" rule, we assume that the person will never work again. The person may not go back to prison forever, but

it is assumed that they will never be employed again. The model can be modified to allow another reentry (after three prison sentences) into the non-incarcerated population.

Data

The BJS (Durose et al., 2014) presents summary results on recidivism in Table 16 of their report for various measures of recidivism. We will focus on the recidivism rates for "return to prison." The BJS (Durose et al., 2014) classifies persons as returning to prison "when an arrest resulted in a conviction with a disposition of a prison sentence or when the offender was returned to prison without a new conviction because of a technical violation of his or her release, such as failing a drug test or missing an appointment with a parole officer." The BJS considers a person to be in prison if the sentence length is longer than one year. Specifically, the BJS (Durose et al., 2014, p. 21) states, "When the type of facility (e.g., prison or jail) where an incarceration sentence was to be served was not reported in the criminal history records, a sentence of a year or more was defined as imprisonment."

The data reveal that each year that a person "survives" without recidivating reduces the probability of recidivating in future years. In Table 1, we present data from the BJS (Durose et al., 2014) Table 16 for "return to prison." It is evident that 30.4% recidivate within one year, 43.3% recidivate within two years, 49.7% recidivate within three years, 52.9% recidivate within four years and 55.1% recidivate within five years. From this cumulative data, we can construct the conditional probabilities of recidivating for persons who have been successfully out of prison for several years. In Tables 2–5, we calculate the conditional (on the number of years without recidivating) cumulative probabilities of return to prison for all offenses and the subcategories of violent, property, drug and public order offenses.

In Table 2, it can be seen that a released prisoner who has survived one year without recidivating has a 35.5 percent chance of recidivating within the next four years, which is five years since their release. The conditional (conditioned on surviving one year) probabilities in Table 2 are calculated as follows. After one year, 69.6 (100 free persons - 30.4 persons who recidivate) out of 100 released prisoners have remained out of jail. Of this surviving 69.6 persons, 12.9 (=43.3-30.4), or 18.5% will recidivate within the next year. Also in this next year 56.7 have remained out of prison. Of the 69.6 persons who survived one year, 19.3 (=49.7-30.4), or 27.7% cumulatively will year have recidivated within the next two years. In a similar vein, after three years, cumulatively 32.3% ((52.9-30.4)/69.6) of the original 69.6 persons who survived one year, have recidivated, and cumulatively 35.5% ((55.1-30.4)/(69.6)) have recidivated by year 4.

In Table 3 it can be seen that a released prisoner who has survived two years without recidivating has a 20.8% ((55.1-43.3)/(100-43.3)) chance of recidivating within the next three years, which is five years since their release. In Table 4 it can be seen that a released prisoner who has survived three years without recidivating has a 10.7% ((55.1-49.7)/(100-49.7)) chance of recidivating within the next two years, which is five years since their release. In Table 5 it can be seen that a released prisoner who has survived four years without recidivating has a small (4.7% =((55.1-52.9)/(100-52.9))) chance of recidivating within the next year, which is five years since their release. As can be seen in Table 5, only 2.2 out of 47.1 persons (=4.7%) recidivate within the next year, so the percent who recidivate at year 6 is likely to be close to zero. It will be assumed that if someone "survives" five years without recidivating, they will remain on a path out of prison for the remainder of their life. In the next section the survival process will be

modeled to account for these aforementioned different probability distributions for ex-offenders, conditioned on how many years they have been out of prison.

IV. A Markov Model for Determining Probabilities of Remaining out of Prison

In the usual Markov model for determining labor force attachment (see Millimet et al., 2003; Skoog et al., 2011), persons can transition in and out of labor force activity each year (except of course they cannot return from the state of death). In modelling the years in which a person is out of prison, a somewhat similar process occurs. Namely an ex-prisoner can move in and out of the two states of free or incarceration several times. But there is a significant difference whereas person can move from the free-state to the incarcerated state in any year, the incarcerated person has to remain in prison for several years before they can return to the free-state. As noted above, it will be assumed that the ex-prisoner will remain in prison for five years each time they return to prison. Of course, this could be modified to assume that the length of sentence could be longer each time a person returns to prison if data become available.

To determine the availability to work in given future years, depending (i.e. conditional) on the number of years that a released prisoner has been out of prison, a Markov process is constructed in Tables 6-10 to show the various paths that ex-prisoners may follow. Figures 1 and 2 illustrate the process.

Table 6 shows the probabilities of a being "free" each year for a person who has recently been released and, of course, has the highest risk of recidivism. The data in columns 2 and 3 come from the BJS (Durose et al., 2014) Table 16, as shown in our Table 1. There are five major branches of recidivism that these released prisoners can follow. Group 1 refers to persons who will recidivate within one year. Group 2 refers to persons who will recidivate between year one

and year two. Group 3 refers to persons who will recidivate between year two and year three. Group 4 refers to persons who will recidivate between year three and year four. Group 5 refers to persons who will recidivate between year four and year five.

Figure 1 shows the Markov chain for years one through five for 100 persons beginning on the day that they are released from prison. The conditional probabilities of surviving free or returning to prison are shown on each branch. The number of persons (out of an initial 100 persons) are shown in parentheses at the end of each branch below the words "Prison Group _" or "Free." For example at the end of year 4, 47.1 persons have survived free. The conditional probability of remaining free during year 5 is 0.953 which when multiplied by 47.1 yields 44.9 persons who will remain free forever since they have survived five years. The conditional probability of returning to prison is 0.047, which when multiplied by 47.1 yields 2.2 persons who will comprise Group 5 and return to prison for five years.

Group 1, shown in Table 6, is the group of 30.4 persons who recidivated within one year and then spent five years in jail. At the beginning of year 6 they return to free society and by the end of year 6, 30.4% (9.24) of these 30.4 newly released prisoners are back in prison within a year. They will remain in prison for five years, and because this is their third time in prison, it is assumed that they will never return to the population of persons available to work. 21.16 of these 30.4 persons remain free for at least one year. By the end of year 7, 43.3% (13.16 persons) of these 30.4 persons cumulatively will be in prison. This is 3.92 (13.16-9.24) additional persons who will never work again because this is their third sentence. Cumulatively 17.24 persons will still be free. Similar calculations can be made until year 10. At the end of year 10, 16.75 (=0.551*30.4) persons cumulatively will never work again. 13.65 (=30.4-16.75) persons have survived five years and thus, by assumption, will be free for the rest of their lives, no differently

than those who survived five years without recidivating after their first release from prison. Figure 2 illustrates this process for Group 1 and shows the conditional probabilities at each branch. Similar figures could be drawn for Groups 2-5.

Group 2, shown in Table 6 is the group of 12.9 persons who recidivated between the end of year one and the end of year two and then spent five years in jail. In year 7, they return to free society and by the end of year 7, 30.4% (3.92) of these 12.9 newly released prisoners are back in prison. They will remain in prison and because this is their third time in prison, it is assumed that they will never return to the population of persons available to work. 8.98 of these 12.9 persons remain free for at least one year. By the end of year 8, 43.3% (5.59 persons) of these 12.9 persons will cumulatively be in prison. This is 1.66 (5.59-3.92) additional persons who will never work again because this is their third sentence. Cumulatively 7.31 persons will still be free. Similar calculations can be made until year 11. At the end of year 11, 7.11 (=0.551*12.9) persons cumulatively will never work again. 5.79 (12.9-7.11) persons will be free for the rest of their lives.

Similar calculations can be made for Group 3 (ex-prisoners who recidivated between years 2 and 3 and return to freedom in year 8); Group 4 (ex-prisoners who recidivated between years 3 and 4 and return to freedom in year 9); and Group 5 (ex-prisoners who recidivated between years 4 and 5 and return to freedom in year 10).

In the next to last column, labeled “Total Free,” the total number of persons who are free each year for years one through five are simply the numbers from the third column. In years six and thereafter, the number who are free are summed from each of the five groups plus the persons in the third column who are free. At the end of year 1, 69.6 persons are free. At the end of year 5, 44.9 persons are free. At the beginning of year 6, the 30.4 persons from Group 1 are

released. And some of them (21.16) remain out of prison so that 66.1 (44.9 + 21.16) persons of the original 100 persons are free at the end of year 6. At the beginning of year 7, the 12.9 persons from Group 2 are released and some of them (8.98) are still free at the end of the year and some of the free persons (17.24 of the 30.4) from Group 1 are still free. The total number of free persons equals 44.9 plus 17.24 plus 8.98 which equals 71.1 free persons. Each year some persons are added from the newly released group and some are lost from the previous groups of newly released persons. Eventually 69.6 persons are free starting in year 14 for the remainder of time. The calculations are done for an arbitrary 25 future years. If we assume that persons recidivate at the mid point of the year, we can average the number of free persons between any two years to calculate the last column in Table 6, labeled "Mid Point." This is the number of persons who were, on average, free each year.

Tables 7-10 provide calculations for the probability of being free or in prison for persons who, at the time of their injury (or death), had survived one, two, three, or four years, respectively, without going back to prison. It can be seen that the probability of returning to prison greatly diminishes the longer a person has gone without recidivating. For example, in Table 8, there is an 88.5% chance of being free in years 12 to 25 for persons who have gone two years without recidivating. Note the cumulative probabilities of returning to prison are 11.29% for year 1, 16.93% for year two and 20.81% for year 3, as shown in the second column, come from Table 3 which gives the conditional probabilities of recidivating for a person who has survived two years. Also note that there are no persons in Groups 4 and 5 because for persons who have survived two years free they will be permanently free if they survive three more years.

Forensic economists can use Tables 6-10 to adjust the worklife probabilities at each age. If one uses the worklife probabilities (e.g. Tucek (2015) derived from Skoog et al., 2011) at each

age, the forensic economist could multiply Tucek's (2015) probabilities by the probabilities in Tables 6-10 to get the adjusted worklife probabilities (i.e., multiplied by the probability of an ex-prisoner staying free). It is assumed that probability of death is being modelled in the worklife probabilities at each age and thus does not need to be modelled into Tables 6-10.

V. Conclusions

This paper has shown how to model the probability of an ex-prisoner being free in future years conditional on how many years the person has survived without recidivating. These probabilities can be used to adjust the usual worklife probability at each age to calculate worklife probabilities for ex-prisoners. The assumptions in this model were chosen to be reasonable, such as assuming that after a third prison term, there is essentially no possibility of being in the labor force. We assume that if an ex-prisoner survives five years, they will remain out of prison for the rest of his life. We assume that the average prison length is five years. These assumptions can be modified to adjust the model. It should be noted that the individual BJS data are not available to the public at this time due to confidentiality restrictions. Thus it is not possible to adjust the recidivism probabilities any further than shown in this paper. For example, it may be likely that a younger person or a male is more likely to recidivate, but the data are not available to adjust the model for this factor. This model provides forensic economists a useful framework for estimating the worklife expectancy of ex-prisoners who have been injured at zero, one, two, three, or four years out of prison.

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Table 1: Recidivism rates for return to prison by most serious offense

	Cumulative percent of released prisoners who recidivated within					
	6 months	1 year	2 years	3 years	4 years	5 years
Return to prison	17.6	30.4	43.3	49.7	52.9	55.1
Violent	16.2	27.5	39.5	45.4	48.4	50.6
Property	21.8	36.4	49.6	56.2	59.5	61.8
Drug	15.4	28.1	41.8	48	51.2	53.3
Public order	16.1	27.7	39.4	46.7	50.1	52.6

Table 2: Recidivism rates for ex-prisoner who survives one year without recidivating

	Cumulative percent of released prisoners who recidivated within			
	1 year	2 years	3 years	4 years
Return to prison	18.5	27.7	32.3	35.5
Violent	16.6	24.7	28.8	31.9
Property	20.8	31.1	36.3	39.9
Drug	19.1	27.7	32.1	35.0
Public order	16.2	26.3	31.0	34.4

Table 3: Recidivism rates for ex-prisoner who survives two years without recidivating

	Cumulative percent of released prisoners who recidivated within		
	1 year	2 years	3 years
Return to prison	11.3	16.9	20.8
Violent	9.8	14.7	18.3
Property	13.1	19.6	24.2
Drug	10.7	16.2	19.8
Public order	12.0	17.7	21.8

Table 4: Recidivism rates for ex-prisoner who survives three years without recidivating

	Cumulative percent of released prisoners who recidivated within	
	1 year	2 years
Return to prison	6.4	10.7
Violent	5.5	9.5
Property	7.5	12.8
Drug	6.2	10.2
Public order	6.4	11.1

Table 5: Recidivism rates for ex-prisoner who survives four years without recidivating

	Cumulative percent of released prisoners who recidivated within
	1 year
Return to prison	4.7
Violent	4.3
Property	5.7
Drug	4.3
Public order	5.0

Table 6: Percentage of ex-prisoners free each year conditional on day of release

	Inmates 100		Group 1		Group 2		Group 3		Group 4		Group 5		Total	Mid
Year	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Free	Point
0	0	100	0	30.4	0	12.9	0	6.4	0	3.2	0	2.2	100.0	
1	30.4	69.6	30.4	0	0	12.9	0	6.4	0	3.2	0	2.2	69.6	84.8
2	43.3	56.7	30.4	0	12.9	0	0	6.4	0	3.2	0	2.2	56.7	63.2
3	49.7	50.3	30.4	0	12.9	0	6.4	0	0	3.2	0	2.2	50.3	53.5
4	52.9	47.1	30.4	0	12.9	0	6.4	0	3.2	0	0	2.2	47.1	48.7
5	55.1	44.9	30.4	0	12.9	0	6.4	0	3.2	0	2.2	0	44.9	46.0
6		44.9	9.24	21.16	12.9	0	6.4	0	3.2	0	2.2	0	66.1	55.5
7		44.9	13.16	17.24	3.92	8.98	6.4	0	3.2	0	2.2	0	71.1	68.6
8		44.9	15.11	15.29	5.59	7.31	1.95	4.45	3.2	0	2.2	0	72.0	71.5
9		44.9	16.08	14.32	6.41	6.49	2.77	3.63	0.97	2.23	2.2	0	71.6	71.8
10		44.9	16.75	13.65	6.82	6.08	3.18	3.22	1.39	1.81	0.67	1.53	71.2	71.4
11		44.9	16.75	13.65	7.11	5.79	3.39	3.01	1.59	1.61	0.95	1.25	70.2	70.7
12		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.69	1.51	1.09	1.11	69.8	70.0
13		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.16	1.04	69.7	69.8
14		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.7
15		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
16		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
17		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
18		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
19		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
20		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
21		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
22		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
23		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
24		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6
25		44.9	16.75	13.65	7.11	5.79	3.53	2.87	1.76	1.44	1.21	0.99	69.6	69.6

Table 7: Percentage of ex-prisoners free each year conditional on one year of no recidivism

Inmates

100			Group 1		Group 2		Group 3		Group 4		Group 5		Total	Mid
Year	Jail	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Free	Point
0	0	100.00	0.00	18.53	0.00	9.20	0.00	4.60	0.00	3.16	0.00	0.00	100.0	
1	18.53	81.47	18.53	0.00	0.00	9.20	0.00	4.60	0.00	3.16	0.00	0.00	81.5	90.7
2	27.73	72.27	18.53	0.00	9.20	0.00	0.00	4.60	0.00	3.16	0.00	0.00	72.3	76.9
3	32.33	67.67	18.53	0.00	9.20	0.00	4.60	0.00	0.00	3.16	0.00	0.00	67.7	70.0
4	35.49	64.51	18.53	0.00	9.20	0.00	4.60	0.00	3.16	0.00	0.00	0.00	64.5	66.1
5	35.49	64.51	18.53	0.00	9.20	0.00	4.60	0.00	3.16	0.00	0.00	0.00	64.5	64.5
6		64.51	5.63	12.90	9.20	0.00	4.60	0.00	3.16	0.00	0.00	0.00	77.4	71.0
7		64.51	8.03	10.51	2.80	6.40	4.60	0.00	3.16	0.00	0.00	0.00	81.4	79.4
8		64.51	9.21	9.32	3.98	5.21	1.40	3.20	3.16	0.00	0.00	0.00	82.2	81.8
9		64.51	9.80	8.73	4.57	4.63	1.99	2.61	0.96	2.20	0.00	0.00	82.7	82.5
10		64.51	10.21	8.32	4.86	4.33	2.29	2.31	1.37	1.79	0.00	0.00	81.3	82.0
11		64.51	10.21	8.32	5.07	4.13	2.43	2.17	1.57	1.59	0.00	0.00	80.7	81.0
12		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.67	1.49	0.00	0.00	80.5	80.6
13		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.5
14		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
15		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
16		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
17		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
18		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
19		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
20		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
21		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
22		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
23		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
24		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4
25		64.51	10.21	8.32	5.07	4.13	2.53	2.06	1.74	1.42	0.00	0.00	80.4	80.4

Table 8: Percentage of ex-prisoners free each year conditional on two years of no recidivism

Inmates			Group 1		Group 2		Group 3		Group 4		Group 5		Total	Mid
100														
Year	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Free	Point
0	0	100	0.00	11.29	0.00	5.64	0.00	3.88	0.00	0.00	0.00	0.00	100.0	
1	11.29	88.71	11.29	0.00	0.00	5.64	0.00	3.88	0.00	0.00	0.00	0.00	88.7	94.4
2	16.93	83.07	11.29	0.00	5.64	0.00	0.00	3.88	0.00	0.00	0.00	0.00	83.1	85.9
3	20.81	79.19	11.29	0.00	5.64	0.00	3.88	0.00	0.00	0.00	0.00	0.00	79.2	81.1
4	20.81	79.19	11.29	0.00	5.64	0.00	3.88	0.00	0.00	0.00	0.00	0.00	79.2	79.2
5	20.81	79.19	11.29	0.00	5.64	0.00	3.88	0.00	0.00	0.00	0.00	0.00	79.2	79.2
6		79.19	3.43	7.86	5.64	0.00	3.88	0.00	0.00	0.00	0.00	0.00	87.0	83.1
7		79.19	4.89	6.40	1.72	3.93	3.88	0.00	0.00	0.00	0.00	0.00	89.5	88.3
8		79.19	5.61	5.68	2.44	3.20	1.18	2.70	0.00	0.00	0.00	0.00	90.8	90.1
9		79.19	5.97	5.32	2.80	2.84	1.68	2.20	0.00	0.00	0.00	0.00	89.5	90.2
10		79.19	6.22	5.07	2.99	2.66	1.93	1.95	0.00	0.00	0.00	0.00	88.9	89.2
11		79.19	6.22	5.07	3.11	2.53	2.05	1.83	0.00	0.00	0.00	0.00	88.6	88.7
12		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.6
13		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
14		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
15		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
16		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
17		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
18		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
19		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
20		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
21		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
22		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
23		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
24		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5
25		79.19	6.22	5.07	3.11	2.53	2.14	1.74	0.00	0.00	0.00	0.00	88.5	88.5

Table 9: Percentage of ex-prisoners free each year conditional on three years of no recidivism

Inmates			Group 1		Group 2		Group 3		Group 4		Group 5		Total	Mid
100														
Year	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Free	Point
0	0	100	0.00	6.36	0.00	4.37	0.00	0.00	0.00	0.00	0.00	0.00	100.0	
1	6.36	93.64	6.36	0.00	0.00	4.37	0.00	0.00	0.00	0.00	0.00	0.00	93.6	96.8
2	10.74	89.26	6.36	0.00	4.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.3	91.5
3	10.74	89.26	6.36	0.00	4.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.3	89.3
4	10.74	89.26	6.36	0.00	4.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.3	89.3
5	10.74	89.26	6.36	0.00	4.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.3	89.3
6		89.26	1.93	4.43	4.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93.7	91.5
7		89.26	2.75	3.61	1.33	3.04	0.00	0.00	0.00	0.00	0.00	0.00	95.9	94.8
8		89.26	3.16	3.20	1.89	2.48	0.00	0.00	0.00	0.00	0.00	0.00	94.9	95.4
9		89.26	3.37	3.00	2.17	2.20	0.00	0.00	0.00	0.00	0.00	0.00	94.5	94.7
10		89.26	3.51	2.86	2.31	2.06	0.00	0.00	0.00	0.00	0.00	0.00	94.2	94.3
11		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
12		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
13		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
14		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
15		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
16		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
17		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
18		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
19		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
20		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
21		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
22		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
23		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
24		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1
25		89.26	3.51	2.86	2.41	1.96	0.00	0.00	0.00	0.00	0.00	0.00	94.1	94.1

Table 10: Percentage of ex-prisoners free each year conditional on four years of no recidivism

Inmates			Group 1		Group 2		Group 3		Group 4		Group 5		Total	Mid
100														
Year	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Inmates	Free	Free	Point
0	0	100	0.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.0	
1	4.67	95.33	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	95.3	97.7
2	4.67	95.33	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	95.3	95.3
3	4.67	95.33	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	95.3	95.3
4	4.67	95.33	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	95.3	95.3
5	4.67	95.33	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	95.3	95.3
6		95.33	1.42	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98.6	97.0
7		95.33	2.02	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98.0	98.3
8		95.33	2.32	2.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.7	97.8
9		95.33	2.47	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.5	97.6
10		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.5
11		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
12		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
13		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
14		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
15		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
16		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
17		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
18		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
19		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
20		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
21		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
22		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
23		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
24		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4
25		95.33	2.57	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.4	97.4

Figure 1: Markov Chain for 100 Individuals Initially Released from Prison

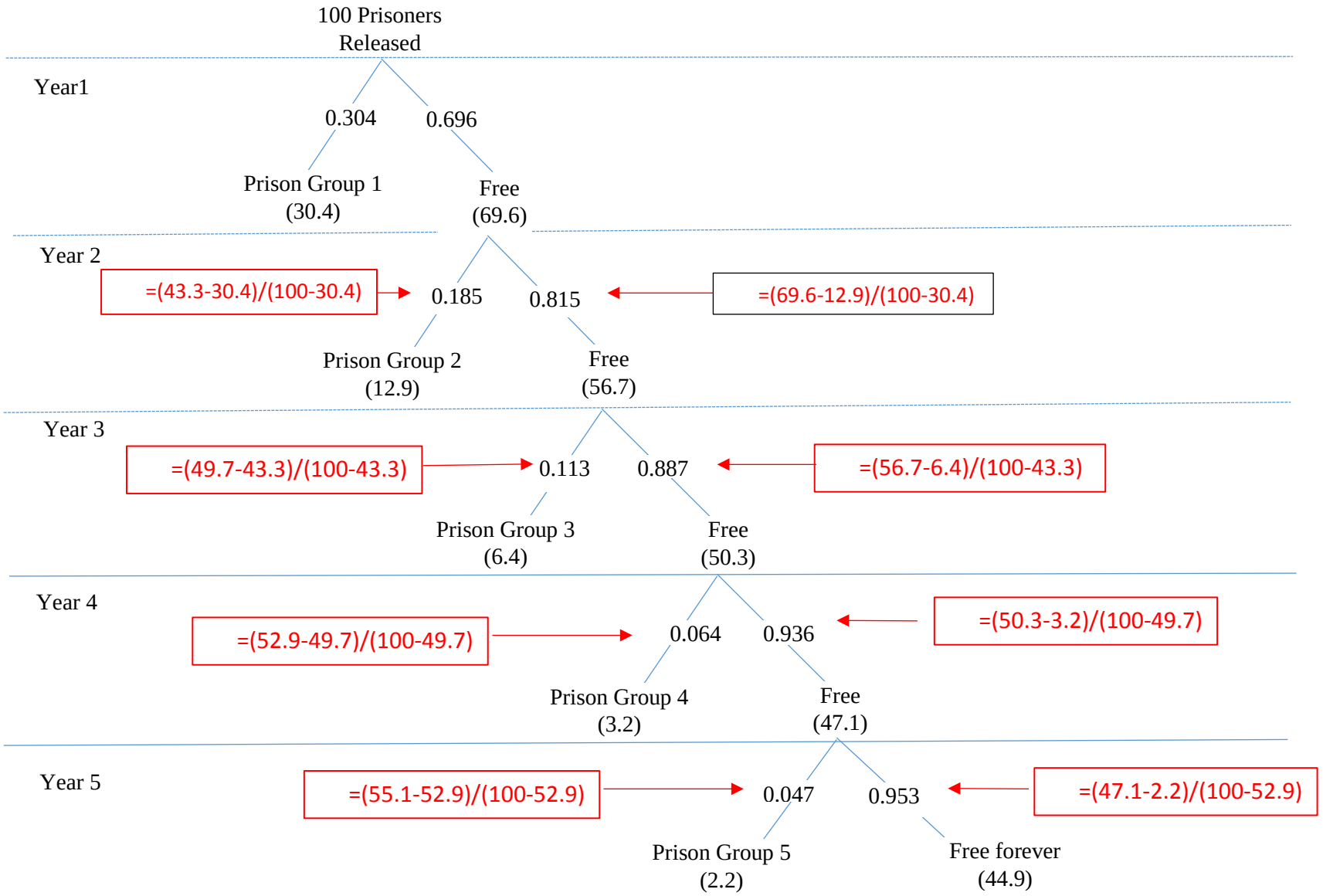

Figure 2: Markov Chain for Group 1 after Prison Exit in Year 6