"Contractualised Distress Resolution in the Shadow of the Law"(*)

UNITED KINGDOM NATIONAL REPORT

What determines type of proceeding and outcomes

- **Debtor size** is highly significant:
    - Pre-packs formed 31% of proceedings in the sample for the smallest companies, and 21% of the largest.
    - The larger the debtor, the more likely a going concern sale, more than doubling from 15% to 33% of the sample for the smallest and the largest companies.
- Whether the **main creditor was oversecured** was also highly significant:
    - going concern sale administrations were significantly more common where the main creditor was over-secured (13.5% for under-secured compared to 20.6% for over-secured).
    - going concern sale receiverships (10.4% for under-secured compared to 8.6% for over-secured) and
    - piecemeal sale receiverships were significantly less common for undersecured creditors (12.7% for undersecured compared to 8.2% for over-secured) which.

(*) The project "Contractualised distress resolution in the shadow of the law: Effective judicial review and oversight of insolvency and pre-insolvency proceedings" is carried out by a partnership of several universities: Università degli Studi di Firenze (Project Coordinator), Humboldt-Universität zu Berlin (Partner) and Universidad Autónoma de Madrid (Partner), supported by the Consejo General del Poder Judicial (Associate Partner), Banca d'Italia (Associate Partner) and Entrepreneurship Lab Research Center (Associate Partner).

The project addresses several key issues highlighted in the Recommendation of 12 March 2014 on a new approach to business failure and insolvency (2014/135/EU). It also considers the Proposal for a Directive of the European Parliament and of the Council on preventive restructuring frameworks, second chance and measures to increase the efficiency of restructuring, insolvency and discharge procedures and amending Directive 2012/30/EU (COM(2016) 723 final), published on November 22, 2016.

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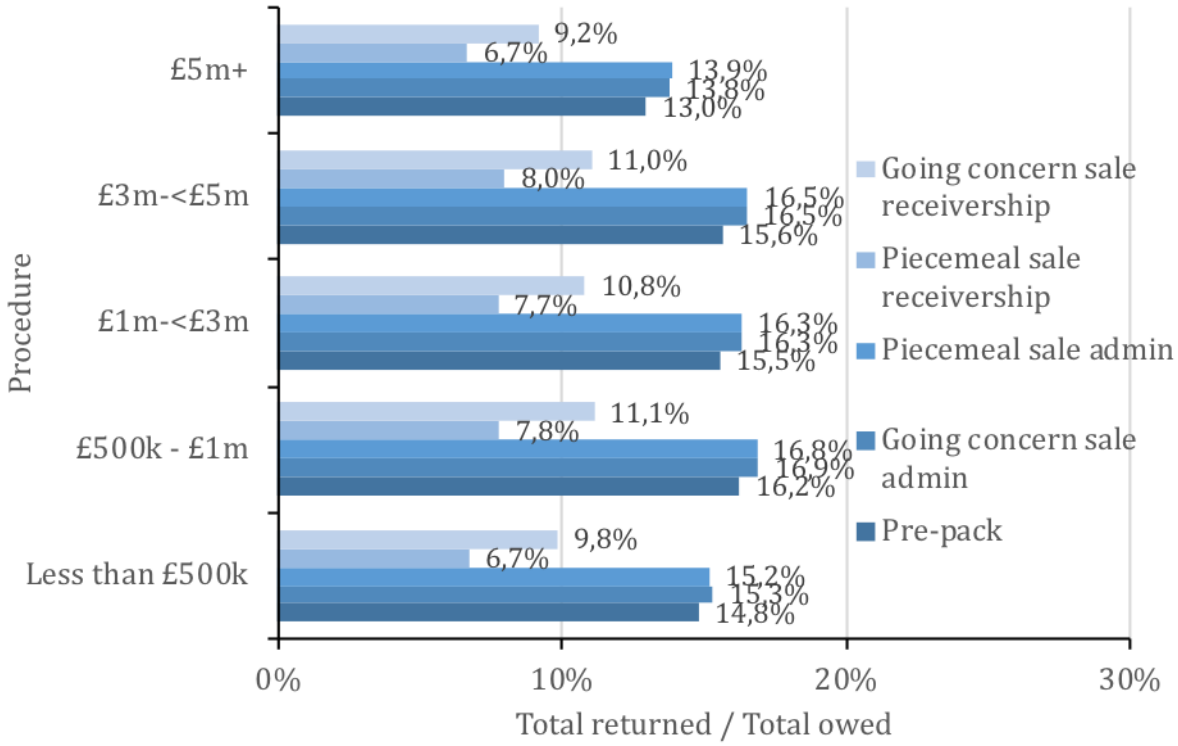
- No difference re pre-packs.

Creditor returns

Debts overall

- Takeaway:
  - administrations do better than receiverships
  - pre-packs do badly compared to other administrations
- This hold for all size of debtor companies.



Secured debt

- Standard administrations again tend to do better for secured creditors than other types of procedure.

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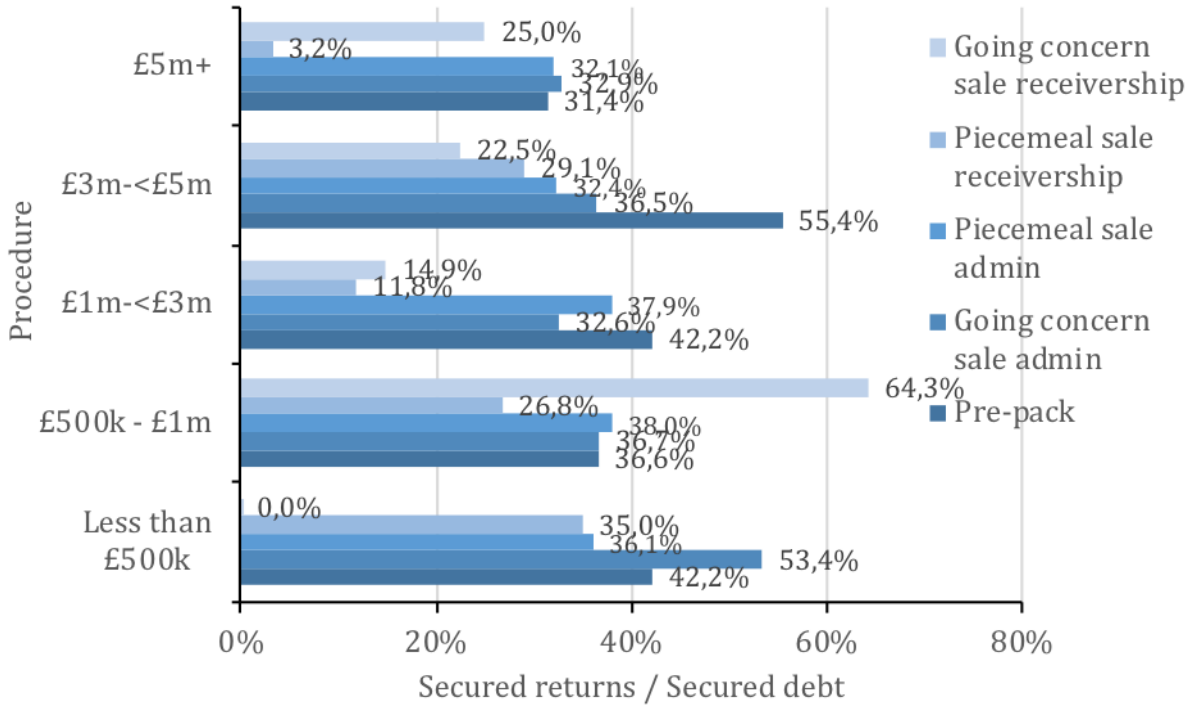

Survival of purchaser

- No evidence of difference amongst procedures.

- There were regional differences, with buyers in the West of England and East Midlands more likely to cease to operate, and those in the small number of cases in Wales, Scotland, and Northern Ireland less likely to do so.

Benefits where the ip belongs to a bigger firm

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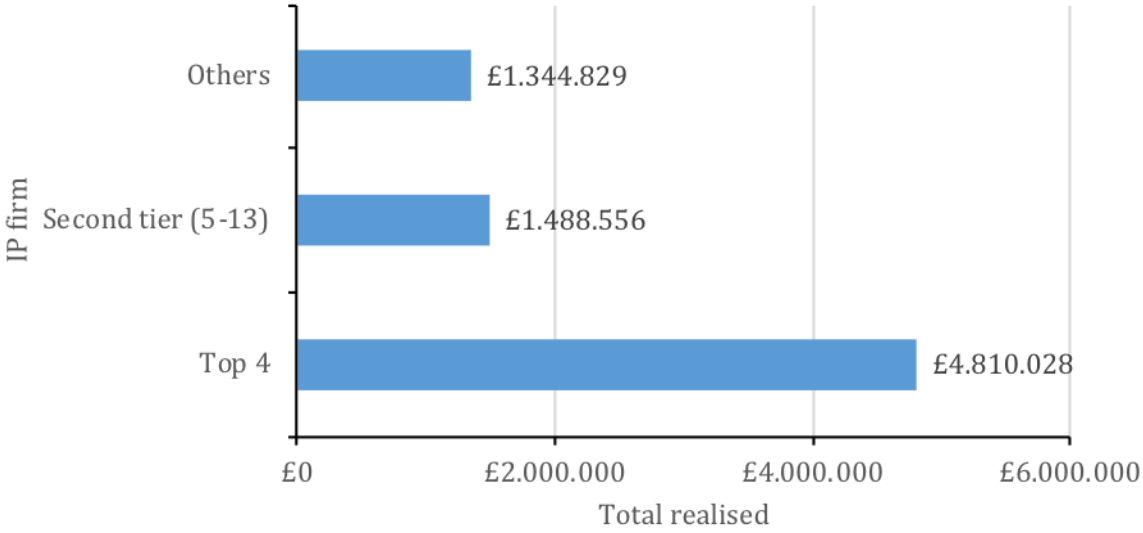
- Piecemeal sale administrations were least common for ‘top 4’ firms (35.5%) compared to ‘second tier’ (41.6%) or ‘other’ (41.4%) firms.

- IPs from larger firms realise more value for creditors as a group. Compared to the ‘other IP’ group, total realised was 3.6 times higher for the ‘top 4’ group, and 3.2 times higher when compared to ‘second tier’ firms.



  - So a case realising £1,000,000 for an ‘other’ IP firm would be expected to realise £1,107,000 for a ‘second tier’ firm and £3,577,000 for a ‘top 4’ firm, controlling for the other variables included in the model.

- Secured creditors tended to do better when the case was run by an IP from a larger firm. Other creditors did not tend to do worse than when the case was run by IPs from smaller firms.

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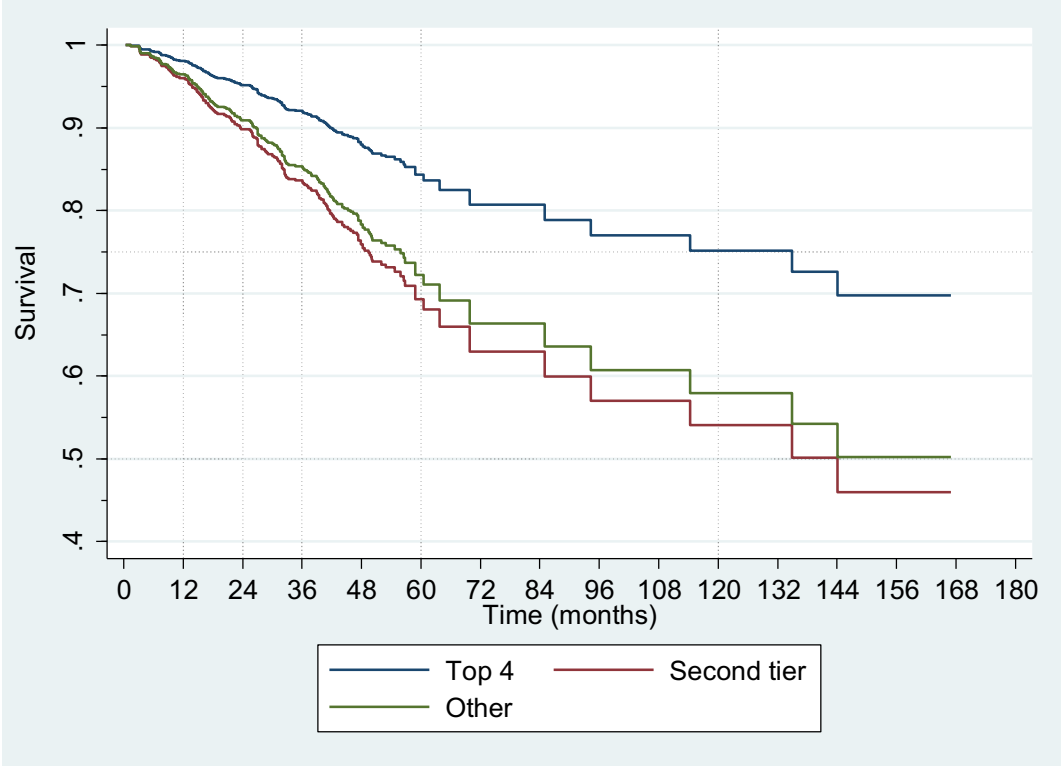
- Buyers in cases run by IPs from bigger firms had higher longevity.



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Effect of connected purchasers and of deferred consideration

- When the sale was to connected purchasers, there was a significantly higher risk of buyer mortality.

- Similarly, compared to the 'zero' group, cases with 'positive deferred consideration' had a significantly greater hazard of ceasing to operate.

- There were statistically significant differences in the total realised by presence of a purchaser and whether or not the purchaser was connected. This was primarily a result of significantly higher total realised for the 'purchaser not connected' category. Compared to the 'not applicable/unknown/missing' group, total realised was 1.64 times higher for the 'purchaser not connected' group, and higher still when compared to the 'purchaser connected' (2.00 times higher total realised) and 'purchaser unknown' groups (2.02 times higher).

- Compared to other groups, 'purchaser not connected' group had lower procedure costs as a proportion of value realised (56.8% compared to 61.9% where the purchaser was connected).

- Overall creditor returns are higher where the purchaser is unconnected (18.4%) compared to connected purchaser cases (141%).

Problems with pre-packs

- Controlling for other factors, total realised was higher for going concern sale administrations and piecemeal sale administrations compared to pre-packs.

- Controlling for other factors, for all but one band of size of debtor company, pre-packs realise less from the company's assets than going concern sale administrations. The same is true even for piecemeal sale administrations: in three of five size bands, such administrations outperformed prepacks.

- Prepacks are not significantly (or at all) cheaper than other administrations, costing between 51.3% and 69.6% of total realised, depending on debtor size. This compares with going concern administrations (54.3% to 72.2%) and piecemeal sale administrations (52.7% to 70.9%).

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- Overall, differences between costs of procedures were fairly modest. The only difference of particular note was between piecemeal sale receiverships (which had the lowest proportion) and other procedures (particularly going concern sale administrations and piecemeal sale administrations). That is to say, the greater accountability and transparency in administration does not come at a significantly higher cost.

- IP fees are not significantly less for going concern receiverships than for administrations.

1. Methods

1.1 Approach to data collection and the CoDiRe UK quantitative dataset

The initial dataset consisted of 3,128 cases which were identified by reviewing insolvency notices published in the *London Gazette*, and comprised as follows:

i) 2,120 administration proceedings under the Insolvency Act 1986 (as amended by the Enterprise Act 2002), representing the total number of administrations that commenced between January 1 and December 31, 2012 based on notices in the *London Gazette*; and

ii) A comparator group of 1,008 administrative receivership proceedings that commenced between January 1 and December 31, 2002 (the last year before the Enterprise Act effectively abolished administrative receiverships).

As data collection progressed, the dates of the *London Gazette* notices were compared to the actual dates of initiation of insolvency proceedings recorded in the reports filed in Companies House's online database. These comparisons revealed that a number of insolvency proceedings in the initial dataset were initiated outside of the desired timeframes. In general, these were cases in which proceedings were initiated in late December of 2001 (for receiverships) or 2011 (for administrations), such that notices were published in the *London Gazette* the following January, causing them initially to be misidentified as cases from 2002 and 2012, respectively. Accordingly, such cases were removed from the dataset, reducing the total number of cases to 3,037.

Section 2.2 below sets out the contents of the dataset. Where practicable, data collection and entry was automated using the online database of UK company records maintained by Companies House. For example, data such as the name and number of each company, the dates of incorporation and dissolution (where applicable), and the head office address generally are

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available on the information page of each company in Companies House's online database, thereby permitting automated collection and entry for many of these data.

Automated entries were then verified manually so as to confirm that the entries based on the Companies House information page were consistent with the reports filed by the insolvency practitioners ('**IPs**') in each case. Manual verification was necessary because there were various discrepancies between the automatically entered data and the information contained in the IPs' reports. For example, the head office address of the company was sometimes changed during or after insolvency proceedings were initiated – often to the address of the IP's firm – such that the automated entry from Companies' House's information page did not provide the correct address at the time that insolvency proceedings began. In addition, in some cases one or more IPs ceased to act and new IPs were appointed, but the automated entries only reflected the most recently appointed IPs and firms. Accordingly, automated entries from the information page were revised in those cases to include the names of the IPs and firms at the time insolvency proceedings were initiated, as set out in the documents filed at the initiation of proceedings.

The balance of the data, comprising the vast majority of the database, were manually collected and entered. This process involved detailed reviews of the reports filed with Companies House by IPs over the course of each insolvency proceeding.[1] Manual data review and entry was time and resource intensive – far from merely rote data entry, in many cases careful thought was required in order to accurately identify and record the relevant data. Despite the regulatory obligations imposed on IPs and insolvent companies to provide various prescribed data in a clear and uniform manner, significant variation in the quality and presentation of the relevant data was found in the IPs' reports across all cases. In particular, several obstacles were encountered as data collection progressed because of documents that were incomplete, excessively lengthy, poorly organised, internally inconsistent, erroneous in some other way, missing, and/or unavailable.

The nature and extent of discrepancies and omissions varied by report and case, but inconsistent or incomplete reports frequently complicated the data collection process for various key data such as levels of debt, returns to creditors, and costs of the insolvency proceeding. For example, often the IPs' initial valuations of the insolvent debtor's assets and liabilities would be revised in subsequent reports, necessitating careful review of all reports in a given proceeding to ensure that complete and accurate data were entered.[2]

Missing documents were a particular problem for the receivership cases, as many companies which underwent receivership proceedings in 2002 were dissolved over a decade ago and their

[1] For example, the following reports were reviewed in each administration case, where available: (1) Statement of Affairs, filed upon or shortly after commencement of administration proceedings; (2) Statement of Administrator's Proposal, filed shortly after commencement; and (3) one or more Administrator's Progress Reports, filed at different stages of proceedings.

[2] While time consuming, the process of collecting full and accurate data on each case was necessary to conduct meaningful analyses. Although researchers in past studies undoubtedly encountered similar difficulties with data collection, such studies examined comparatively much smaller samples of cases. By comparison, data cleaning and quality control for the number of cases in the present study necessarily imposed significant demands upon the UK team's time and resources. These were the cases where procedure was determined. Numbers used in analysis vary throughout the report, since availability of individual fields (such as outcome, components of debt, components of returns, survival etc) vary from case to case.

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documents were archived. Accordingly, unlike for most of the administration cases, the data on receiverships were rarely available on Companies' House's online database. Instead, the relevant data could only be obtained by identifying and ordering for purchase specific IP reports from Companies' House's archives.

Consequently, data collection and entry consumed roughly 2,000 hours of the researchers' time in total for the full dataset. This time commitment significantly exceeded original and interim estimates – in short, and as detailed above, the size and scope of this project magnified many of the data collection problems that might typically arise in a study of this kind. Nonetheless, all available data on the 2,120 administration cases were collected, along with data on a subset of 500 receiverships. In the result, the final database is the largest of its kind on formal insolvency proceedings in the UK. For comparison, the Graham Report collected data on roughly 500 administrations and purchased data on an additional 100 cases.

1.2 Analysis

Quantitative analysis took the form of descriptive statistics (section 3.1) describing the dataset and introducing key variables and more detailed statistical modelling (section 3.2). A range of statistical methods were employed, including fractional regression, multinomial logistic regression, cox (proportional hazard) regression, gamma generalized linear models and zero one inflated beta regression models. Each modelling section includes a separate statistical appendix, which sets out the specific model(s) employed and presents detailed statistical output. The main text for each modelling section describes and interprets the statistical model in lay terms.

2. Results

2.1 Description of the UK quantitative dataset

Types of proceeding

The final UK dataset was made up of 2,489 cases from a total of 3,037 cases in England, Wales, Scotland and Northern Ireland. Since the complete list of 3,037 cases were randomised at the outset, with data entered in this random order, the final sample constitutes a random sample of cases.[3] Of the 2,489, 596 (23.9%) were pre-packs, 15 (0.6%) successful restructuring administration, 429 (17.2%) going concern sale administrations, 979 (39.3%) piecemeal sale administrations, 298 (12.0%) piecemeal sale receiverships and 172 (6.9%) going concern sale receiverships.

Debtor's location

[3] One caveat to this would be in cases where difficult to obtain fields, with considerable missing values (where information was not available, for examples, details of purchasers) were not missing/unavailable at random. However, this would be difficult to determine.

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2,254 (90.6%) of the 2,489 cases were in England and Wales, 78 (3.1%) in Northern Ireland and 146 (5.9%) in Scotland.[4] Converting head office postcodes into first-level NUTS (Nomenclature of Territorial Units of Statistics) regions gave the distribution of cases in Table 1.

Table 1. Spread of cases (based on head office location) using first-level NUTS regions

First-level NUTS region	Frequency	Percent
London - UKI	597	24.0
South East - UKJ	252	10.1
South West - UKK	108	4.3
East - UKH	119	4.8
West Midlands - UKG	231	9.3
East Midlands - UKF	99	4.0
Yorkshire & Humberside - UKE	314	12.6
North West - UKD	447	18.0
North East - UKC	51	2.0
Scotland - UKM	155	6.2
Wales - UKL	26	1.0
Northern Ireland - UKN	79	3.2
Unknown	11	.4

The overall geographic spread of cases (based on head office location) is shown in Figures 1 and 2.[5]

[4] Jurisdiction/region was unclear for 11 cases.
[5] For cases where the head office could be mapped. Note that for some cases, the head office location was the address of the IP firm acting for the insolvent debtor, reflecting the fact that in such cases, for all practical purposes, the IP had taken over management of the debtor.

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Figure 1. The geographical spread of cases based on head office location (heat map), created using geolytics

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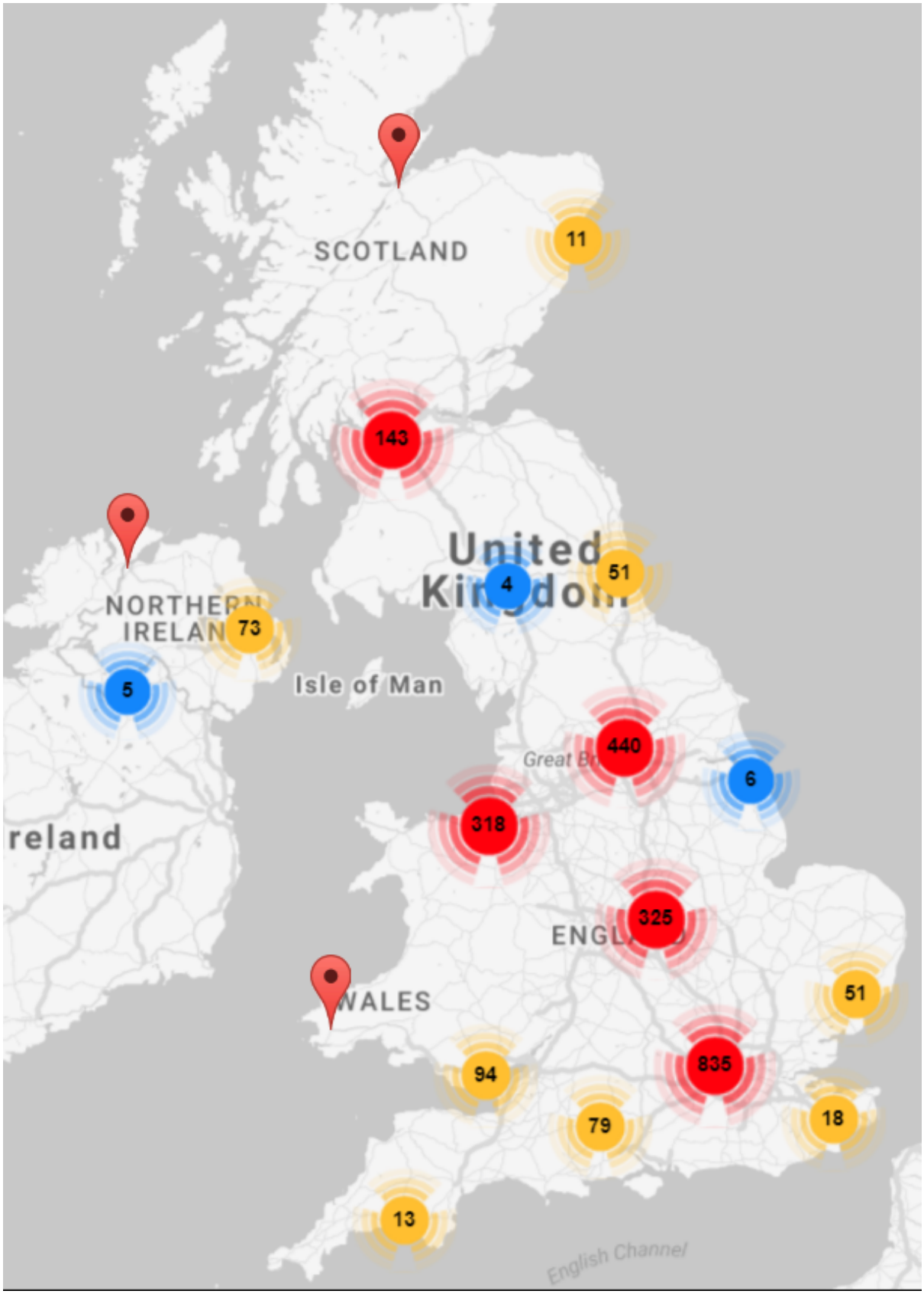

Figure 2. The geographical spread of cases based on head office location (clusters), created using geolytics

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Debtor's age

Age at commencement (in years) was calculated as the difference between the date on which an administrator was appointed and incorporation date. Across 2,502 cases where age at commencement could be calculated, the mean was 14.4 years (median of 9.3) The mean age of companies making use of a pre-pack prior to entering administration was 13.7 years (median of 9.1). This compared to 19.9 years for a small number of standard administrations (median of 7.2), 15.9 years for going concern sale administrations (median of 9.9), 13.5 years for piecemeal sale administrations (median of 9.3), 13.9 years for piecemeal sale receiverships (median of 9.2 years) and 14.7 years for going concern sale receiverships (median of 9.0 years). Figure 3 illustrates age at commencement of administration (grouped) by procedure.

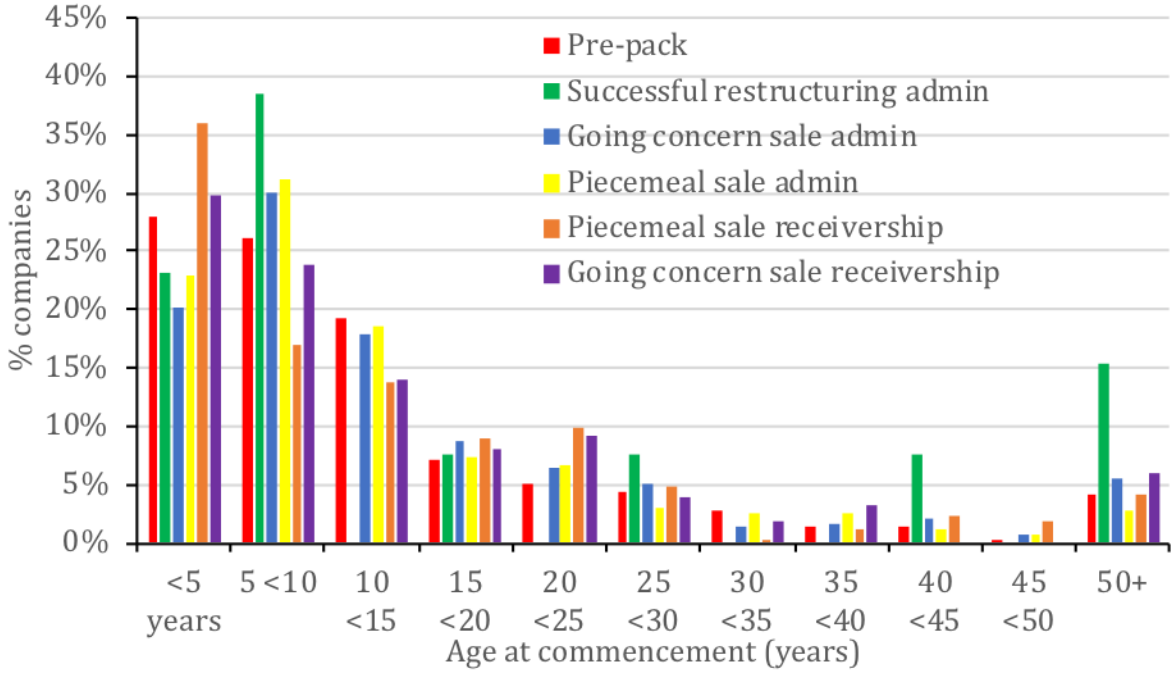

Figure 3. Age at commencement by type of procedure

Duration of proceedings

Duration of procedures (in months) could be calculated for 2,499 cases, with an overall mean duration of 22.4 months (standard deviation = 21.9) and median of 12.8 (interquartile range = 16.8). The duration of procedures for companies making use of a pre-pack was 13.4 months (median of 11.8). This compared to 20.5 months for a small number of standard administrations (median of 12.0), 17.4 months for going concern sale administrations (median of 12.0), 17.3 months for piecemeal sale administrations (median of 12.0), 39.1 months for piecemeal sale receiverships (median of 32.0 years) and 44.6 months for going concern sale receiverships (median of 34.9 years). Figure 4 groups duration of procedure for each of the six procedures.

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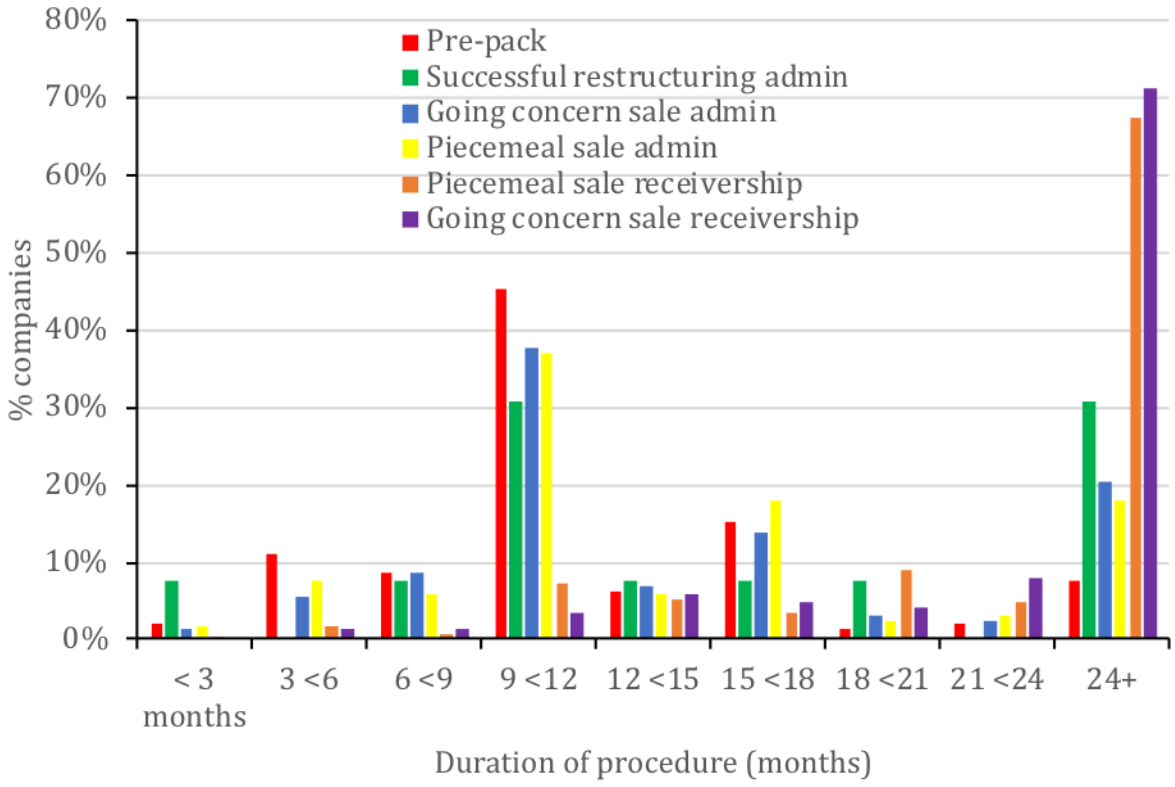

Figure 4. Duration of procedures by type of procedure

Longevity after proceedings

140 of 2,487 organisations were still operating (5.6%). While details of purchasers and the continued operation of purchaser was only available for a subset of cases, there were 658 cases with a purchaser and valid data on both end of procedure and either the purchaser ceasing to operate or the purchaser still existing at the time of data entry. Of the 658 cases the purchaser ceased to exist for 170 (25.8%), with these 658 cases used in statistical modelling of purchaser survival below.

Debt levels

Of 2,177 cases where debt and components of debt could be calculated, mean total debt was £14,522,552 (median = £1,239,185). Mean secured debt was £7,684,079 (median = £230,886), while mean unsecured debt was £6,527,905 (median = £565,524) and mean preferential debt £310,568 (median = £500). Table 2 shows total debt and components of debt by procedure, with grouped total debt by procedure in Figure 5.

Table 2. Total debt and components of debt by procedure

Procedure		Total Debt	Secured	Unsecured	Preferential
Pre-pack	Mean	7,730,768	2,164,947	5,495,681	70,140

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	Median	763,226	91,750	464,704	0
	N	576	576	576	576
Successful restructuring admin	Mean	139,048,831	109,917,426	27,789,743	1,341,663
	Median	9,480,005	279,770	1,794,520	5,055
	N	13	13	13	13
Going concern sale admin	Mean	25,295,310	18,932,508	6,229,293	133,508
	Median	1,673,894	317,395	755,621	800
	N	404	404	404	404
Piecemeal sale admin	Mean	13,096,189	5,065,543	7,565,849	464,798
	Median	1,211,694	238,475	493,945	695
	N	926	926	926	926
Piecemeal sale receivership	Mean	9,437,331	5,367,433	3,453,563	616,335
	Median	1,847,839	484,819	608,486	92,606
	N	149	149	149	149
Going concern sale receivership	Mean	14,701,837	8,377,355	5,938,338	386,144
	Median	3,486,709	1,009,872	1,398,836	173,627
	N	109	109	109	109

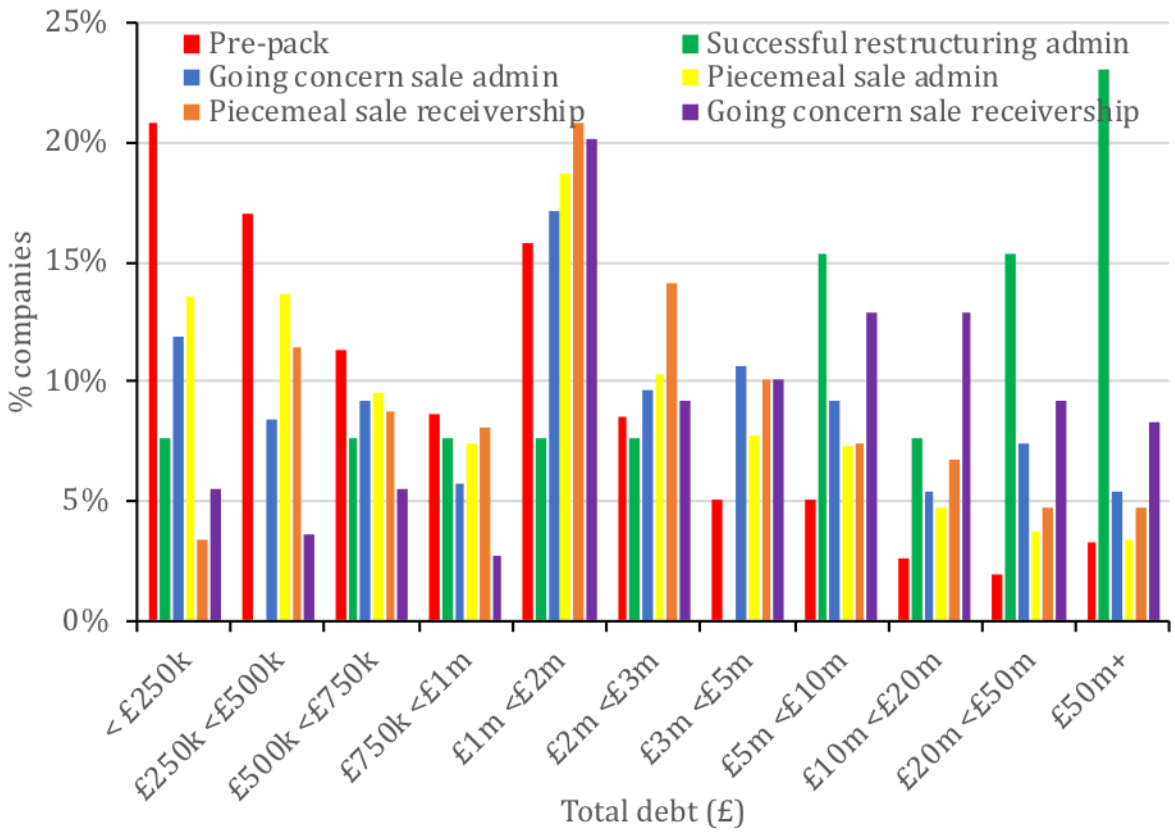

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Figure 5. Total debt (grouped) by procedure

Creditor recoveries

Of 2,174 cases where total returns and components of total returns were available, mean total returns were £1,209,064 (median = £23,259). Mean secured returns were £1,128,495 (median = £11,378), while mean unsecured returns were £71,405 (median = £0) and mean preferential returns £9,164 (median = £0). Table 3 shows total returns and components of total returns debt by procedure.

Table 3. Total returns and components of total returns by procedure

Procedure		Total returns	Secured	Unsecured	Preferential
Pre-pack	Mean	746,327	679,432	65,220	1,675
	Median	12,500	8,897	0	0
	N	585	585	585	585
Successful restructuring admin	Mean	1,751,003	1,721,039	16,132	13,832
	Median	0	0	0	0
	N	14	14	14	14
Going concern sale admin	Mean	2,335,475	2,244,620	82,869	7,987
	Median	83,384	52,842	0	0
	N	422	422	422	422
Piecemeal sale admin	Mean	1,117,405	1,018,927	84,539	13,939
	Median	27,019	13,603	0	0
	N	964	964	964	964
Piecemeal sale receivership	Mean	536,913	528,746	1,164	7,004
	Median	0	0	0	0
	N	136	136	136	136
Going concern sale receivership	Mean	596,606	573,609	4,352	18,646
	Median	755	755	0	0
	N	53	53	53	53

Procedure costs

Of 2,026 cases with data available on costs, mean total costs were £650,016 (median = £63,869). Mean IP fees pre-appointment were £5,116 (median = £0), with mean total IP fees of £102,910 (median = £27,425). Table 4 shows total costs, IP fees pre-appointment and total IP fees by procedure.

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Table 4. Total costs, IP fees pre-appointment and total IP fees by procedure

Procedure		Total costs	IP fees pre-appointment	Total IP fees
Pre-pack	Mean	301,555	9,354	62,278
	Median	46,443	2,288	21,759
	N	571	579	579
Successful restructuring admin	Mean	1,954,206	16,390	620,496
	Median	224,195	943	36,697
	N	14	14	14
Going concern sale admin	Mean	1,368,519	4,099	162,512
	Median	112,639	0	50,000
	N	410	418	418
Piecemeal sale admin	Mean	572,262	3,244	92,336
	Median	62,960	0	26,435
	N	937	952	950
Piecemeal sale receivership	Mean	206,430	0	96,811
	Median	62,029	0	20,286
	N	62	59	62
Going concern sale receivership	Mean	227,650	1,941	158,841
	Median	48,616	0	19,533
	N	32	32	32

2.2 Statistical modelling

The following results sections set out findings from a series of statistical models. The number of cases included in each model varied by subject matter (and availability of data), with numbers included detailed below. Independent variables included are described in section 3.1.1 above, though the specific set included also vary by model as set out below. In each model, findings are summarised in the main text in lay terms, with details of the statistical model used and statistical output at the end of each model section.

Procedure was a key variable in the statistical models fitted, as both a dependent variable (in section 3.2.1) and independent variable in a number of other analyses. In all cases, successful restructuring administration was excluded (due to small numbers), leaving five groups. Subsequent analyses were also included collapsing procedure into three groups (pre-packs, other administrations, receiverships).

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Survival of purchasers formed the dependent variable in section 3.2.2, with time calculated from the end of procedure to either the date when the purchaser ceased to operate, or the date of data entry. Survival was simply whether or not the purchaser had ceased to operate.

In section 3.2.3, *total realised* (from sale of assets, surplus from trading etc) formed the dependent variable and was calculated as the sum of the total costs, returns to secured creditors, returns to unsecured creditors and returns to preferred creditors.

Dependent variables in 3.2.4 to 3.2.7 were all proportions and are introduced in the relevant sections below. In analyses from section 3.2.3 onwards, where figures are derived from the main model (presented in the statistical appendices), figure bars are blue. Where subsequent models have been fitted, with new or alternative independent variables introduced, figure bars are green. The majority of dependent variables were common to a number of the statistical models fitted:

- *Debtor size* was defined using total debt, in five groups. This was supplemented by analyses using size based on turnover (less than £2,000,000 – micro, £2,000,000 to £8,000,000 – small, £8,000,000 to £40,000,000 – medium, £40,000,000 or more – large), though key analyses (those presented in statistical appendices) used total debt groups as a measure of debtor size.

- Whether creditors were *over* or *under-secured* was calculated as market value greater than secured debt or secured debt of zero for over-secured and market value less than secured debt for under-secured. Percentage of secured debt (of total debt) was also included in the majority of models, collapsed into four groups.

- *Sector* used SIC classifications, with the nine most common sectors with their own categories and the remaining cases collapsed into an 'other sector' category.

- *Region* was produced by converting head office postcodes into first-level NUTS (Nomenclature of Territorial Units of Statistics), resulting in twelve regions.

- *IP firms* were categorised as either 'top 4', 'second tier (5-13)' or 'other firms', based on Accountancy Age rankings.[6]

- A *purchaser/purchaser connected* variable grouped cases based on whether the purchaser was connected, not connected, of unknown connection or unknown.

- Details of *deferred consideration* (positive, zero or not known) were also combined with the purchaser variable to make a composite variable for subsequent analyses.

[6] https://www.accountancyage.com/rankings/top-5050-accountancy-firms-2016/

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3.2.1 Modelling factors associated with type of procedure

Of 2,489 cases in the dataset, 596 (23.9%) were pre-packs, 15 (0.6%) successful restructuring administration, 429 (17.2%) going concern sale administrations, 979 (39.3%) piecemeal sale administrations, 298 (12.0%) piecemeal sale receiverships, and 172 (6.9%) going concern sale receiverships.

Factors associated with type of procedure (excluding a small number of successful restructuring administrations) were explored using multinomial logistic regression. The model predicts the probability of different types of procedure on the basis of a range of independent variables. Additional detail on the statistical modelling and model output can be found in the statistical appendix, though this section summarises model output in lay terms. Figures displayed are derived from the statistical model and control for other variables. Note, that while missing or unknown categories are included in the model for some independent variables (see the statistical appendix), they are excluded from some figures.

Independent variables included in the main statistical model (as main effects) were total debt (grouped) whether creditors were over or undersecured, SIC sector, NUTS1 region, IP firm and presence of a purchaser and whether the purchaser was connected. Additional variables (such as percentage of secured debt[7]) or different formulations of variables (for example purchaser, including information on deferred consideration) were also introduced into additional models.[8]

Debtor size

There was a highly statistically significant relationship between debtor size (total debt group) and procedure adopted.[9] Pre-packs were most common for the 'less than £500,000' total debt category (30.7%). Compared to piecemeal sale administrations (the base outcome in the statistical model), pre-packs were significantly less likely in the '£1,000,000 to less than £3,000,000' debt category rather than the 'less than £500,000' total debt category.[10] Going concern sale administrations became increasingly prominent as total debt increased (increasing from 13.1% to 25.9%). Again, compared to piecemeal sale administrations and the 'less than £500,000' debt category, the increase in the probability of going concern sale administrations was significant for the '£3,000,000 to less than £5,000,000' and '£5,000,000 or more' debt categories.[11] The percentage of piecemeal sale receiverships was highest for the '£1,000,000 to less than £3,000,000' total debt category (11.1%), while the percentage of going concern

[7] A separate model was used for percentage of secured debt, due to its close relationship to whether or not creditors were over or under-secured.
[8] Though the statistical appendices include only output for the main statistical models. Further details for subsequent models can be requested from the authors.
[9] Jointly testing the total debt terms; $\chi^2_{20} = 136.82$, $p < 0.001$. Testing the known total debt group terms (i.e. excluding 'unknown' terms); $\chi^2_{16} = 66.79$, $p < 0.001$
[10] Odds ratio = 0.64, Z = -2.60, p = 0.009.
[11] Odds ratio = 2.30, Z = 3.33, p = 0.001 and odds ratio = 2.45, Z = 4.29, $p < 0.001$ respectively.

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sale receiverships increased significantly with total debt, from 2.3 per cent in the 'up to £500,000' category to 7.4 per cent in the £5,000,000 or more debt category. Figure 6 illustrates the relationship between procedure and debtor size (total debt), controlling for the range of other variables included in the statistical model. Replacing total debt in the model with size based on turnover,[12] resulted in Figure 7.

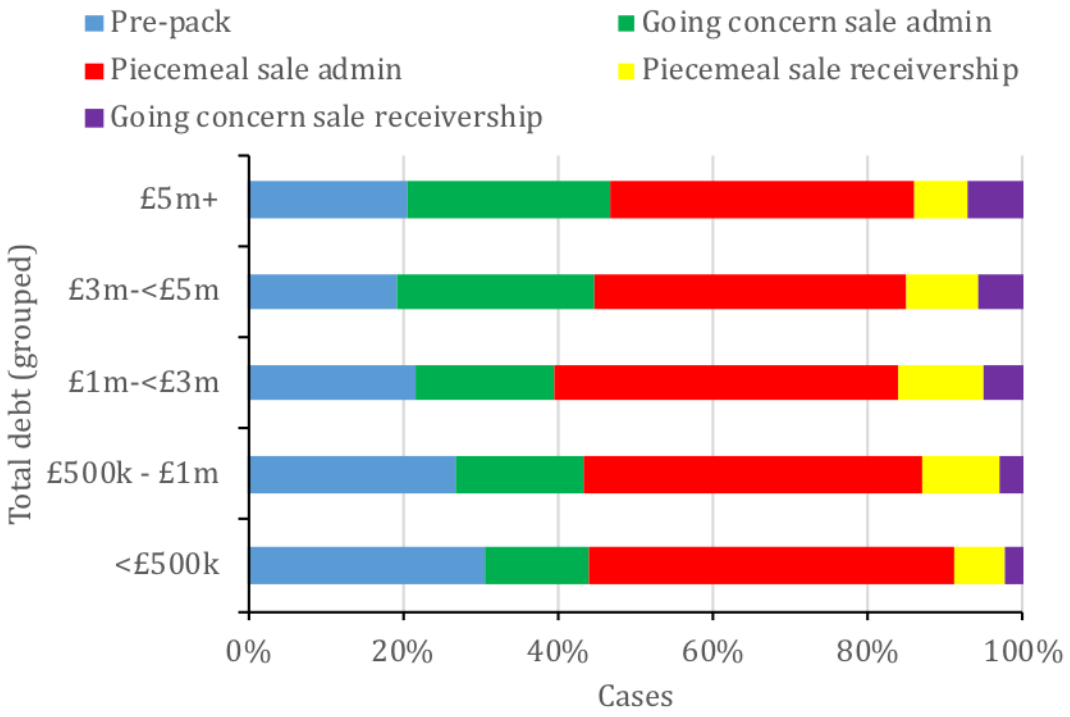

Figure 6. The relationship between procedure and debtor size (total debt), derived from the multinomial logistic regression model and controlling for a range of other variables

[12] Note, that turnover was available for 929 cases.

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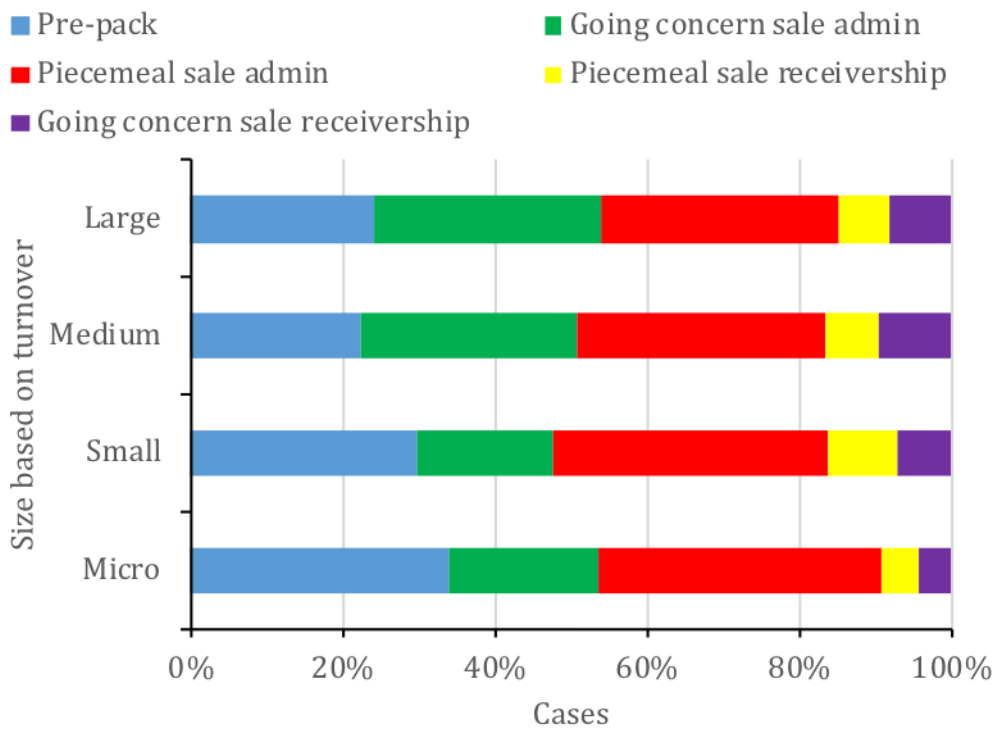

Figure 7. The relationship between procedure and debtor size (based on turnover), derived from the multinomial logistic regression model and controlling for a range of other variables

Whether creditors were over or under-secured and the percentage of debt which was secured

There was also a highly statistically significant relationship between the procedure adopted and whether or not creditors were over or under-secured.[13] Comparing over-secured creditors to the under-secured group, key differences were in the percentage of going concern sale administrations (13.5% for under-secured compared to 20.6% for over-secured) which were significantly more common for over-secured creditors,[14] as well as going concern sale receiverships (10.4% for under-secured compared to 8.6% for over-secured) and particularly piecemeal sale receiverships (12.7% for under-secured compared to 8.2% for over-secured) which was significantly less common for over-secured creditors.[15] Figure 8 illustrates the relationship between procedure and whether creditors were over or under-secured, controlling for a range of other variables.

[13] Testing the over or under-secured model terms together; $\chi^2_8 = 36.30$, $p < 0.001$.
[14] Compared to the Piecemeal sale administration base model category; odds ratio = 1.67, Z = 3.52, $p < 0.001$.
[15] Compared to the Piecemeal sale administration base model category; odds ratio = 0.51, Z = -3.13, $p = 0.002$.

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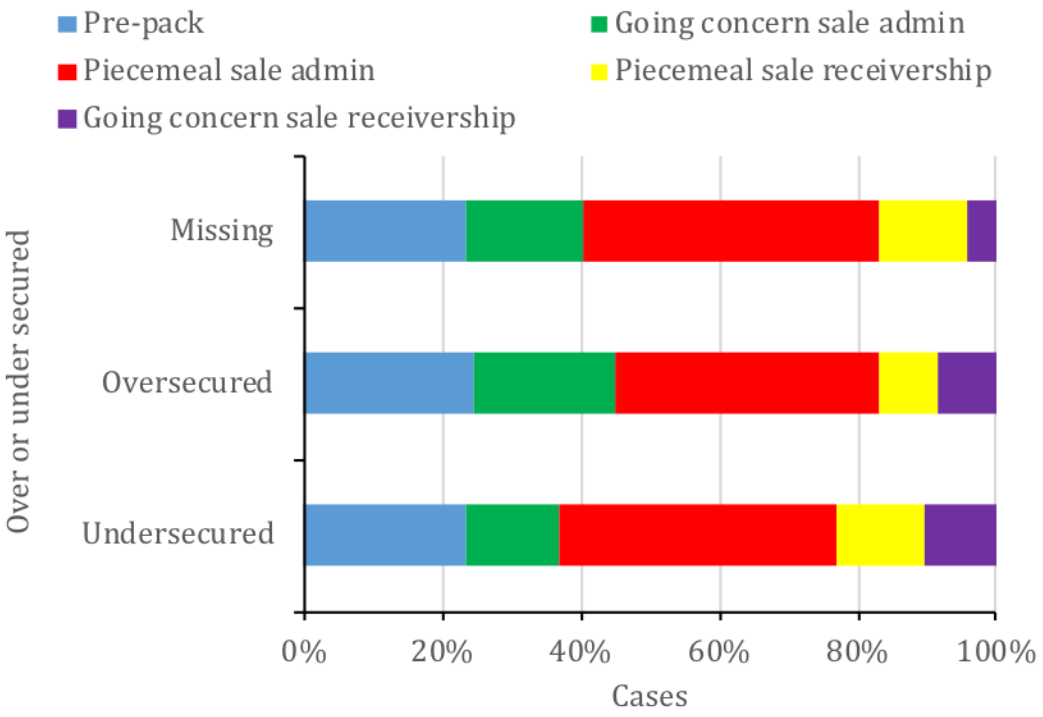

Figure 8. The relationship between procedure and whether creditors were over or under-secured, derived from the multinomial logistic regression model and controlling for a range of other variables

Whether creditors were over or under-secured was then replaced by percentage of secured debt in the model, with a highly statistically significant relationship between the procedure adopted and percentage of secured debt.[16] Key differences included pre-packs and going concern sale administrations being comparatively less common (than piecemeal sale administrations) in the 'greater than 75% to 100%' category when compared to the 'up to 25% category.[17] The relationship between procedure and percentage of secured debt (of total debt) is illustrated in Figure 9.

[16] Jointly testing the 'percentage of secured debt' model terms; $\chi^2_{16} = 45.77$, $p < 0.001$.
[17] Odds ratio = 0.47, Z = -3.52, $p < 0.001$.

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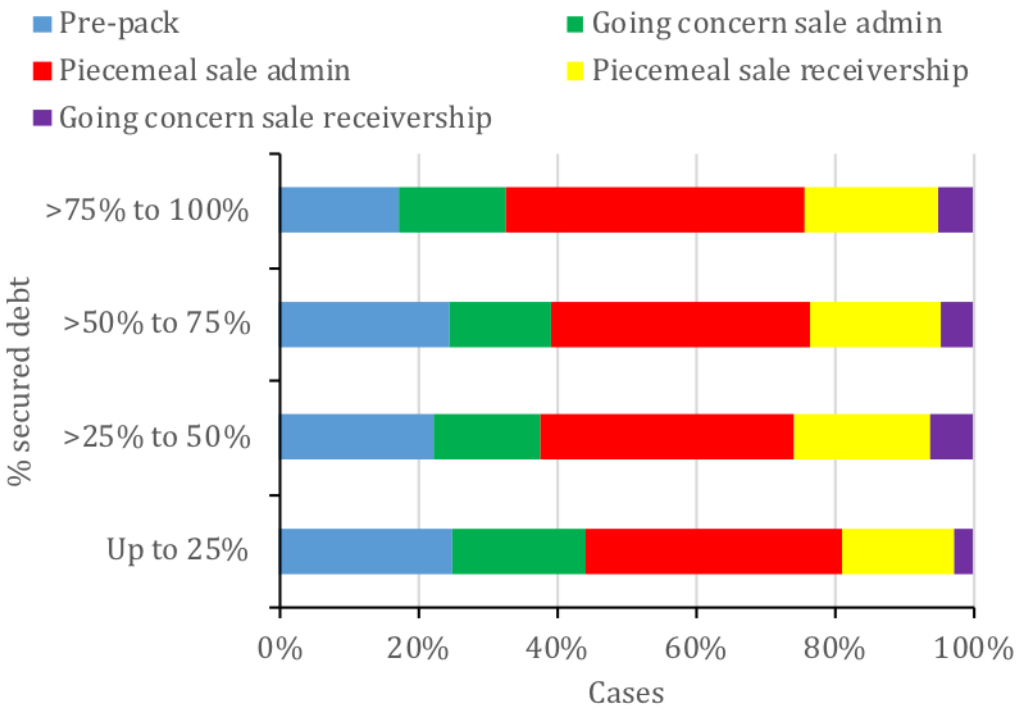

Figure 9. The relationship between procedure and the percentage of secured debt, derived from the multinomial logistic regression model and controlling for a range of other variables

SIC sector

There were highly statistically significant differences in type of procedure between different sectors,[18] with a large number of statistically significant model terms (see the statistical appendix for further details). Piecemeal sale administrations (the single most common procedure in the dataset overall) were most common in real estate (51.2%) and particularly construction sectors (59.5%) and far less common in sectors such as accommodation and food service activities (28.9%) and manufacturing (30.1%). Real estate also had the lowest percentage of pre-packs (15.1%) and receiverships (3.6%), with pre-packs most common in the information and communication sector (32.1%). Accommodation and food service activities had the highest percentage of going concern sale administrations (38.2%), with the lowest percentages in financial and insurance services and construction (11.5% and 11.3% respectively). These differences are illustrated in Figure 10, controlling for a range of other variables.

[18] Testing the SIC sector terms together'; $\chi^2_{40} = 191.44$, $p < 0.001$.

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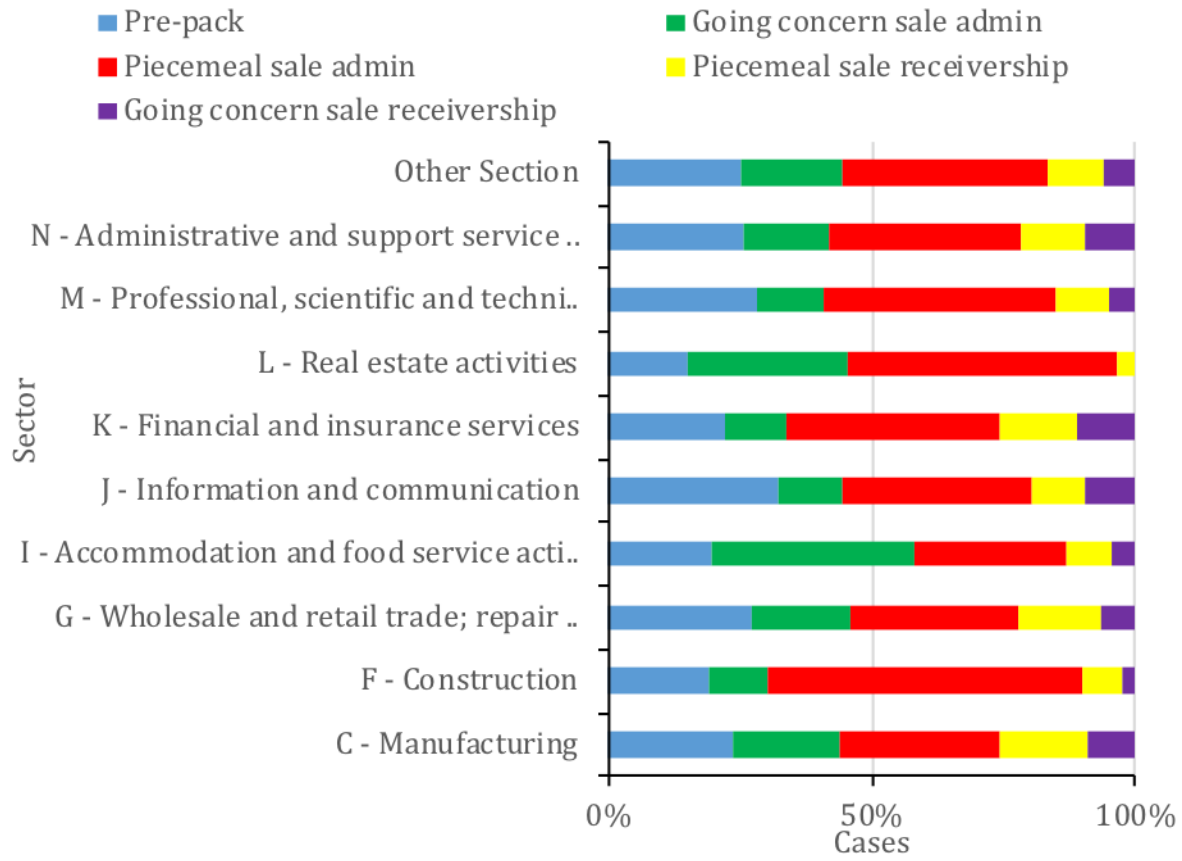

Figure 10. The relationship between procedure and sector, derived from the multinomial logistic regression model and controlling for a range of other variables

Region

There were also highly significant differences in the procedures adopted in different regions,[19] and as with region there were a number of statistically significant model terms (see the statistical appendix). Piecemeal sale administrations made up the highest percentage in Northern Ireland (69.6%) followed by Scotland (55.9%). Conversely, Scotland and Northern Ireland had the lowest percentage of pre-packs (13.4% for Northern Ireland and 11.6% for Scotland) and receiverships (none for Northern Ireland and 7.6% for Scotland). Pre-packs were most common in the North East (29.3%), while piecemeal sale receiverships were most common in Wales and the South East (18.5% and 17.8% respectively) and going concern sale receiverships in the West Midlands (12.0%). The highest percentage of going concern sale administrations was in the South West (25.0%), closely followed by Scotland (24.9%). In contrast, they only accounted for 13.8% in the East, 13.1% in the East Midlands and 8.3% of a small number of Welsh cases (N = 26). Figure 11 shows variation in type of procedure region, controlling for a range of other variables included in the statistical model.

[19] Testing the NUTS1 region terms together; $\chi^2_{44} = 109.73$, $p < 0.001$.

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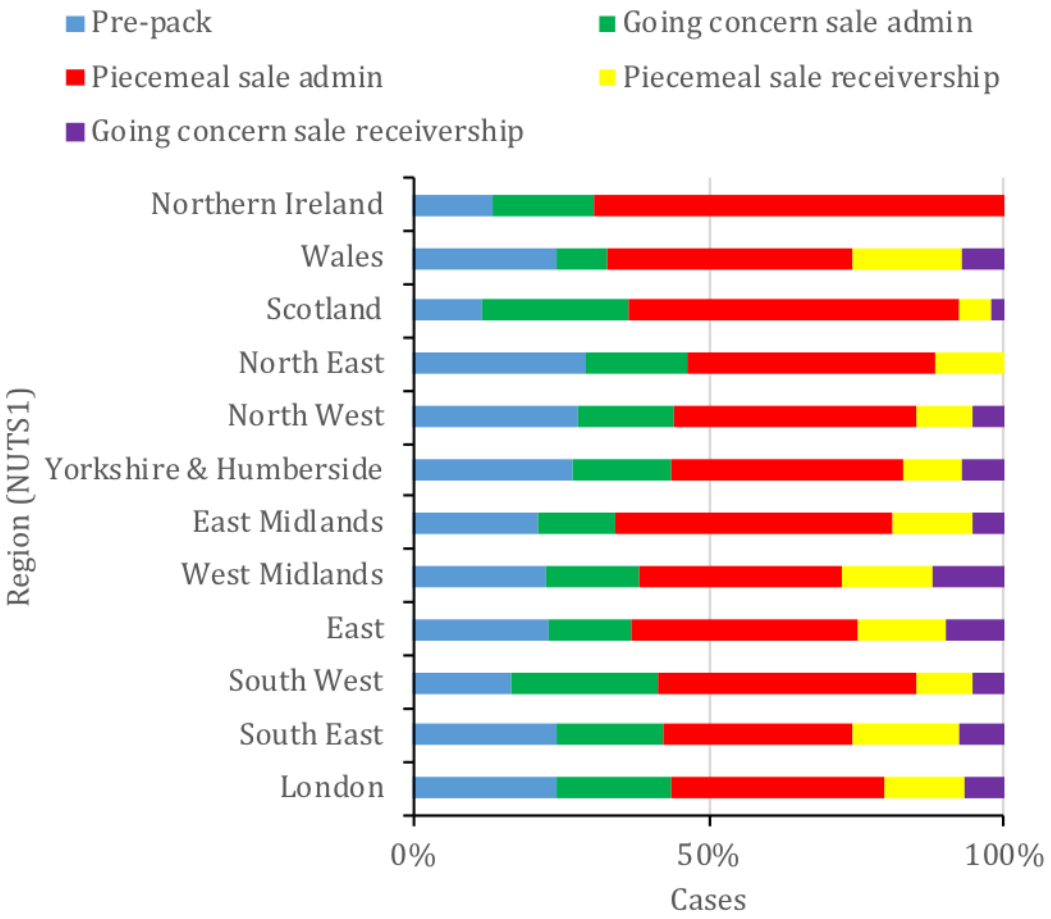

Figure 11. The relationship between procedure and region (NUTS1), derived from the multinomial logistic regression model and controlling for a range of other variables

IP firm

Differences in type of procedure by category of IP firm were highly statistically significant.[20] Piecemeal sale administrations were least common for 'top 4' firms (35.5%) compared to 'second tier' (41.6%) or 'other' (41.4%) firms. Compared to piecemeal sale administrations, both going concern sale receiverships and piecemeal sale receiverships were both more common for 'second tier'[21] and particularly 'top 4'[22] firms when compared to 'other firms'. While piecemeal sale receiverships made up 10.1 per cent of 'other' IP firm cases, they accounted for 12.5 per cent for 'second tier' and 16.7 per cent for 'top 4' firms. Similarly, while going concern sale receiverships made up 4.8 per cent of 'other' IP firm cases, they accounted for 7.8 per cent for 'second tier' and 8.0 per cent for 'top 4' firms. Elsewhere, pre-packs made up a slightly higher percentage of 'other' IP firms (25.3%), compared to 'second tier' (22.6%)

[20] Testing the IP firm terms together; $\chi^2_{12} = 67.90$, $p < 0.001$, or $\chi^2_8 = 31.36$, $p < 0.001$ if the missing terms are discarded.

[21] Compared to piecemeal sale administrations and 'other' firms; odds ratio = 1.86, Z = 2.43, p = 0.015 (going concern sale receiverships), a statistically significant difference and odds ratio = 1.51, Z = 1.91, p = 0.056 (piecemeal sale receiverships), marginally short of statistical significance.

[22] Compared to piecemeal sale administrations and 'other' firms; odds ratio = 2.53, Z = 3.26, p = 0.001 (going concern sale receiverships) and odds ratio = 2.90, Z = 4.27, $p < 0.001$ (piecemeal sale receiverships).

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and ‘top 4’ firms (21.3%), while percentage of going concern sale administrations was broadly comparable for ‘other’ and ‘top 4’ firms (18.3% and 18.5% respectively) and slightly lower for ‘second tier’ firms (15.5%). Figure 12 shows the relationship between procedure and IP Firm, controlling for other variables included in the statistical model.

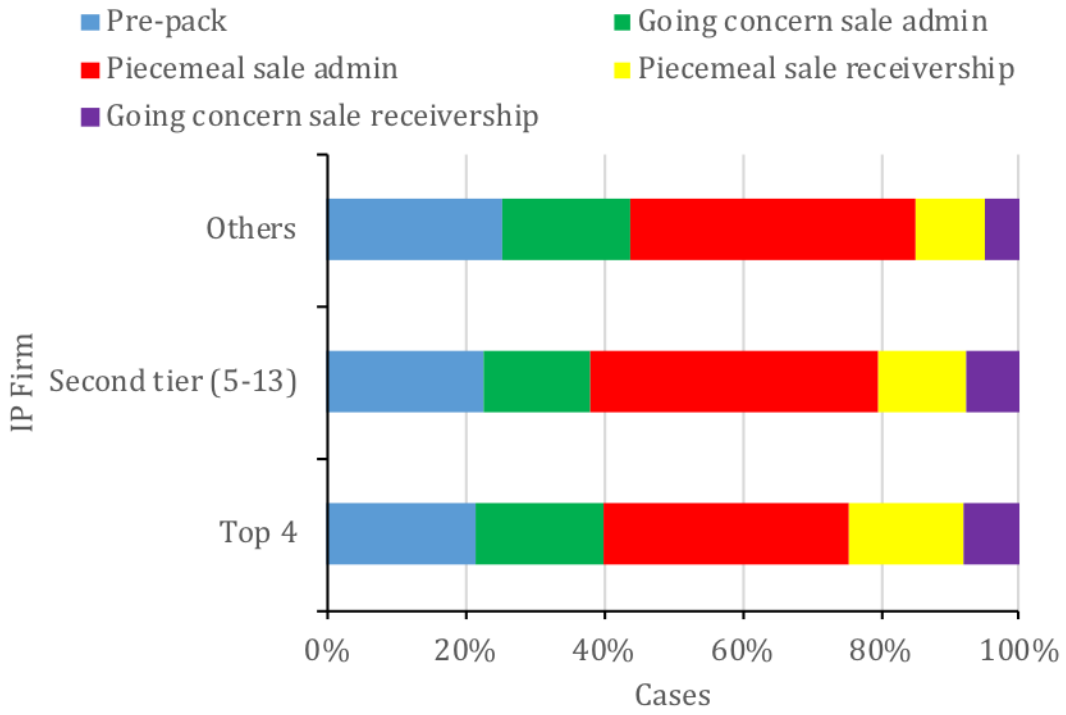

Figure 12. The relationship between procedure and IP Firm, derived from the multinomial logistic regression model and controlling for a range of other variables

Presence of a purchaser and whether they were connected

There were highly statistically differences in procedure adopted on the basis of presence of a purchaser and whether or not they were connected.[23] A large part of the difference was a very different spread of procedures for the ‘not applicable/unknown/missing’ category, where there were a far higher proportion of piecemeal sale administrations and piecemeal sale receiverships, and far fewer pre-packs (when compared to other groups). Focussing specifically on ‘purchaser connected’ and ‘purchaser not connected’ groups still indicated significant differences in procedure (though of a much smaller scale).[24] Where the purchaser was connected, there was a higher percentage of pre-packs than where they were not connected (49.9% compared to 38.9%) and a lower percentage of going concern sale administrations (14.6% compared to 20.1%) and going concern sale receiverships (9.2% compared to 13.0%). Procedures for each purchaser/purchaser connected group is shown in Figure 13, controlling for other variables.

[23] Jointly testing the purchaser/purchaser connected terms; $\chi^2_{12} = 391.78$, $p < 0.001$.
[24] $\chi^2_4 = 11.60$, $p = 0.021$.

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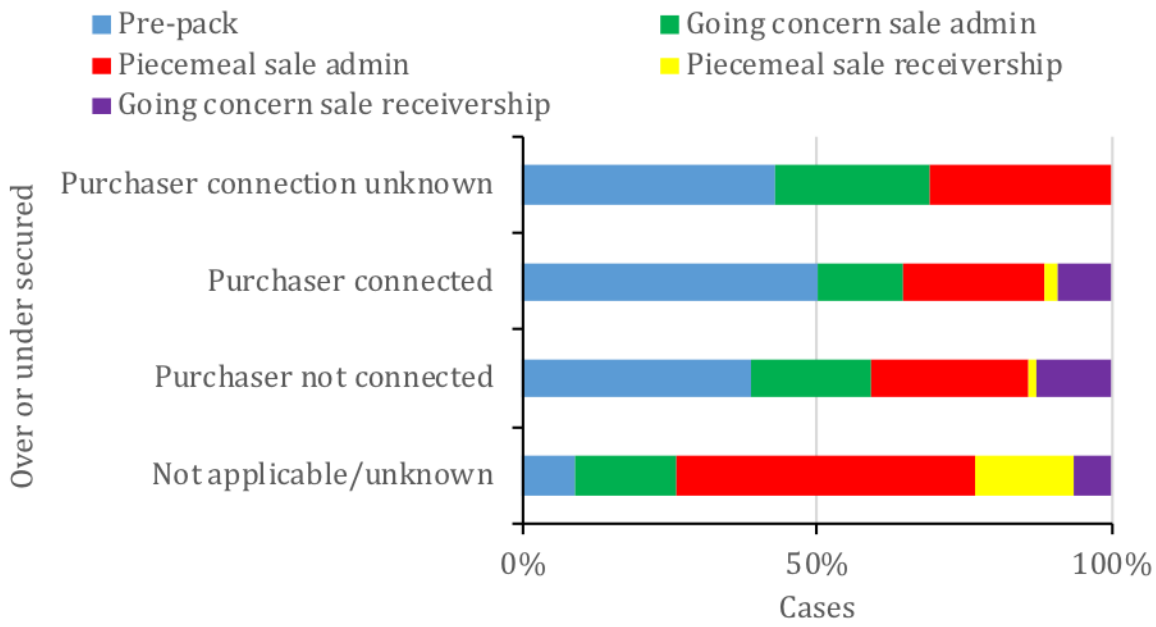

Figure 13. The relationship between procedure and whether a purchaser could be identified (and whether or not they were connected), derived from the multinomial logistic regression model and controlling for a range of other variables

The relationship between procedure, presence of a purchaser, purchaser connection and deferred consideration is shown in Figure 14. Note, that the figure shows the simple bivariate relationship and does not control for other variables. This was because of a lack of receiverships for a number of categories meaning a model could not be estimated.

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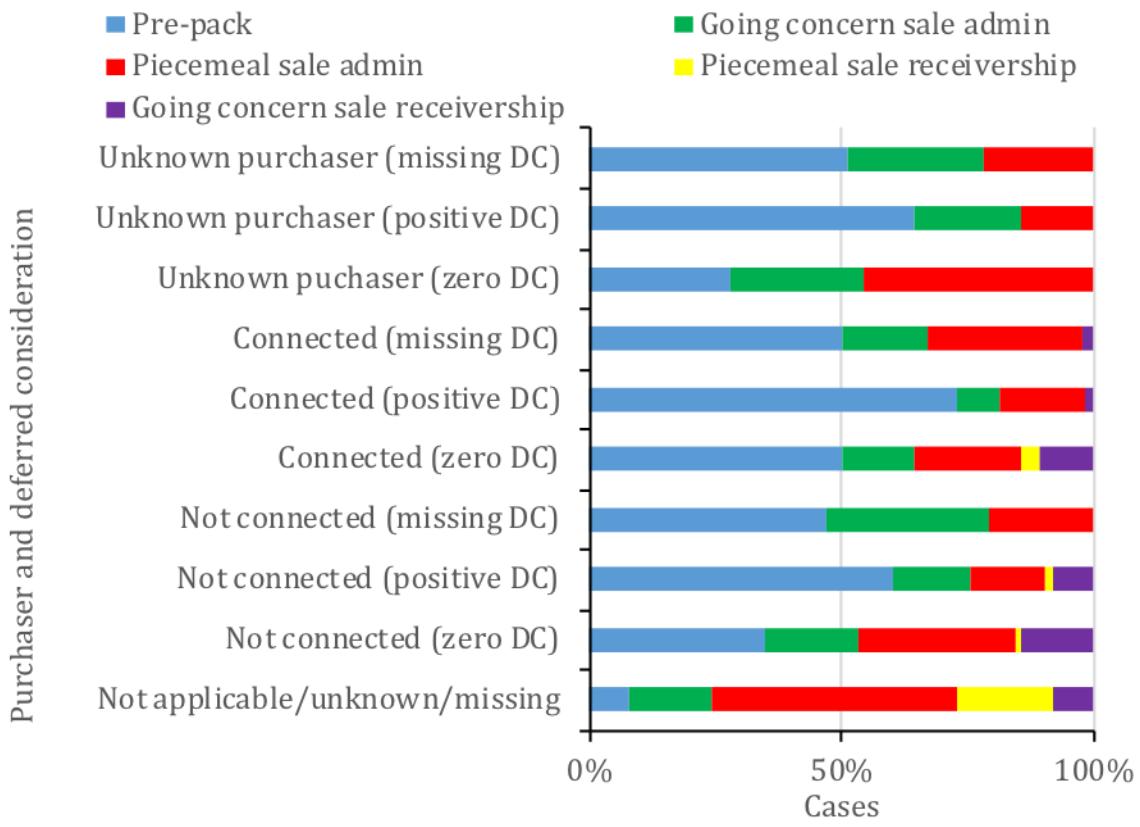

Figure 14. The relationship between procedure and whether a purchaser could be identified, whether or not they were connected and deferred consideration (positive, zero or missing)

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Statistical appendix

Factors associated with type of procedure (excluding a small number of successful restructuring administrations) was explored using multinomial logistic regression (e.g. see Hosmer et al., 2013). Multinomial logistic regression generalises logistic regression to multiclass problems, where the nominal dependent variable (in this case procedure) has more than two categories. The model predicts the probability of different types of procedure on the basis of a range of independent variables. In our case, these included total debt (grouped) SIC sector, NUTS1 region, IP firm and percentage of secured debt (of total debt, grouped). After fitting the model, proportions or percentages in each procedure type (for categories of each predictor) were calculated using *margins* in Stata, controlling for the other variables in the model. In our case, a 'margin' is a statistic based on a fitted model calculated over a dataset in which some of or all the independent variables are fixed at values different from what they really are. For instance, after fitting the model, the marginal mean (margin of mean) for 'over secured' is the predicted mean of the dependent variable, where every observation is treated as if it creditors were over secured; thus those observations where creditors are in fact over secured are included, as well as those observations where the creditor was under secured (or missing). Similarly, the marginal mean for 'under secured' would be similarly obtained by treating all observations as if they represented creditors who were under secured.

Table 5. Multinomial logistic regression of procedure (excluding a small number of successful restructuring administrations)

Outcome	Variable	Level	Coef.	SE	z	p
Pre_pack	Total debt	Less than £500k	0.000	-		
		£500k - £1m	-0.128	0.185	-0.690	0.489
		£1m-<£3m	-0.443	0.170	-2.600	0.009
		£3m-<£5m	-0.473	0.282	-1.680	0.093
		£5m+	-0.305	0.220	-1.390	0.165
		Unknown	-0.128	0.390	-0.330	0.743
	Over/under-secured	Undersecured	0.000	-		
		Oversecured	0.167	0.143	1.170	0.244
		Missing	-0.058	0.253	-0.230	0.819

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	SIC Sector	C - Manufacturing	0.000	-		
		F - Construction	-1.013	0.228	-4.450	0.000
		G - Wholesale and retail trade; repair of motor vehicles	0.139	0.221	0.630	0.527
		I - Accommodation and food service activities	-0.117	0.343	-0.340	0.734
		J - Information and communication	0.277	0.325	0.850	0.393
		K - Financial and insurance services	-0.447	0.366	-1.220	0.223
		L - Real estate activities	-1.056	0.415	-2.550	0.011
		M - Professional, scientific and technical activities	-0.147	0.265	-0.550	0.579
		N - Administrative and support service activities	-0.083	0.239	-0.350	0.729
		Other Section	-0.153	0.227	-0.670	0.500
		Unknown	-0.775	0.356	-2.180	0.029
	Region (NUTS1)	London - UKI	0.000	-		
		South East - UKJ	0.088	0.234	0.380	0.706
		South West - UKK	-0.709	0.344	-2.060	0.039
		East - UKH	-0.164	0.318	-0.520	0.606
		West Midlands - UKG	-0.083	0.256	-0.320	0.746
		East Midlands - UKF	-0.518	0.332	-1.560	0.119
		Yorkshire & Humberside - UKE	0.077	0.210	0.370	0.714
		North West - UKD	0.072	0.183	0.400	0.692
		North East - UKC	0.121	0.402	0.300	0.763
		Scotland - UKM	-1.376	0.420	-3.280	0.001
		Wales - UKL	-0.236	0.698	-0.340	0.735

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		Northern Ireland - UKN	-1.423	0.483	-2.940	0.003
	IP Firm	Other	0.000	-		
		Top 4	-0.106	0.230	-0.460	0.643
		Second tier (5-13)	-0.191	0.173	-1.100	0.271
		Unknown	-17.087	3139.752	-0.010	0.996
	Purchaser	Not applicable/unknown/missing	0.000	-		
		Purchaser not connected	2.231	0.173	12.920	0.000
		Purchaser connected	2.629	0.176	14.980	0.000
		Purchaser not unknown	2.201	0.186	11.810	0.000
	Constant		-1.178	0.267	-4.420	0.000
Going concern sale administration	Total debt	Less than £500k	0.000	-		
		£500k - £1m	0.298	0.207	1.440	0.149
		£1m-<£3m	0.358	0.184	1.950	0.051
		£3m-<£5m	0.835	0.251	3.330	0.001
		£5m+	0.896	0.209	4.290	0.000
		Unknown	0.793	0.353	2.240	0.025
	Over/under-secured	Undersecured	0.000	-		
		Oversecured	0.513	0.146	3.520	0.000
		Missing	0.145	0.233	0.620	0.532
	SIC Sector	C - Manufacturing	0.000	-		
		F - Construction	-1.337	0.230	-5.820	0.000
		G - Wholesale and retail trade; repair of motor vehicles	-0.136	0.222	-0.610	0.540

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		I - Accommodation and food service activities	0.708	0.281	2.520	0.012
		J - Information and communication	-0.684	0.394	-1.740	0.082
		K - Financial and insurance services	-0.902	0.376	-2.400	0.017
		L - Real estate activities	-0.163	0.271	-0.600	0.546
		M - Professional, scientific and technical activities	-0.871	0.296	-2.950	0.003
		N - Administrative and support service activities	-0.393	0.247	-1.590	0.112
		Other Section	-0.338	0.223	-1.520	0.130
		Unknown	-1.102	0.386	-2.850	0.004
	Region (NUTS1)	London - UKI	0.000	-		
		South East - UKJ	0.082	0.234	0.350	0.726
		South West - UKK	0.063	0.291	0.220	0.829
		East - UKH	-0.400	0.342	-1.170	0.242
		West Midlands - UKG	-0.133	0.255	-0.520	0.603
		East Midlands - UKF	-0.689	0.362	-1.900	0.057
		Yorkshire & Humberside - UKE	-0.203	0.220	-0.930	0.355
		North West - UKD	-0.304	0.192	-1.580	0.114
		North East - UKC	-0.262	0.476	-0.550	0.582
		Scotland - UKM	-0.228	0.253	-0.900	0.368
		Wales - UKL	-1.038	0.804	-1.290	0.197
		Northern Ireland - UKN	-0.874	0.340	-2.570	0.010
	IP Firm	Other	0.000	-		
		Top 4	0.166	0.193	0.860	0.388

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		Second tier (5-13)	-0.193	0.166	-1.160	0.244
		Unknown	-0.067	0.698	-0.100	0.924
	Purchaser	Not applicable/unknown/missing	0.000	-		
		Purchaser not connected	0.843	0.182	4.640	0.000
		Purchaser connected	0.609	0.215	2.830	0.005
		Purchaser unknown	0.921	0.194	4.750	0.000
	Constant		-1.196	0.267	-4.480	0.000
Piecemeal sale administration			Base outcome			
Piecemeal sale receivership	Total debt	Less than £500k	0.000	-		
		£500k - £1m	0.670	0.331	2.020	0.043
		£1m-<£3m	0.844	0.295	2.860	0.004
		£3m-<£5m	0.705	0.402	1.750	0.079
		£5m+	0.387	0.347	1.120	0.264
		Unknown	3.316	0.439	7.550	0.000
	Over/under-secured	Undersecured	0.000	-		
		Oversecured	-0.667	0.213	-3.130	0.002
		Missing	-0.340	0.350	-0.970	0.331
	SIC Sector	C - Manufacturing	0.000	-		
		F - Construction	-2.143	0.324	-6.610	0.000
		G - Wholesale and retail trade; repair of motor vehicles	-0.240	0.265	-0.900	0.366
		I - Accommodation and food service activities	-1.129	0.482	-2.340	0.019

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		J - Information and communication	-0.996	0.492	-2.030	0.043
		K - Financial and insurance services	-0.433	0.395	-1.100	0.273
		L - Real estate activities	-3.330	0.842	-3.960	0.000
		M - Professional, scientific and technical activities	-1.291	0.387	-3.340	0.001
		N - Administrative and support service activities	-0.682	0.315	-2.170	0.030
		Other Section	-1.101	0.299	-3.690	0.000
		Unknown	-0.726	0.379	-1.920	0.055
	Region (NUTS1)	London - UKI	0.000	-		
		South East - UKJ	0.634	0.278	2.280	0.023
		South West - UKK	-0.761	0.469	-1.620	0.105
		East - UKH	0.209	0.369	0.570	0.571
		West Midlands - UKG	0.478	0.290	1.650	0.099
		East Midlands - UKF	-0.235	0.404	-0.580	0.560
		Yorkshire & Humberside - UKE	-0.539	0.309	-1.740	0.081
		North West - UKD	-0.771	0.282	-2.730	0.006
		North East - UKC	-0.693	0.727	-0.950	0.340
		Scotland - UKM	-2.039	0.525	-3.880	0.000
		Wales - UKL	0.417	0.673	0.620	0.535
		Northern Ireland - UKN	-19.156	1763.806	-0.010	0.991
	IP Firm	Other	0.000	-		
		Top 4	1.065	0.250	4.270	0.000
		Second tier (5-13)	0.413	0.216	1.910	0.056

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		Unknown	2.289	0.470	4.870	0.000
	Purchaser	Not applicable/unknown/missing	0.000	-		
		Purchaser not connected	-2.318	0.605	-3.830	0.000
		Purchaser connected	-1.761	0.539	-3.270	0.001
		Purchaser unknown	-17.403	1084.880	-0.020	0.987
	Constant		-0.995	0.363	-2.740	0.006
Going concern sale receivership	Total debt	Less than £500k	0.000	-		
		£500k - £1m	0.410	0.485	0.850	0.398
		£1m-<£3m	1.025	0.398	2.580	0.010
		£3m-<£5m	1.237	0.493	2.510	0.012
		£5m+	1.497	0.418	3.580	0.000
		Unknown	4.412	0.728	6.060	0.000
	Over/under-secured	Undersecured	0.000	-		
		Oversecured	-0.436	0.240	-1.810	0.070
		Missing	-1.402	0.629	-2.230	0.026
	SIC Sector	C - Manufacturing	0.000	-		
		F - Construction	-2.630	0.464	-5.670	0.000
		G - Wholesale and retail trade; repair of motor vehicles	-0.492	0.317	-1.550	0.121
		I - Accommodation and food service activities	-1.048	0.593	-1.770	0.077
		J - Information and communication	-0.322	0.464	-0.690	0.487
		K - Financial and insurance services	-0.115	0.408	-0.280	0.777
		L - Real estate activities	-18.335	1934.261	-0.010	0.992

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		M - Professional, scientific and technical activities	-1.315	0.434	-3.030	0.002
		N - Administrative and support service activities	-0.264	0.332	-0.800	0.426
		Other Section	-0.951	0.343	-2.770	0.006
		Unknown	-0.824	0.487	-1.690	0.091
	Region (NUTS1)	London - UKI	0.000	-		
		South East - UKJ	0.453	0.342	1.320	0.185
		South West - UKK	-0.596	0.576	-1.040	0.301
		East - UKH	0.507	0.422	1.200	0.229
		West Midlands - UKG	0.891	0.322	2.760	0.006
		East Midlands - UKF	-0.546	0.526	-1.040	0.299
		Yorkshire & Humberside - UKE	-0.073	0.335	-0.220	0.829
		North West - UKD	-0.542	0.314	-1.730	0.084
		North East - UKC	-17.350	3140.592	-0.010	0.996
		Scotland - UKM	-2.129	0.779	-2.730	0.006
		Wales - UKL	0.059	0.935	0.060	0.950
		Northern Ireland - UKN	-18.778	2746.942	-0.010	0.995
	IP Firm	Other	0.000	-		
		Top 4	0.929	0.285	3.260	0.001
		Second tier (5-13)	0.620	0.256	2.430	0.015
		Unknown	2.993	0.493	6.070	0.000
	Purchaser	Not applicable/unknown/missing	0.000	-		
		Purchaser not connected	1.073	0.260	4.120	0.000

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		Purchaser connected	0.663	0.330	2.010	0.044
		Purchaser not unknown	-17.183	1378.375	-0.010	0.990
	Constant		-2.494	0.475	-5.260	0.000

N = 2,465, Log-likelihood = -2,442.59, Pseudo R^2 = 0.261

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3.2.2 Modelling survival of purchasers

There were 658 cases included in the analysis exploring ongoing survival of purchasers. These were cases with a purchaser and valid data on both end of procedure and either the purchaser ceasing to operate or the purchaser still existing at the time of data entry. Of the 658 cases the purchaser ceased to exist for 170 (25.8%), with a total of 30,574 months 'at risk' in the dataset. The incidence rate (number ceasing to operate / time at risk) was 0.0056. The Cox (proportional hazards) regression model (a type of survival model) was used to model survival time on the basis of a range of independent variables (Cox, 1984). The model assesses the effect of the independent variables on the time taken for the purchaser to cease to operate.

Model output is included in a statistical appendix, though results of the model are summarised in simple terms below. For each independent variable, the relationship between the different levels of the variable and the risk of purchasers ceasing to operate are discussed. This is followed by survivor functions, which illustrate the proportion of each group surviving (continuing to operate) over time (in months).

Procedure

There was no evidence of a significant difference in the risk of purchasers ceasing to operate between different types of procedure.[25] While the small number of receiverships (n = 41) appeared to be comparatively more likely to cease to operate than other groups (e.g. a hazard ratio of 1.54 compared to pre-packs), differences were clearly non-significant.[26] A larger sample of receiverships would be required to explore any possible differences further. Figure 15 illustrates the survivor function for different procedures, controlling for the range of other variables included in the Cox regression model.

[25] Testing the procedure model terms; $\chi^2_3 = 1.66$, $p = 0.65$.
[26] For example, compared to pre-packs, $Z = 1.07$, $p = 0.28$.

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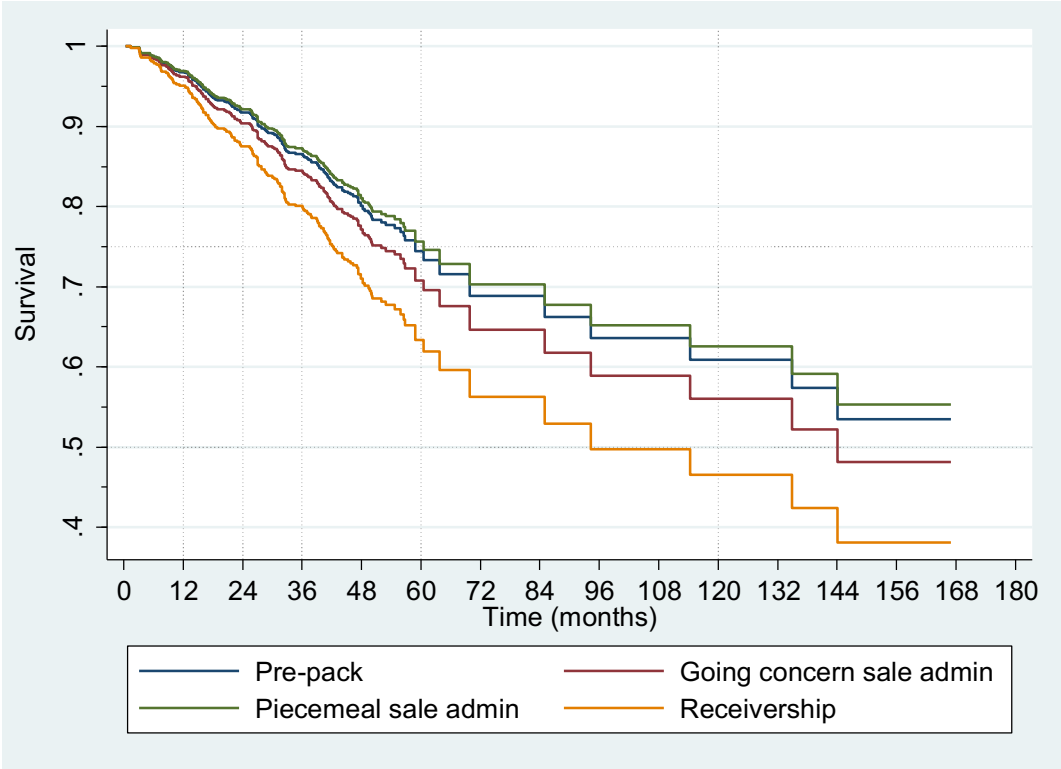

Figure 15. Survivor functions for different types of procedure, derived from the Cox regression model and controlling for other variables.

Debtor size

Overall, difference in the risk of purchasers ceasing to operate between different sizes of debt was non-significant,[27] though some individual model terms were close to significance.[28] Hazard of ceasing to operate and, therefore, survival over time was also ordered by debtor size, with the hazard decreasing with increasing debt. However, further cases would be required to explore the relationship more fully. Survivor functions for different debtor size (total debt) groups, are illustrated in Figure 16, controlling for other variables.

[27] Jointly testing the total debt model terms; $\chi^2_5 = 5.45$, $p = 0.36$.

[28] For example, the reduction in the hazard of ceasing to operate for the '£1,000,000 to less than £3,000,000' total debt group compared to the 'less than £500,000' model reference category; hazard ratio = 0.64, Z = -1.94, p = 0.053.

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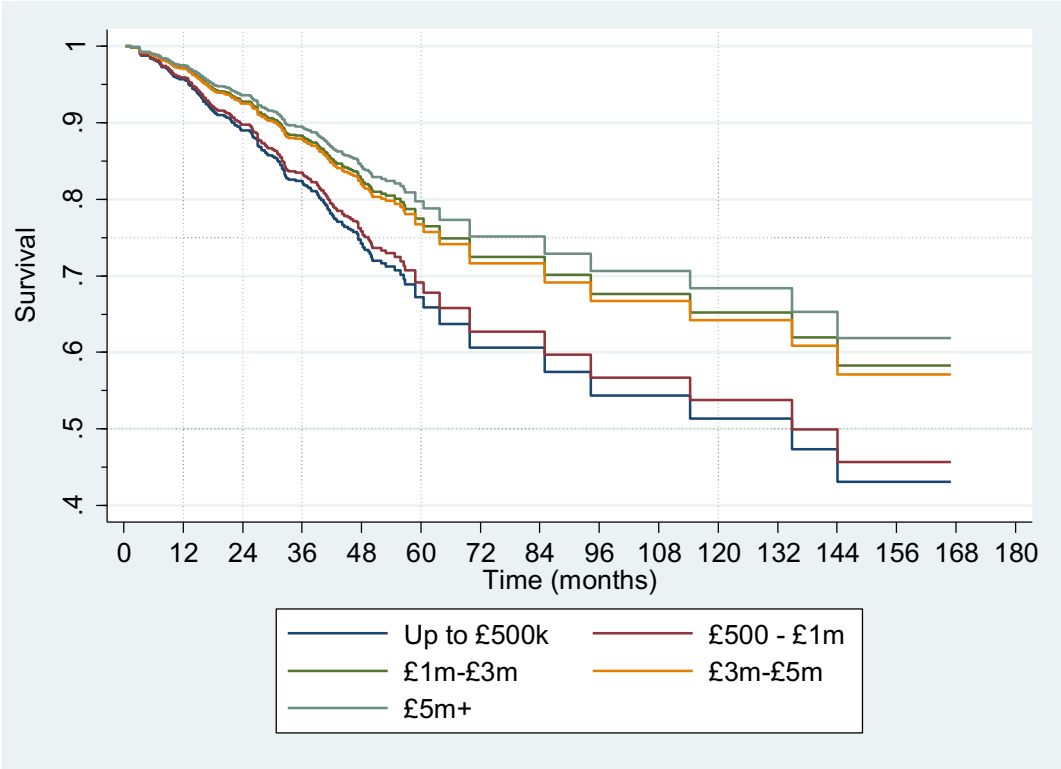

Figure 16. Survivor functions for different debtor size (total debt) groups, derived from the Cox regression model and controlling for other variables.

Percentage of secured debt

There was no evidence of statistically significant differences in the risk of ceasing to operate between different 'percentage of secured debt' groups.[29] While it appeared that the 'over 75% to 100%' group had a slightly higher proportion surviving over time (as illustrated in Figure 17), differences between different groups were all clearly non-significant.

[29] Jointly testing the percentage of secured debt model terms; $\chi^2_4 = 1.10$, $p = 0.89$.

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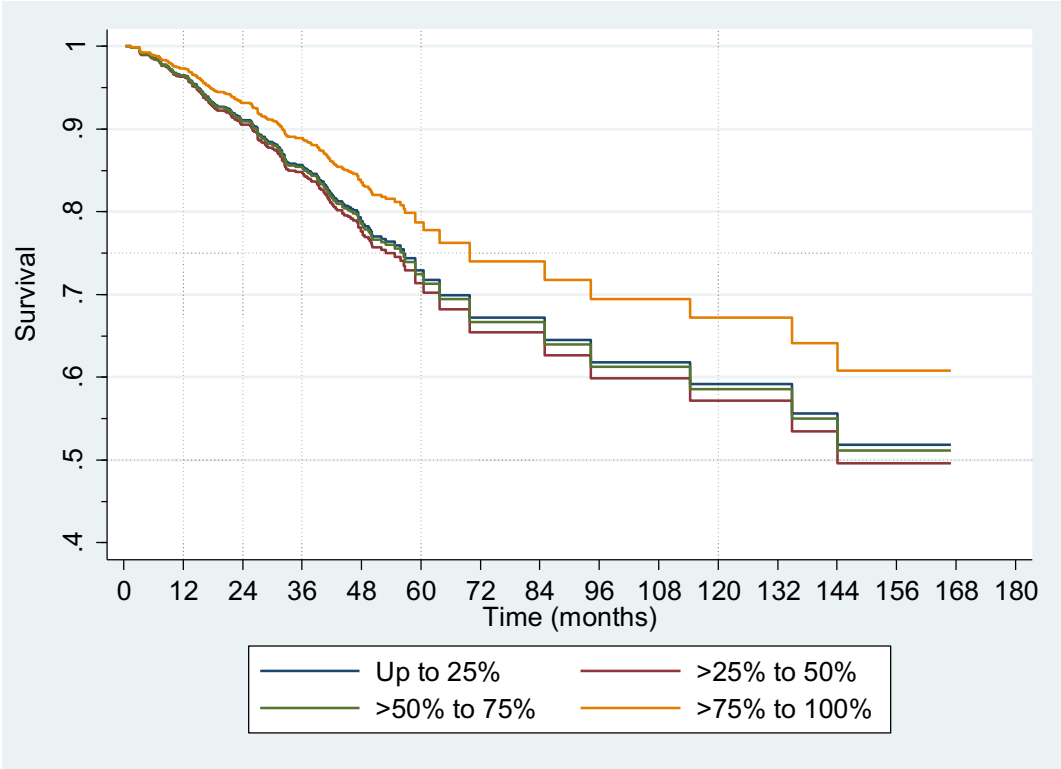

Figure 17. Survivors function for percentage of secured debt groups, derived from the Cox regression model and controlling for other variables.[30]

Region

There were statistically significant differences in the risk of ceasing to operate (and survival over time) between different regions.[31] Compared to London (the model reference category) there were significant increases in the hazard of ceasing to operate in the West and East Midlands[32] and North East, North West and Yorkshire and Humberside.[33] The increase for the East, South West and South East compared to London fell marginally short of statistical significance.[34] There was also a far lower hazard of ceasing to operate among a small number of cases in Wales, Scotland and Northern Ireland (n = 28), which reached statistical significance if compared to the West and East Midlands.[35] However, findings for Wales, Scotland and Northern Ireland should be interpreted with some caution, given the small number of cases. Figure 18 illustrates the survivor functions for different regions, controlling for other variables included in the model.

[30] Note that a separate model was fitted to explore percentage of secured debt, where total debt (grouped) was removed and percentage of secured debt added.
[31] Jointly testing the region terms; $\chi^2_4 = 12.59$, p = 0.014.
[32] Hazard ratio = 2.24, z = 2.93, p = 0.003.
[33] Hazard ratio = 1.71, z = 2.47, p = 0.014.
[34] Hazard ratio = 1.61, z = 1.83, p = 0.067.
[35] Hazard ratio = 7.8, z = 1.99, p = 0.047.

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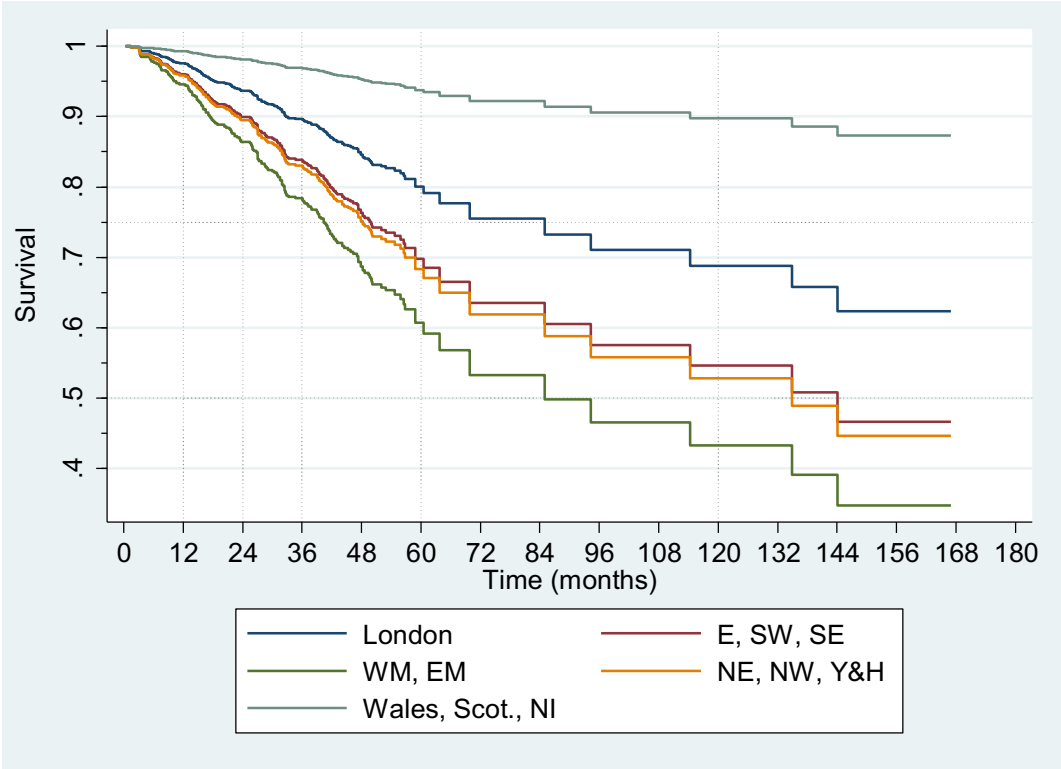

Figure 18. Survivor functions for different regions, derived from the Cox regression model and controlling for other variables.

Sector

While testing all sector terms together fell short of statistical significance,[36] there were some differences in the hazard of ceasing to operate between different groups. While based on small numbers of observation (n = 20 in both cases) there was a higher risk of ceasing to operate for real estate cases[37] and lower risk for financial and insurance sector cases.[38] Differences between other sectors were fairly modest and non-significant, and findings for both real estate and financial and insurance sector cases should be interpreted with caution given the small number of cases. Survivor functions for different SIC sectors, controlling for other variables are illustrated in Figure 19.

[36] Jointly testing the sector model terms; $\chi^2_{10} = 16.38$, $p = 0.089$.
[37] Significantly higher than eight other sectors as well as the 'other' group.
[38] Significantly lower than three other sectors.

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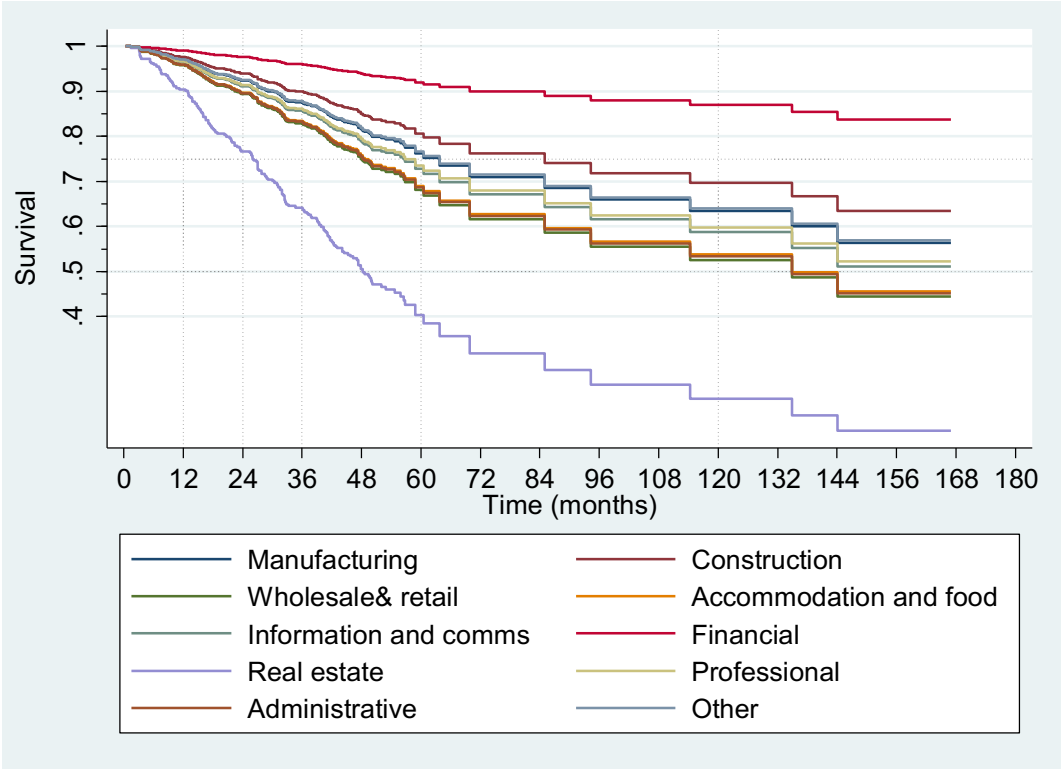

Figure 19. Survivor functions for different SIC sectors, derived from the Cox regression model and controlling for other variables.

IP Firm

While jointly testing the IP firm model terms fell short of statistical significance,[39] there were statistically significant differences between 'top 4' and 'second tier' firms, with a significantly increased hazard of ceasing to exist for 'second tier' firms.[40] 'Other' firms also had a greater risk of ceasing to exist compared to 'top 4' firms, though the difference fell short of statistical significance.[41] Survivor functions for groups of IP firm, controlling for other variables are shown in Figure 20. As can be seen, cases associated with 'top 4' IP firms survived for longer.

[39] $\chi^2_2 = 4.20$, $p = 0.12$.
[40] Hazard ratio = 2.16, $z = 2.03$, $p = 0.042$.
[41] Hazard ratio = 1.91, $z = 1.83$, $p = 0.067$.

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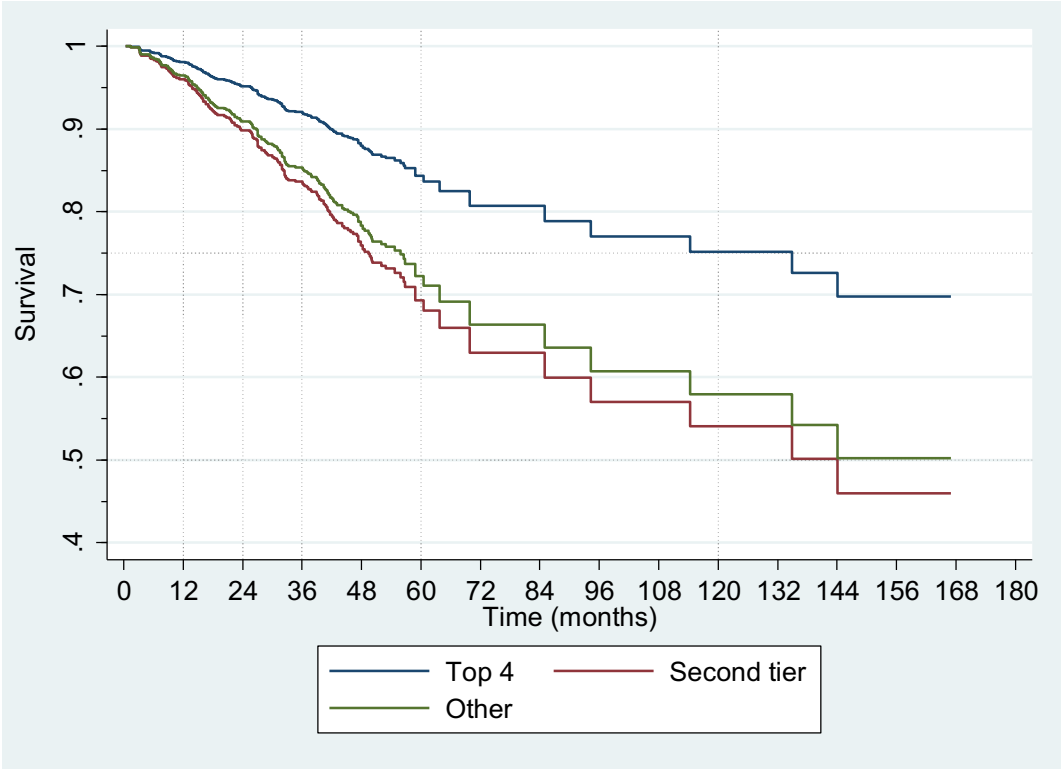

Figure 20. Survivor functions for groups of IP firm, derived from the Cox regression model and controlling for other variables.

Whether the purchaser was connected

There were also significant differences in risk of ceasing to operate and whether or not the purchaser was connected.[42] Cases where the purchaser was connected had a higher risk of ceasing to operate, and statistically significantly higher than both 'purchaser not connected'[43] and 'purchaser unknown'[44] cases. Differences in survival between different purchaser groups are illustrated in Figure 21, controlling for the other variables included in the model. As shown, proportion surviving fell more sharply over time for the 'purchaser connected' group.

[42] Testing the 'purchaser' model terms together, $\chi^2_2 = 9.36$, p = 0.009.
[43] Hazard ratio = 1.48, z = 2.13, p = 0.033.
[44] Hazard ratio = 1.98, z = 2.74, p = 0.006.

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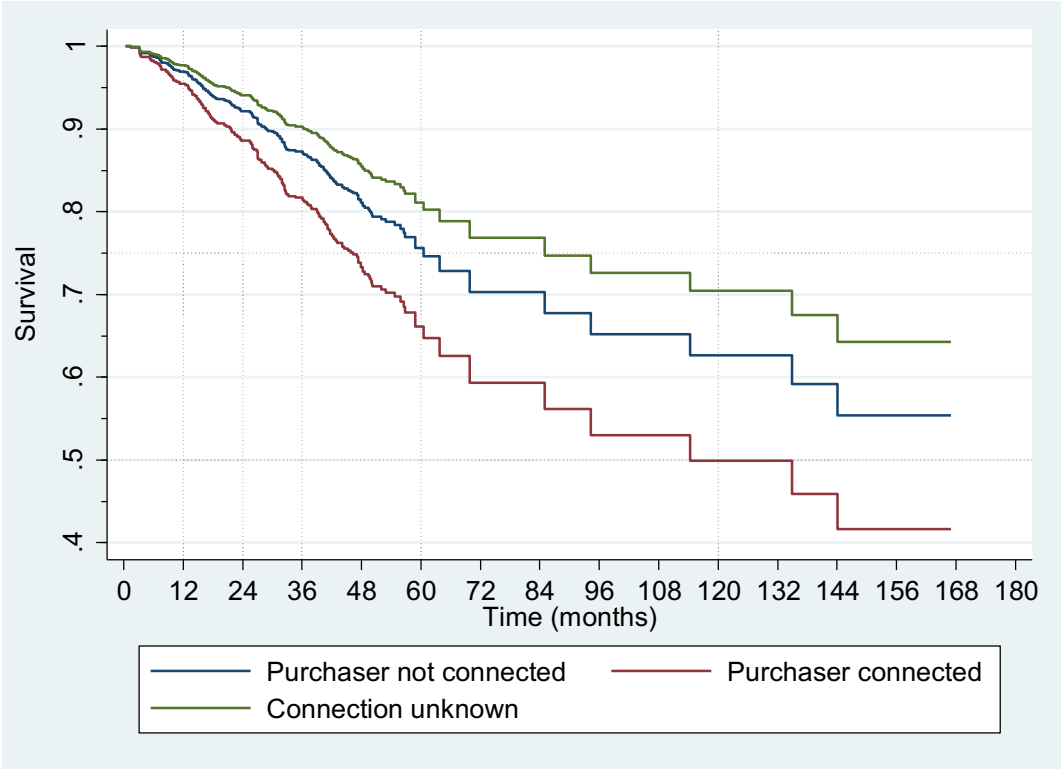

Figure 21. Survivor functions for different types of purchaser, derived from the Cox regression model and controlling for other variables.

Whether creditors were over or under-secured

There were also significant differences in the risk of ceasing to operate depending on whether or not creditors were over or under-secured. Cases with under-secured creditors has a significantly greater hazard of ceasing to operate when compared to over-secured creditors.[45] This difference is illustrated in Figure 22, with a lower proportion surviving over time for the under-secured group when compared to over-secured or 'unknown' groups.

[45] Hazard ratio = 1.50, z = 2.21, p = 0.027.

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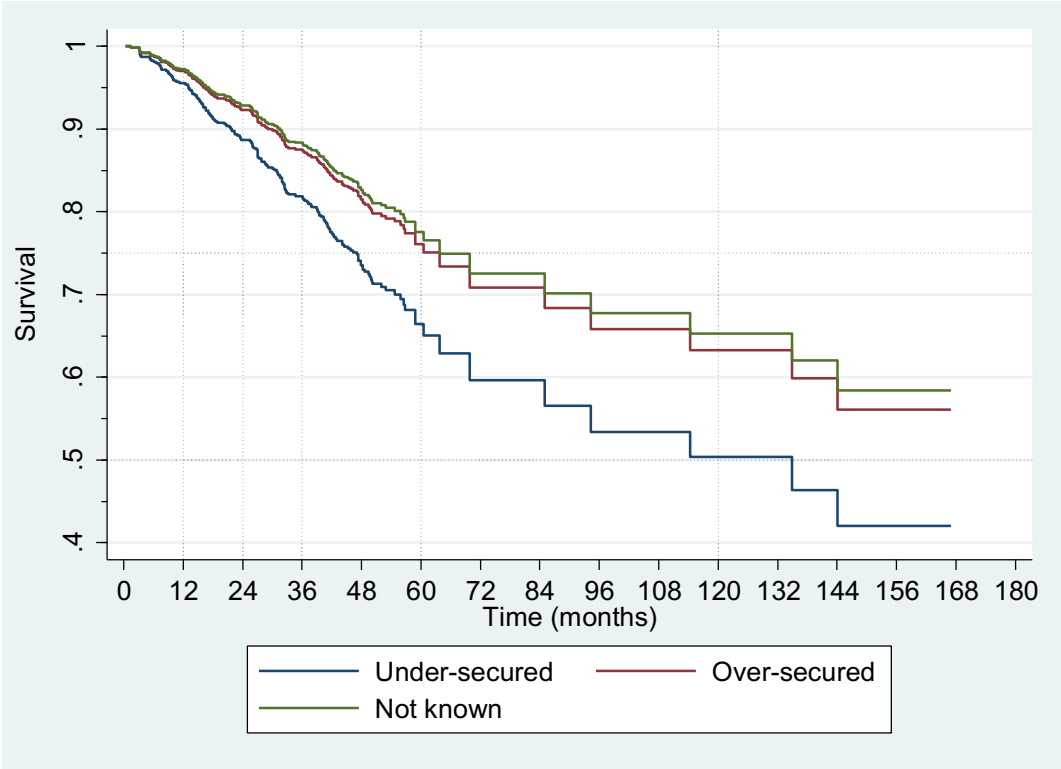

Figure 22. Survivor functions for whether creditors were over or under-secured, derived from the Cox regression model and controlling for other variables.

Duration of procedure

There was no evidence of significant differences in risk of ceasing to operate for different.[46] Figure 23 shows survivor functions for different durations of procedure, controlling for other variables, with little difference in survival over time between the three groups.

[46] Jointly testing the procedure duration model terms, $\chi^2_2 = 0.58$, $p = 0.75$.

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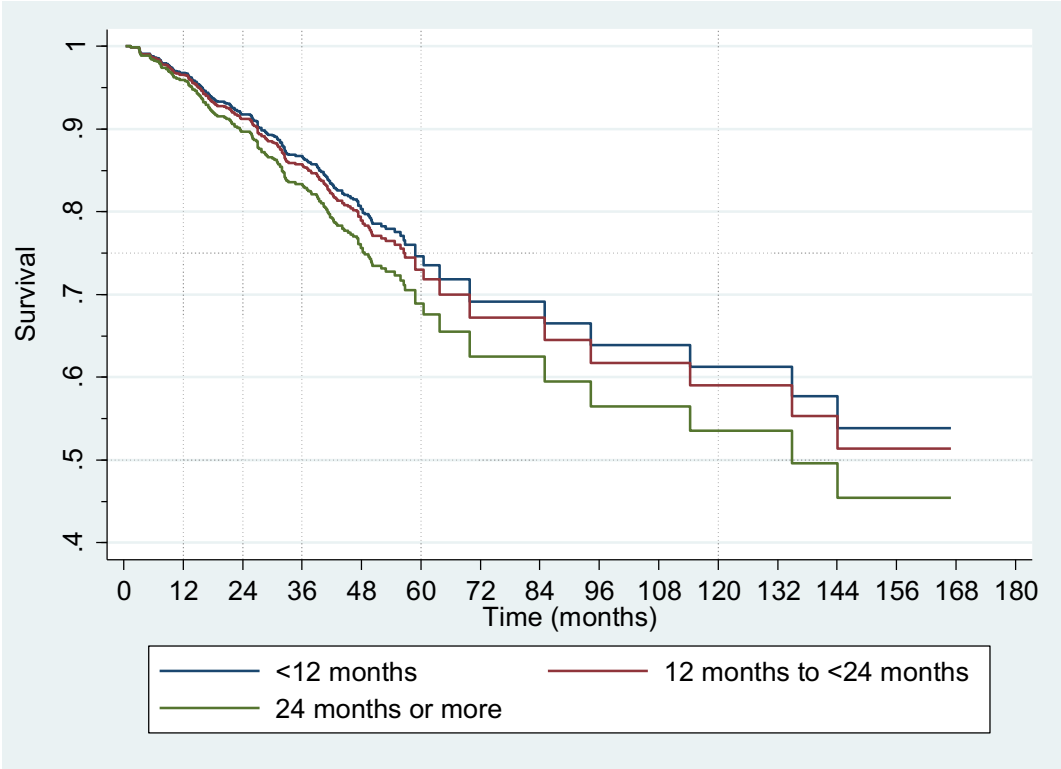

Figure 23. Survivor functions for different durations of procedure, derived from the Cox regression model and controlling for other variables.

Deferred consideration

Ignoring cases with missing/unknown deferred consideration, there were statistically significant differences between 'zero deferred consideration' and 'positive deferred consideration' cases. Specifically, compared to the 'zero' group, cases with 'positive deferred consideration' had a significantly greater hazard of ceasing to operate.[47] Survivor functions for deferred consideration groups, controlling for other variables, are illustrated in Figure 24.

[47] Hazard ratio = 1.49, z = 2.01, p = 0.044.

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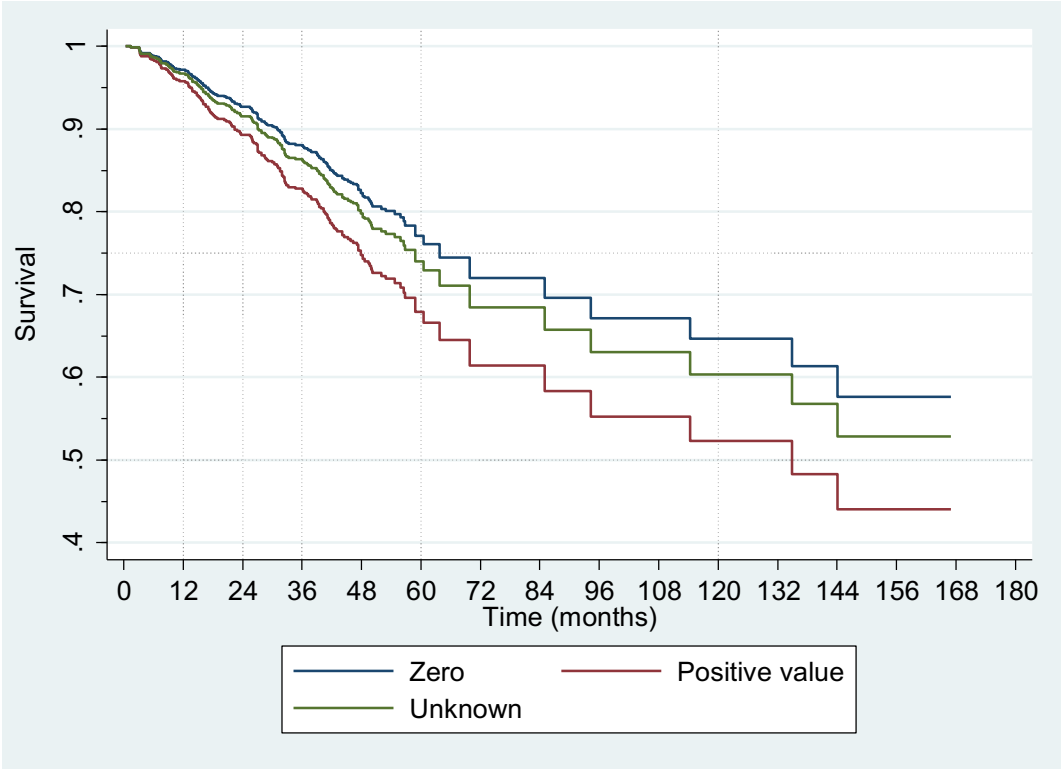

Figure 24. Survivor functions for different deferred consideration groups, derived from the Cox regression model and controlling for other variables.

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Statistical appendix

The Cox (proportional hazards) regression model (a type of survival model) was used to model survival time on the basis of a range of independent variables (Cox, 1984). The model assesses the effect of the independent variables on the time taken for the purchaser to cease to operate. The model is made up of two parts; the baseline hazard function, which describes how the risk of ceasing to operate per month changes over time at the baseline level of covariates, and effect parameters, describing how the hazard of ceasing to operate varies with the independent variables included. For further information, see Singer and Willet (2003). In our model, the proportional hazards assumption was met ($\chi^2_{30} = 32.88$, $p = 0.33$). Predictors were entered as independent main effects only, and there were no time varying covariates. The model output shows model coefficients rather than hazard ratios, though these can be easily derived from the coefficients ($e^{coef.}$).

Table 6. Cox regression output modelling survival time of purchaser on the basis of a range of independent variables.

Variable	Level	Coef.	SE	z	p
Procedure	Pre-pack	0.000	-		
	Going concern sale admin	0.157	0.244	0.640	0.520
	Piecemeal sale admin	-0.056	0.232	-0.240	0.809
	Receivership	0.434	0.405	1.070	0.284
Total debt	Less than £500k	0.000	-		
	£500k - £1m	-0.072	0.225	-0.320	0.748
	£1m-<£3m	-0.444	0.229	-1.940	0.053
	£3m-<£5m	-0.407	0.405	-1.010	0.314
	£5m+	-0.562	0.332	-1.690	0.091
	Unknown	-0.138	0.480	-0.290	0.773
Region	London	0.000	-		
	East, South West, South East	0.479	0.262	1.830	0.067

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	West and East Midlands	0.806	0.275	2.930	0.003
	North East, North West, Yorkshire & Humberside	0.534	0.216	2.470	0.014
	Wales, Scotland, Northern Ireland	-1.246	1.027	-1.210	0.225
SIC Sector	C - Manufacturing	0.000	-		
	F - Construction	-0.231	0.354	-0.650	0.514
	G - Wholesale and retail trade; repair of motor vehicles and..	0.346	0.262	1.320	0.188
	I - Accommodation and food service activities	0.311	0.416	0.750	0.454
	J - Information and communication	0.153	0.362	0.420	0.671
	K - Financial and insurance services	-1.179	0.742	-1.590	0.112
	L - Real estate activities	1.208	0.447	2.710	0.007
	M - Professional, scientific and technical activities	0.123	0.369	0.330	0.739
	N - Administrative and support service activities	0.324	0.289	1.120	0.262
	Other Section	-0.019	0.301	-0.060	0.950
	Unknown	0.526	0.396	1.330	0.183
IP Firm	Other	0.000	-		
	Top 4	-0.648	0.354	-1.830	0.067
	Second tier (5-13)	0.121	0.221	0.550	0.585
Purchaser	Purchaser not connected	0.000	-		
	Purchaser connected	0.394	0.185	2.130	0.033
	Purchaser connection unknown	-0.289	0.262	-1.100	0.270
Over/under-secured	Oversecured	0.000	-		
	Undersecured	0.405	0.183	2.210	0.027

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	Missing	-0.071	0.341	-0.210	0.834
Process duration	Less than 12 months	0.000	-		
	12 months to less than 24 months	0.074	0.195	0.380	0.703
	24 months or more	0.243	0.324	0.750	0.452
Deferred consideration	Zero	0.000	-		
	Positive value	0.397	0.197	2.010	0.044
	Not known	0.146	0.227	0.640	0.520

Log likelihood = -991.00

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3.2.3 Modelling total realised

The total realised (in pounds) was available for 2,007 cases. The mean total realised was £1,878,539, with a median of £150,285. This section explores the relationship between total realised range of variables. The statistical technique used employed was a gamma generalized linear model with a log link function (which provides the relationship between the linear predictor and the mean of the distribution function). Importantly, the model is multiplicative, so a model estimate of say 0.67 for 'going concern sale administration' would indicate $e^{0.67}$ = 1.95 times higher total realised compared to pre-packs. So a pre-pack with total realised of £1,000,000 would be expected to realise £1,950,000 if it were a going concern sale administration (while also controlling for the other variables included in the model). Additional detail of the statistical modelling can be found in the statistical appendix, though this section summarises model output in lay terms.

Independent variables included in the main statistical model were procedure (excluding a small number of successful restructuring administrations), total debt (grouped), the interaction between procedure and total debt (grouped), percentage of debt which was secured (grouped), SIC sector, region (NUTS1 classification), IP firm, and presence of a purchaser and whether or not they were connected. To facilitate interpretation, predicted total realised were also calculated and used to produce figures using the 'margins' post estimation command in Stata 13 to yield estimates for levels of a given independent variable while controlling for other variables.

Procedure

There were highly statistically significant differences in total realised between different types of procedure.[48] Figure 25 shows the total realised by procedure, controlling for other variables, including the interaction between procedure and total debt. As shown, total realised was at its highest for a small number of going concern sale receiverships, though findings should be treated with caution since they were a very small number of cases (n = 30). Elsewhere, compared to pre-packs, total realised was higher for going concern sale administrations and piecemeal sale administrations, and far lower for piecemeal sale receiverships. The interaction between procedure and total debt is discussed in further detail below. Note, if the procedure by total debt interaction term is removed from the model, differences remained significant,[49] and total realised in Figure 25 would be £1,688,027[50] for going concern sale receiverships, £1,213,873 for piecemeal sale receiverships, £2,097,084 for piecemeal sale administrations, £3,332,917 for going concern sale administrations and £2,611,835 for pre-packs. As an aside, if no variables are controlled for, going concern sale administrations still had the highest total realised (£3,651,189), followed by piecemeal sale administrations (£1,638,239), piecemeal sale receiverships (1,248,431), pre-packs (£1,071,509) and going concern sale receiverships (£960,789).

[48] Jointly testing the procedure terms, ignoring the interaction between total debt and procedure, $\chi^2_4 = 24.57$, $p < 0.001$. Note, that there was also a significant interaction as shown below.
[49] Testing the procedure terms; $\chi^2_4 = 23.09$, $p < 0.001$.
[50] Illustrating how susceptible the small number of going concern sale administrations are to change.

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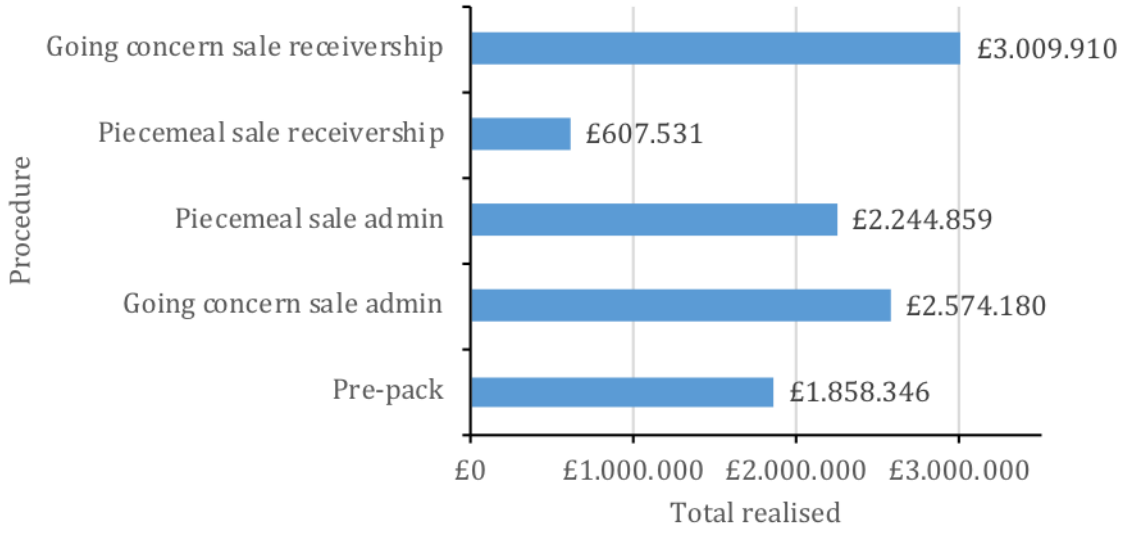

Figure 25. The relationship between the total realised and procedure, derived from the gamma generalized linear model and controlling for the range of other variables included

Total debt

There was a highly significant relationship between total debt and total realised,[51] with total realised increasing with total debt, and particularly high for the £5,000,000 or more group. This relationship is illustrated in Figure 26, controlling for other variables, including the interaction with procedure.[52] Since an interaction with procedure was included in the model the relationship between total debt and total realised should also be interpreted while also considering the interaction (see below).

[51] Jointly testing the total debt main effect terms, having removed the interaction between total debt and procedure; $\chi^2_5 = 355.37$, $p < 0.001$.

[52] Note, that the total debt was included as five simple groups and given the very large increase in the £5,000,000 or more group, further analysis may benefit from the inclusion of additional higher total realised groups or inclusion of total debt as a continuous covariate.

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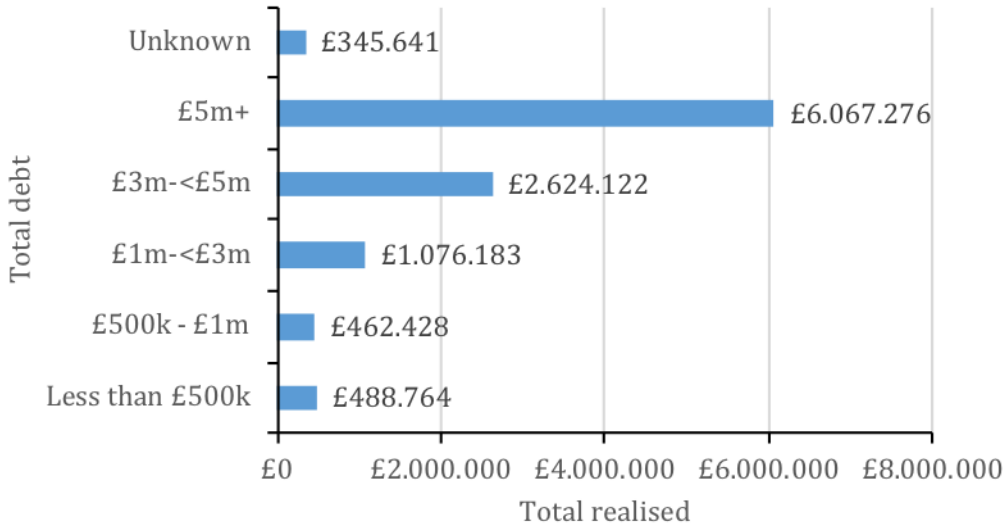

Figure 26. The relationship between the total realised and total debt (grouped), derived from the gamma generalized linear model and controlling for the range of other variables included

The interaction between procedure and total debt

There was also evidence of a highly statistically significant interaction between procedure and total debt group in total realised.[53] The interaction is illustrated in Figure 27, and as shown, the relationship between total debt group and total realised differed substantially between procedures. The increase in total realised with increasing total debt is broadly comparable between pre-packs and going concern sale administrations, though there was some evidence of a more consistent increase for piecemeal sale administrations.[54] So whereas there was no increase from the 'less than £500,000' to the '£500,000 to less than £1,000,000' total debt categories for pre-packs or going concern sale administrations, there was for piecemeal sale administrations (i.e. total realised in the lowest total debt category appeared to be comparatively higher for pre-packs or going concern sale administrations compared to piecemeal sale administrations).

Piecemeal sale receiverships also showed total realised generally increasing with debt, though total realised was low regardless of total debt category, compared to pre-packs or administrations,[55] as can be seen in Figure 27. While going concern sale receiverships generally had lower total realised than pre-packs or other administrations, there was a significant interaction term, with higher total realised in the '£500,000 to less than £1,000,000'[56] and '£5,000,000 or more' total debt categories compared to other groups.[57] However, this finding, and the interaction between total debt and receiverships specifically, should be treated with real caution. Numbers of receiverships very small (there were only 60 piecemeal sale receiverships

[53] Jointly testing the interaction terms; $\chi^2_{20} = 71.90$, $p < 0.001$.
[54] Compared to pre-packs, this resulted in a significant increase in total realised in the £500k-£1m ($Z = 2.93$, $p = 0.003$) and £1m-<£3m ($Z = 2.98$, $p = 0.003$) total debt groups (compared to the <£500k group).
[55] As indicated by non-significant interaction terms and a significant piecemeal sale administration term; $Z = -2.78$, $p = 0.039$).
[56] Testing the going concern sale receivership interaction term; $Z = 2.94$, $p = 0.003$.
[57] Testing the going concern sale receivership interaction term; $Z = 2.66$, $p = 0.008$.

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and 30 going concern sale receiverships included in the analysis) with cell counts smaller still once split into total debt groups (for example, there were only five piecemeal sale receiverships and eleven going concern sale receiverships in the '£5,000,000 or more' total debt category). Differences by procedure may be better interpreted using Figure 25 (at least when receiverships are being examined), though even then, numbers of going concern sale receiverships were small.

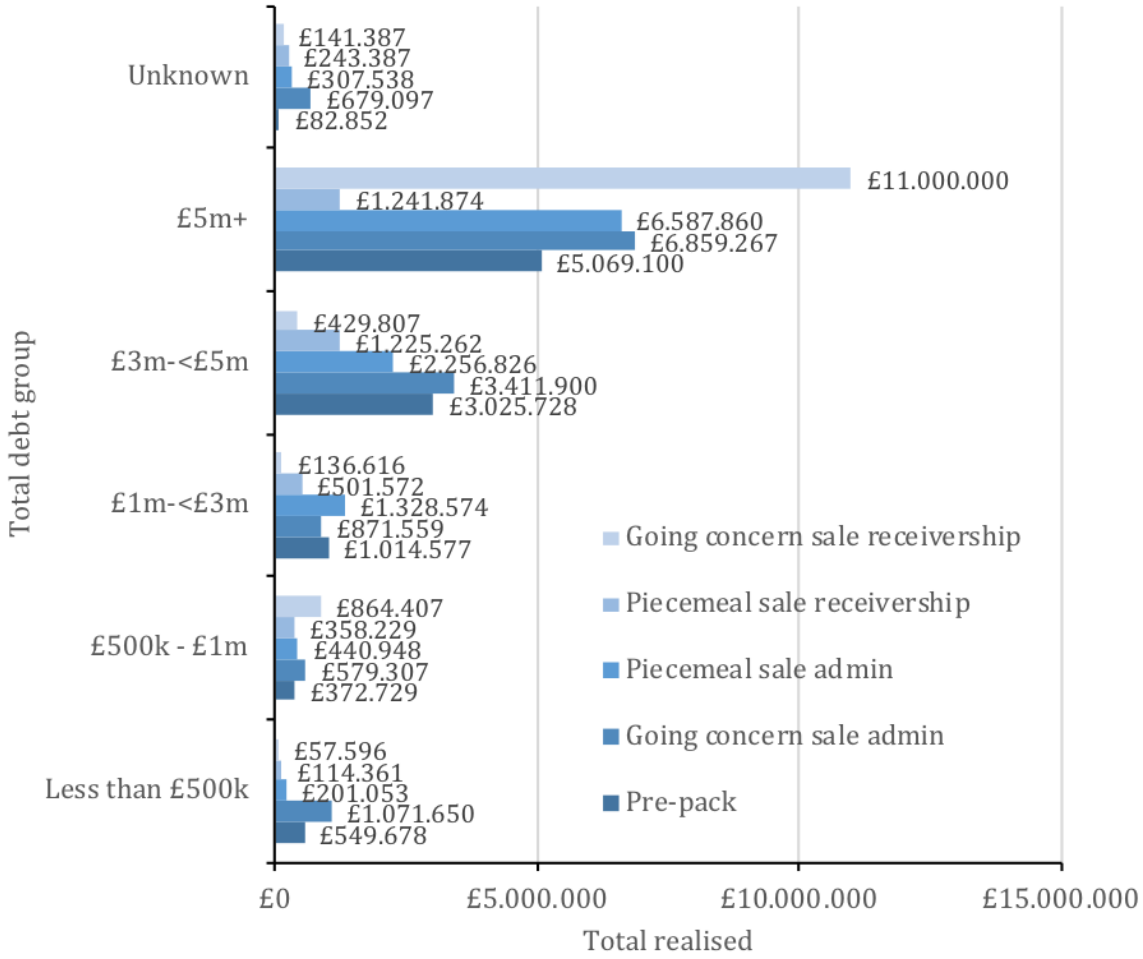

Figure 27. The relationship between the total realised, procedure and total debt (grouped), derived from the gamma generalized linear model and controlling for the range of other variables included

Percentage of debt which was secured

There was a highly statistically significant relationship between total realised and percentage of debt which was secured.[58] The key difference was between the 'less than 25%' category and other categories.[59] Compared to the 'less than 25%' category, total realised was 1.42 times

[58] Jointly testing the 'percentage of secured debt' groups; $\chi^2_4 = 21.13$, $p < 0.001$.
[59] While the 'missing' group is retained in the model, we exclude it from the results and associated figure as any differences would be difficult to interpret.

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higher in the 'greater than 25% to 50%' category,[60] 1.26 times higher in the ''greater than 50% to 75%' category[61] and 1.47 times higher in the 'greater than 75% to 100%' category.[62] Figure 28 shows the relationship between the total realised and the percentage of secured debt, while controlling for the other variables included in the model. As shown, the total realised was noticeably lower in the 'up to 25%' category.

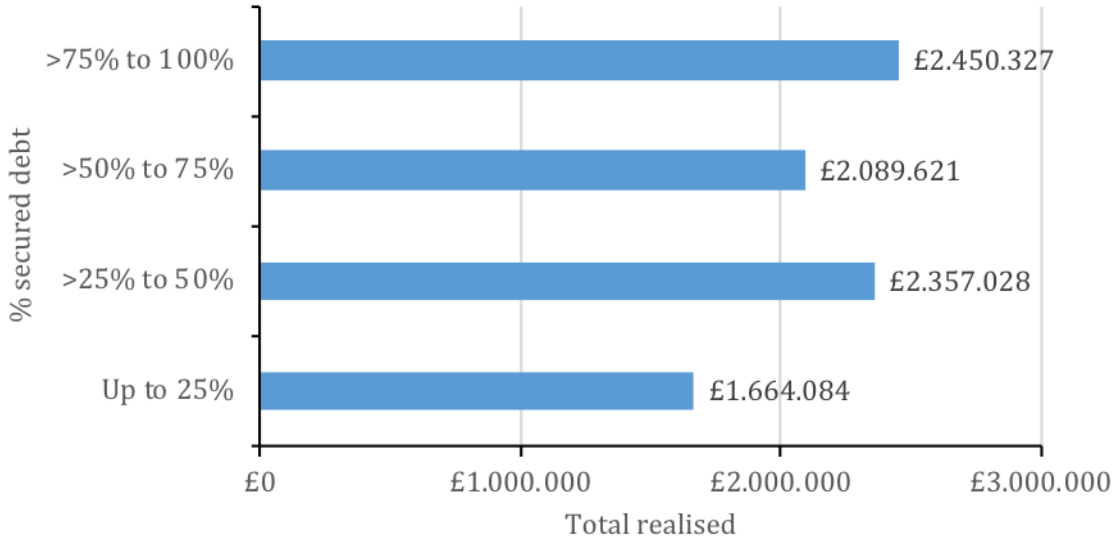

Figure 28. The relationship between the total realised and percentage of secured debt (of total debt), derived from the gamma generalized linear model and controlling for the range of other variables included

SIC sector

There were highly statistically significant differences in the total realised between different sectors.[63] There were a number of significant differences between sectors. For example, compared to the 'manufacturing' model reference category, the total realised was significantly higher for businesses in wholesale and retail trade (1.66 times the total realised of manufacturing), professional, scientific and technical activities (1.60 times the total realised of manufacturing) and administrative and support service sector (2.34 times the total realised of manufacturing). However, the key difference was between the real estate sector and other sectors, with the real estate sector having statistically a significantly higher total realised than all other sectors.[64] These differences are illustrated in Figure 29, controlling for the range of other variables included in the model.

[60] A statistically significant difference; $Z = 2.48$, $p = 0.013$.
[61] Marginally short of statistical significance; $Z = 1.90$, $p = 0.057$.
[62] A statistically significant difference; $Z = 3.11$, $p = 0.002$.
[63] Testing the SIC sector terms together'; $\chi^2_{10} = 47.82$, $p < 0.001$.
[64] Compared to the manufacturing reference category; 5.58 times the total realised ($e^{1.72}$), $Z = 5.56$, $p < 0.001$.

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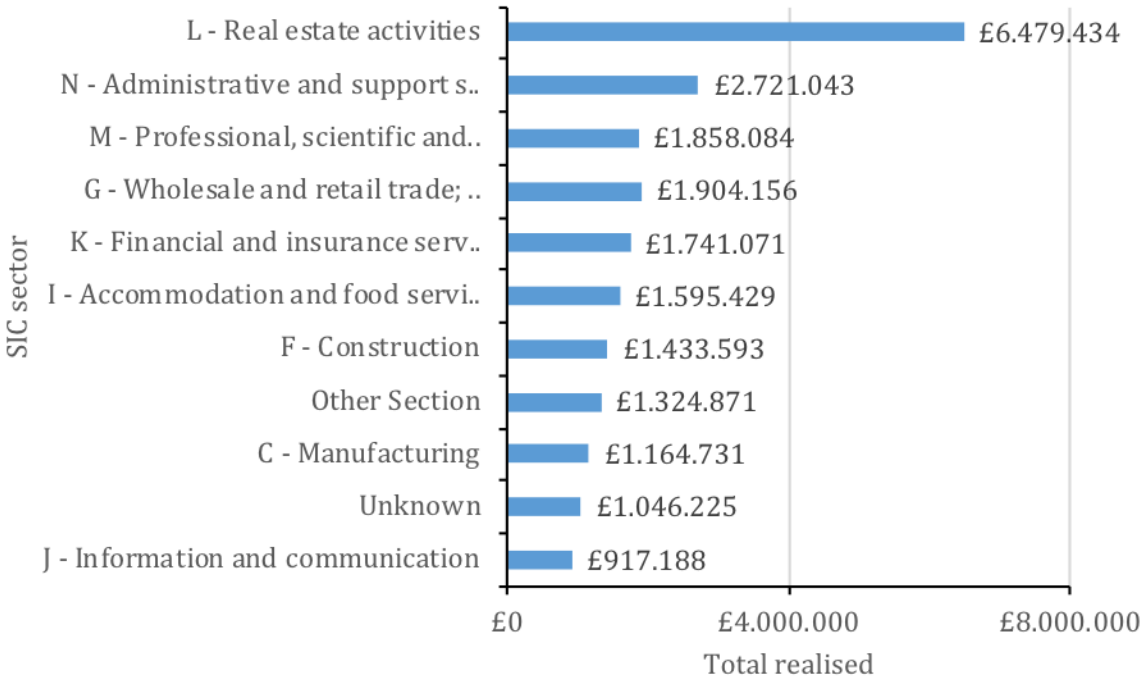

Figure 29. The relationship between the total realised and SIC sector, derived from the gamma generalized linear model and controlling for the range of other variables included

Region

There was evidence of highly statistically significant differences in the total realised between different regions.[65] Compared to London, total realised was comparable in the North West[66] and slightly, but not significantly higher in Northern Ireland.[67] However, again, compared to London, total realised was significantly lower for Yorkshire and Humberside (0.61 times the total realised of London),[68] the West Midlands (0.60 times the total realised of London),[69] Scotland (0.53 times the total realised of London),[70] East of England (0.44 times the total realised of London)[71] and particularly for the North East (0.36 times the total realised of London),[72] East Midlands (0.35 times the total realised of London)[73] and small number of Welsh cases (0.32 times the total realised of London).[74] Figure 30 illustrates the total realised by region, controlling for a range of other variables included in the model.

[65] Testing the NUTS1 region terms together'; $\chi^2_{12} = 78.23$, $p < 0.001$.
[66] 1.03 times higher in the North West and clearly not a statistically significant difference; $Z = 0.15$, $p = 0.88$.
[67] 1.26 times higher, $Z = 0.90$, $p = 0.37$.
[68] $Z = -3.04$, $p = 0.002$.
[69] $Z = -3.17$, $p = 0.002$.
[70] $Z = -3.12$, $p = 0.002$.
[71] $Z = -3.84$, $p < 0.001$.
[72] $Z = -4.33$, $p < 0.001$.
[73] $Z = -5.42$, $p < 0.001$.
[74] $Z = -2{,}94$, $p = 0.003$.

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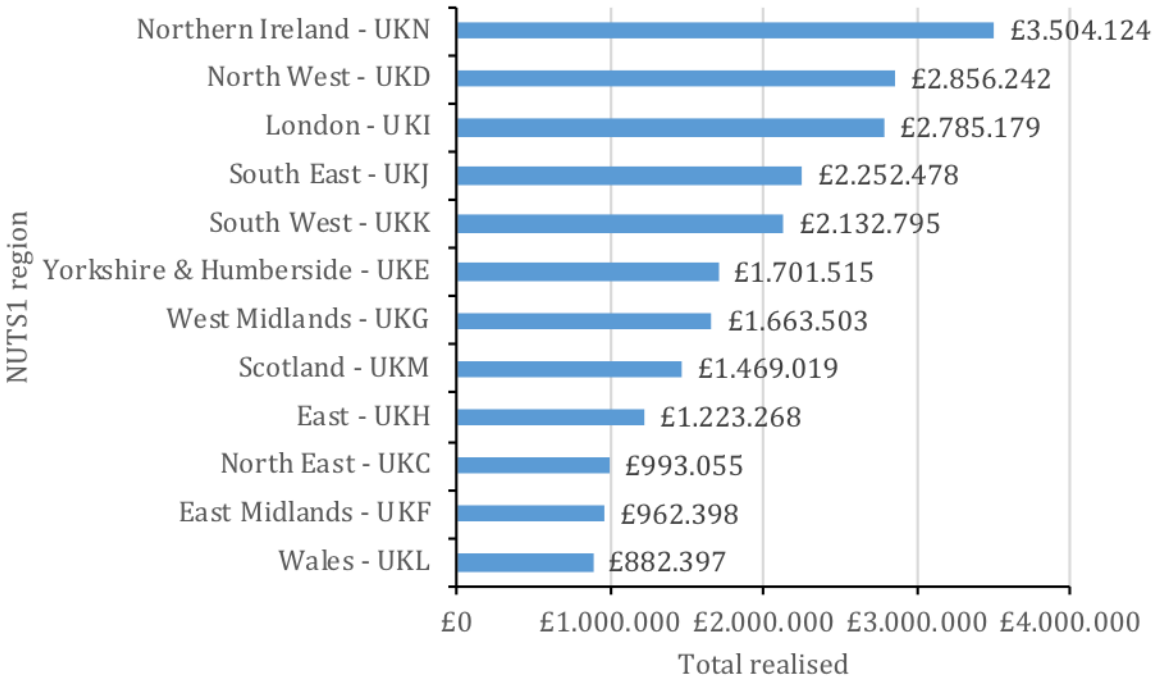

Figure 30. The relationship between the total realised and region (NUTS1 classifications), derived from the gamma generalized linear model and controlling for the range of other variables included

IP firm

There were highly statistically significant differences in total realised by IP firm.[75] This was predominantly a consequence of far higher total realised for 'top 4' firms (having controlled for a range of other factors). Compared to the 'other IP' group, total realised was 3.6 times higher for the 'top 4' group,[76] and 3.2 times higher when compared to 'second tier' firms.[77] So a case realising £1,000,000 for an 'other' IP firm would be expected to realise £1,107,000 for a 'second tier' firm and £3,577,000 for a 'top 4' firm, controlling for the other variables included in the model. The total realised for each IP firm group (excluding a small number of 'unknown' IP cases[78]) is shown in Figure 31, controlling for other variables included in the model. As shown, total realised was far higher for top 4 firms.

[75] Testing the IP firm terms were jointly equal to zero; $\chi^2_3 = 43.36$, $p < 0.001$.
[76] A highly statistically significant difference; $\exp(\beta) = 3.58$, $z = 6.52$, $p < 0.001$.
[77] A highly statistically significant difference; $\exp(\beta) = 3.23$, $z = 5.99$, $p < 0.001$.
[78] While the 'unknown' group was retained in the analysis, they were removed from the figure and should be interpreted with some caution as their findings were based on very small numbers.

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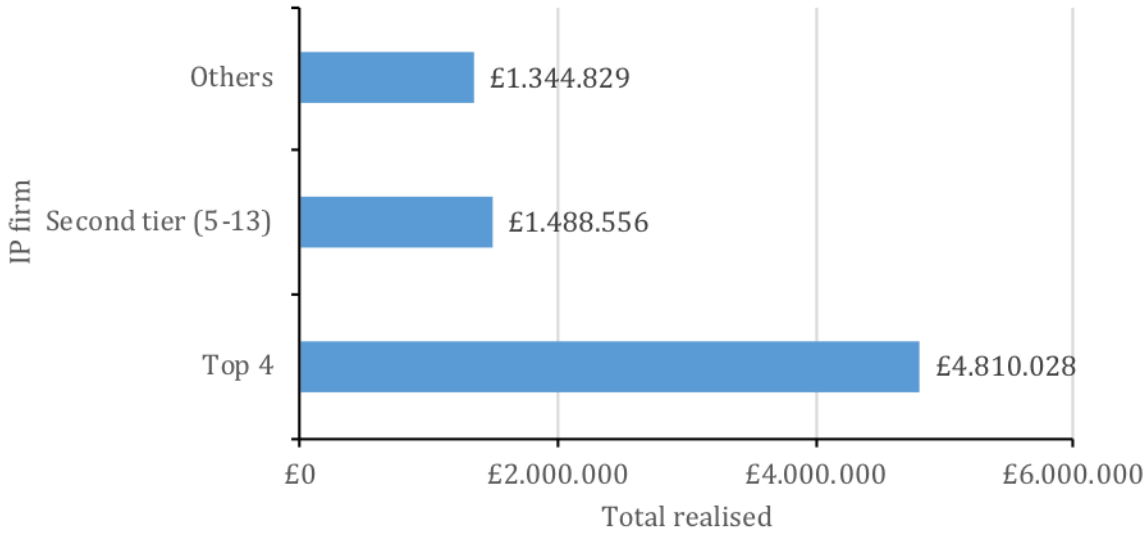

Figure 31. The relationship between the total realised and IP firm (excluding a small number with 'unknown' IP), derived from the gamma generalized linear model and controlling for a range of other variables

Presence of a purchaser and whether they were connected

There were statistically significant differences in the total realised by presence of a purchaser and whether or not the purchaser was connected.[79] This was primarily a result of significantly higher total realised for the 'purchaser not connected' category. Compared to the 'not applicable/unknown/missing' group, total realised was 1.64 times higher for the 'purchaser not connected' group,[80] and higher still when compared to the 'purchaser connected' (2.00 times higher total realised[81]) and 'purchaser unknown' groups (2.02 times higher[82]). The difference in total realised made for each purchaser/purchaser connected group is shown in Figure 32, controlling for other variables.

[79] Testing the purchaser/purchaser connected terms together; $\chi^2_2 = 9.66$, $p = 0.022$.
[80] A statistically significant difference; $\exp(\beta) = 1.64$, $z = 2.26$, $p = 0.024$.
[81] A statistically significant difference; $\exp(\beta) = 2.00$, $z = 2.90$, $p = 0.004$.
[82] A statistically significant difference; $\exp(\beta) = 2.02$, $z = 2.85$, $p = 0.004$.

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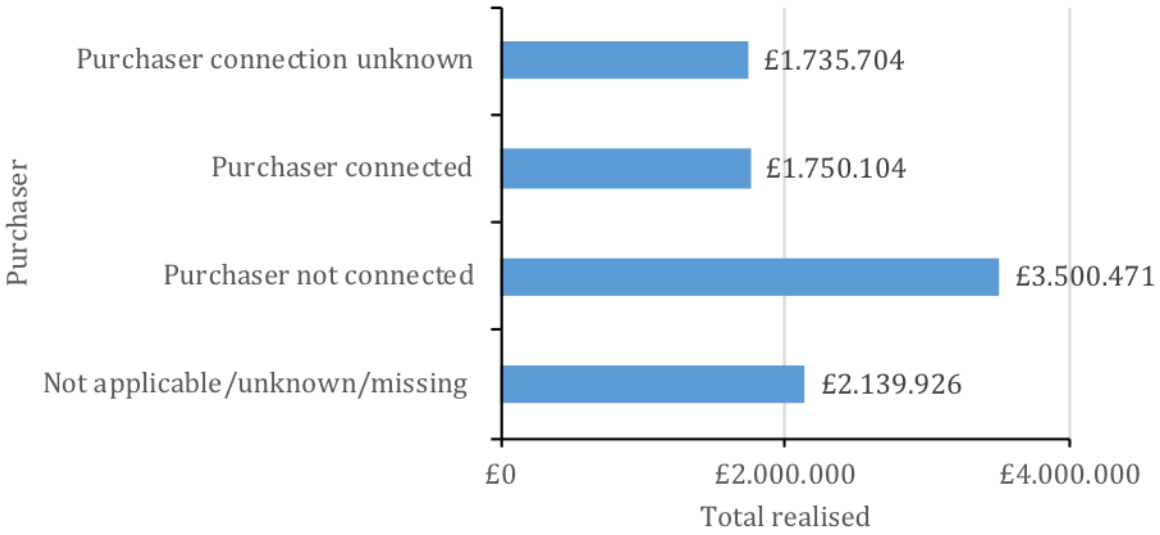

Figure 32. The relationship between the total realised and whether a purchaser could be identified (and whether or not they were connected), derived from the gamma generalized linear model and controlling for a range of other variables

If the current purchaser/purchaser connected variable is replaced in the model with a more detailed variable also including deferred consideration, differences remain significant.[83] Total realised by details of the purchaser and deferred consideration are shown in Figure 33. As can be seen, total realised was highest for non-connected purchasers and zero deferred consideration[84] and lowest for connected purchasers and positive deferred consideration.[85]

[83] Jointly testing whether the new terms are equal; $\chi^2_9 = 22.11$, $p = 0.009$.
[84] For example, compared to the 'not applicable/unknown/missing' reference category; $e^{0.84} = 2.32$ times higher, $Z = 2.26$, $p = 0.024$.
[85] For example, compared to the 'not applicable/unknown/missing' reference category; $e^{-.58} = 0.56$ times lower, $Z = -3.41$, $p = 0.001$.

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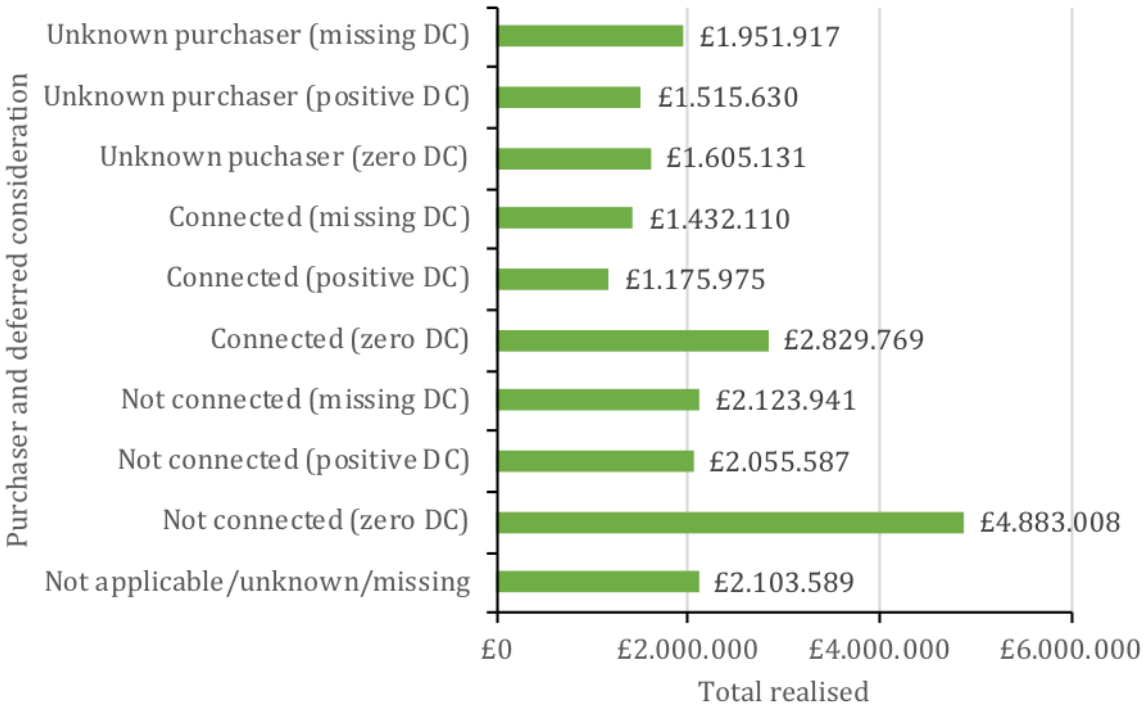

Figure 33. The relationship the total realised made up by costs and whether a purchaser could be identified, whether or not they were connected and deferred consideration (positive, zero or missing), derived from the gamma generalized linear model and controlling for a range of other variables included in the model

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Statistical appendix

To model total realised gamma generalised linear models (with a log link) were fitted (e.g. Hardin and Hilbe, 2012). Log-gamma generalized linear models are a common, flexible approach when modelling (typically skewed) costs data where OLS models are generally inappropriate (Barber & Thompson, 2004; Gregori et al., 2011), with a vast body of literature supporting their use in cases with skewed data, but no censoring or issues with zero values (Gregori et al., 2011). Other approaches may be required in the case of a significant number of zero values, heteroscedasticity or censoring (Gregori et al., 2011; Mihaylova et al., 2011). Note, that in the case of total realised, skewedness was the key issue to address. In a model using the Gaussian distribution, each observation is given equal weight, whereas in the log-gamma model fitted, observations with high predicted costs are down-weighted in calculating regression coefficients (Barber & Thompson, 2004). In addition to accommodating skewed data, the generalized linear model approach also provides estimations directly on the scale of raw data, unlike traditional transformation-based approaches, avoiding the need for back transformation (Barber & Thompson, 2004; Gregori et al., 2011; Mihaylova et al., 2011).

The log link means that the model is multiplicative. If an identity link was used it would be additive, with gamma models with identity links common when modelling duration (Hardin & Hilbe, 2012). In an additive model of total realised, the estimate for a given coefficient would be in pounds, so a positive value of 1,000 for 'going concern sale administration' would indicate an increase of £1,000 compared to the 'pre-pack' reference category. In the multiplicative model used, a value of say 0.67 for 'going concern sale administration' would indicate $e^{0.67} = 1.95$ times higher total realised compared to pre-packs. So a pre-pack with total realised of £500,000 would be expected to realise £977,000 if it were a going concern sale administration (while also controlling for other variables).

To facilitate interpretation, predicted total realised were also calculated and used to produce figures using the 'margins' post estimation command in Stata 13 to yield estimates for levels of a given independent variable while controlling for other independent variables. Table 7 shows gamma generalised linear model (with log link), modelling total realised on the basis of a range of independent variables.

Table 7. Gamma generalized linear model with a log link of the total realised

Variable	Level	Est.	Robust SE	z	p
Procedure	Pre-pack	0.000	-		
	Going concern sale admin	0.668	0.558	1.200	0.231

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	Piecemeal sale admin	-1.006	0.357	-2.820	0.005
	Piecemeal sale receivership	-1.570	0.762	-2.060	0.039
	Going concern sale receivership	-2.256	0.811	-2.780	0.005
Total debt	Less than £500k	0.000	-		
	£500k - £1m	-0.388	0.344	-1.130	0.259
	£1m-<£3m	0.613	0.339	1.810	0.071
	£3m-<£5m	1.706	0.413	4.130	0.000
	£5m+	2.222	0.392	5.660	0.000
	Unknown	-1.892	0.735	-2.570	0.010
Procedure X Total debt	Going concern sale admin X £500k - £1m	-0.227	0.618	-0.370	0.714
	Going concern sale admin X £1m-<£3m	-0.820	0.592	-1.380	0.166
	Going concern sale admin X £3m-<£5m	-0.548	0.716	-0.760	0.445
	Going concern sale admin X £5m+	-0.365	0.625	-0.580	0.559
	Going concern sale admin X Unk.	1.436	0.852	1.690	0.092
	Piecemeal sale admin X £500k - £1m	1.174	0.400	2.930	0.003
	Piecemeal sale admin X £1m-<£3m	1.275	0.428	2.980	0.003
	Piecemeal sale admin X £3m-<£5m	0.713	0.520	1.370	0.171
	Piecemeal sale admin X £5m+	1.268	0.449	2.830	0.005
	Piecemeal sale admin X Unk.	2.317	0.691	3.360	0.001
	Piecemeal sale receivership X £500k - £1m	1.530	0.854	1.790	0.073
	Piecemeal sale receivership X £1m-<£3m	0.865	0.880	0.980	0.326
	Piecemeal sale receivership X £3m-<£5m	0.666	0.949	0.700	0.483

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	Piecemeal sale receivership X £5m+	0.163	0.899	0.180	0.856
	Piecemeal sale receivership X Unk.	2.648	0.934	2.830	0.005
	Going concern sale receivership X £500k - £1m	3.097	1.053	2.940	0.003
	Going concern sale receivership X £1m-<£3m	0.251	0.973	0.260	0.797
	Going concern sale receivership X £3m-<£5m	0.304	0.938	0.320	0.746
	Going concern sale receivership X £5m+	3.029	1.141	2.660	0.008
	Going concern sale receivership X Unk.	2.790	0.994	2.810	0.005
% Secured debt	Up to 25%	0.000	-		
	>25% to 50%	0.348	0.141	2.480	0.013
	>50% to 75%	0.228	0.120	1.900	0.057
	>75% to 100%	0.387	0.124	3.110	0.002
	Missing	1.794	0.528	3.400	0.001
SIC Sector	C - Manufacturing	0.000	-		
	F - Construction	0.208	0.132	1.580	0.115
	G - Wholesale and retail trade; repair of motor vehicles	0.492	0.200	2.460	0.014
	I - Accommodation and food service activities	0.315	0.179	1.760	0.079
	J - Information and communication	-0.239	0.206	-1.160	0.246
	K - Financial and insurance services	0.402	0.306	1.320	0.188
	L - Real estate activities	1.716	0.297	5.780	0.000
	M - Professional, scientific and technical activities	0.467	0.190	2.460	0.014
	N - Administrative and support service activities	0.849	0.301	2.820	0.005
	Other Section	0.129	0.150	0.860	0.391

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	Unknown	-0.107	0.233	-0.460	0.645
Region (NUTS1)	London - UKI	0.000	-		
	South East - UKJ	-0.212	0.175	-1.210	0.225
	South West - UKK	-0.267	0.239	-1.120	0.265
	East - UKH	-0.823	0.214	-3.840	0.000
	West Midlands - UKG	-0.515	0.163	-3.170	0.002
	East Midlands - UKF	-1.063	0.196	-5.420	0.000
	Yorkshire & Humberside - UKE	-0.493	0.162	-3.040	0.002
	North West - UKD	0.025	0.166	0.150	0.880
	North East - UKC	-1.031	0.238	-4.330	0.000
	Scotland - UKM	-0.640	0.205	-3.120	0.002
	Wales - UKL	-1.149	0.391	-2.940	0.003
	Northern Ireland - UKN	0.230	0.255	0.900	0.367
	Unknown	0.222	0.409	0.540	0.587
IP Firm	Other	0.000	-		
	Top 4	1.274	0.195	6.520	0.000
	Second tier (5-13)	0.102	0.109	0.930	0.351
	Unknown	-0.123	0.739	-0.170	0.868
Purchaser	Not applicable/unknown/missing	0.000	-		
	Purchaser not connected	0.492	0.218	2.260	0.024
	Purchaser connected	-0.201	0.185	-1.090	0.276
	Purchaser connection unknown	-0.209	0.131	-1.600	0.110

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Constant		12.111	0.387	31.310	0.000

1,992 cases included in the model, Log pseudolikelihood = -28334.50, AIC = 28.51, BIC = -9927.56.

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3.2.4 Modelling the total costs as a proportion of total realised

The proportion of the total realised accounted for by costs could be calculated for 1,944 cases. Proportions varied from zero to one, with a mean proportion of 0.62 (i.e. on average, 62 per cent of the total realised was accounted for by costs). This section explores the relationship between costs as a function of total realised and a range of variables. The main statistical technique implemented were fractional generalized linear models. Additional detail on these models and statistical output can be found in the statistical appendix, though this section summarises model output in lay terms.

Independent variables included in the main statistical model were procedure (excluding a small number of successful restructuring administrations), total debt (grouped), the interaction between procedure and total debt (grouped), percentage of debt which was secured (grouped), SIC sector, region (NUTS1 classification), IP firm, presence of a purchaser and whether or not they were connected, total costs (grouped) and whether the creditor was over or under-secured. Additional variables, such as size based on turnover (which was available for a smaller number of cases), deferred consideration and percentage of debt which was secured were tested by making changes to the model in the statistical appendix. Percentage of debt which was secured was excluded from the initial model due to its close relationship to whether creditors were over or under-secured (because of how the over or under-secured variable was defined). Results look at each in turn rather than attempting to incorporate them into a single model. Figures derived from the main statistical model are displayed in blue with figures derived from additional models displayed in green.

Procedure

Overall, differences between procedures were fairly modest.[86] The only difference of particular note was between piecemeal sale receiverships (which had the lowest proportion) and other procedures (particularly going concern sale administrations and piecemeal sale administrations).[87] Figure 34 shows the proportion of the total realised made up by total costs by procedure, controlling for other variables, including the interaction between procedure and total debt. The interaction between procedure and total debt is discussed in further detail below.[88]

[86] Jointly testing the procedure terms, having removed the interaction between total debt and procedure, χ^2_4 = 6.26, p = 0.18. The interaction is discussed further below.

[87] Both significant differences; odds ratio = 0.61, Z = -2.29, p = 0.022 and odds ratio = 0.66, Z = -2.07, p = 0.039 respectively.

[88] Note, if the procedure by total debt interaction term were removed from the model, percentages in Figure 34 would be 65.4 per cent for going concern receiverships, 53.4 per cent for piecemeal sale receiverships, 62.6 per cent for piecemeal sale receiverships, 64.0 per cent for going concern sale administrations and 61.2 per cent for pre-packs.

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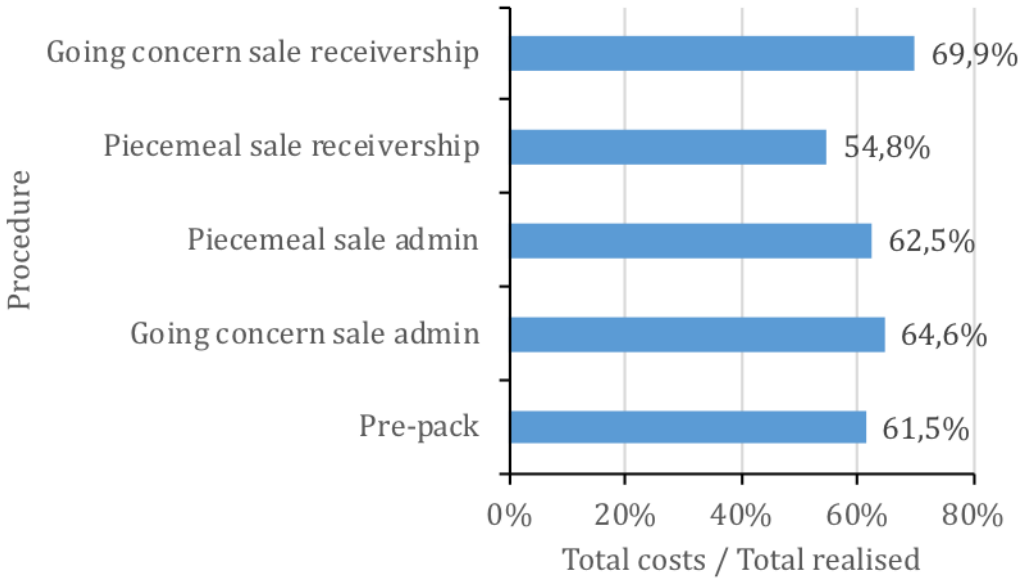

Figure 34. The relationship between the percentage of the total realised made up by costs and procedure, derived from the fractional generalized linear model and controlling for a range of other variables

Interestingly, controlling for other variables moderated the relationship between the proportion of the total realised made up by total costs and procedure. If no other variables were controlled for, there was an overall statistically significant relationship between the proportion of the total realised made up by total costs and procedure,[89] with 60.4 per cent for going concern receiverships, 52.8 per cent for piecemeal sale receiverships, 61.5 per cent for piecemeal sale receiverships, 60.8 per cent for going concern sale administrations and 65.5 per cent for pre-packs. Failing to control for other variables suggested that the proportion/percentage for pre-packs was significantly higher than for going concern sale administrations, piecemeal sale administrations and piecemeal sale receiverships. This was no longer the case having controlled for other factors (as shown in Figure 34), illustrating the importance of controlling for other key variables to give an unbiased picture of the relationship between the proportion of the total realised made up by total costs and procedure

Debtor size

Controlling for other variables indicated that as total debt increased, the proportion of the total realised made up by total costs decreased.[90] This relationship is illustrated in Figure 35, controlling for other variables, including the interaction with procedure. As shown, percentage of the total realised made up by total costs consistently decreases as total debt (categories) increase. Replacing total debt in the model with size based on turnover,[91] resulted in Figure 36. The total debt by procedure interaction is discussed further below.

[89] Jointly testing the procedure terms, $\chi^2_4 = 9.74$, $p = 0.045$.
[90] Jointly testing the total debt terms, removing the interaction between total debt and procedure; $\chi^2_4 = 38.05$, $p < 0.001$.
[91] Without a size by procedure interaction. Note, that turnover was available for 784 cases with values for costs as a proportion of total realised.

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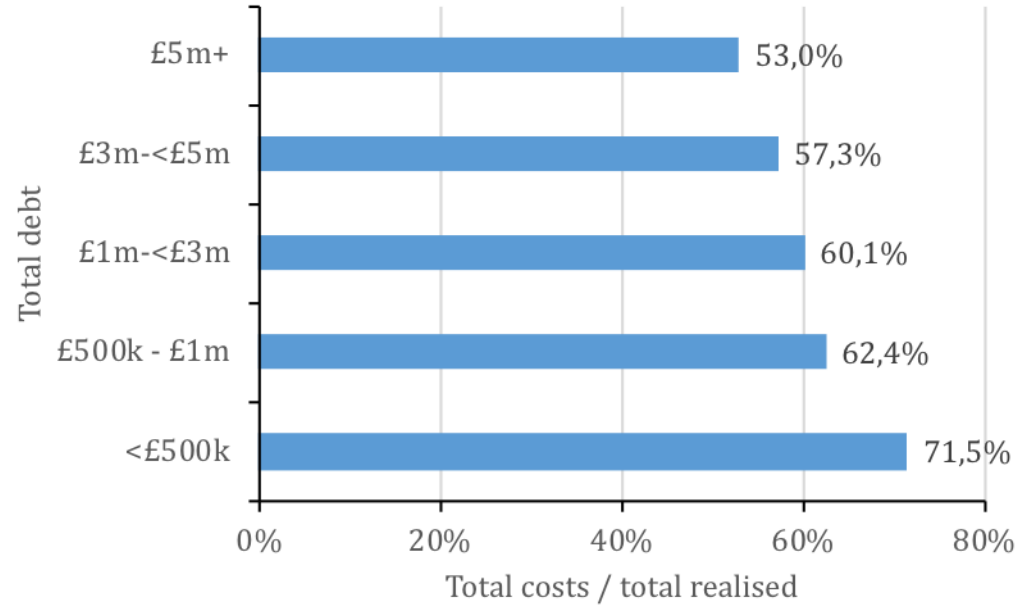

Figure 35. The relationship between the percentage of the total realised made up by costs and total debt, derived from the fractional generalized linear model and controlling for a range of other variables[92]

Figure 36. The relationship between the percentage of the total realised made up by costs and size based on turnover, derived from the fractional generalized linear model and controlling for a range of other variables

The interaction between procedure and total debt

[92] Cases with unknown total debt are retained in the model, but excluded from the figure

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There was a significant interaction between procedure and total debt group in the percentage of the total realised made up by costs.[93] The interaction is illustrated in Figure 37, and as shown, the relationship between total debt group and the percentage of the total realised made up by costs differed between procedures. For example, compared to pre-packs (the model reference category), there was a significant reduction in proportion/percentage for going concern sale administrations in the '£5,000,000 or more' total debt category.[94] Elsewhere, again compared to pre-packs, there was a significant increase in percentage for piecemeal sale administrations in the '£3,000,000 - <£5,000,000' total debt category.[95] For going concern sale receiverships, there was a significant reduction in proportion compared to pre-packs in the '£5,000,000 or more' category'.[96] For going concern sale receiverships, all interaction terms were statistically significant. This was mainly a consequence of costs making up one hundred percent of returns for a small number (n = 10) of 'less than £500,000' going concern sale receivership cases. As for a number of other models in the report, despite significant differences in the relationship between IP fees as a percentage of total realised and total debt for administrations and receiverships in Figure 37, findings should be interpreted with caution. Overall there were only 59 piecemeal sale receiverships and 27 going concern sale receiverships included in the model. As a result, Figure 38 is also provided, which removes the interaction term from the model, and may be safer to interpret in the case of receiverships.

[93] Jointly testing the interaction terms; $\chi^2_{20} = 155.96$, $p < 0.001$ or $\chi^2_{16} = 151.71$, $p < 0.001$ without 'unknown debt' interaction terms.
[94] Rather than 'up to £500,000'; odds ratio = 0.49, Z = -2.19, p = 0.028.
[95] Rather than 'up to £500,000'; odds ratio = 2.29, Z = 2.25, p = 0.024.
[96] Again compared to 'up to £500,000'; odds ratio = 0.16, Z = 2.11, p = 0.035.

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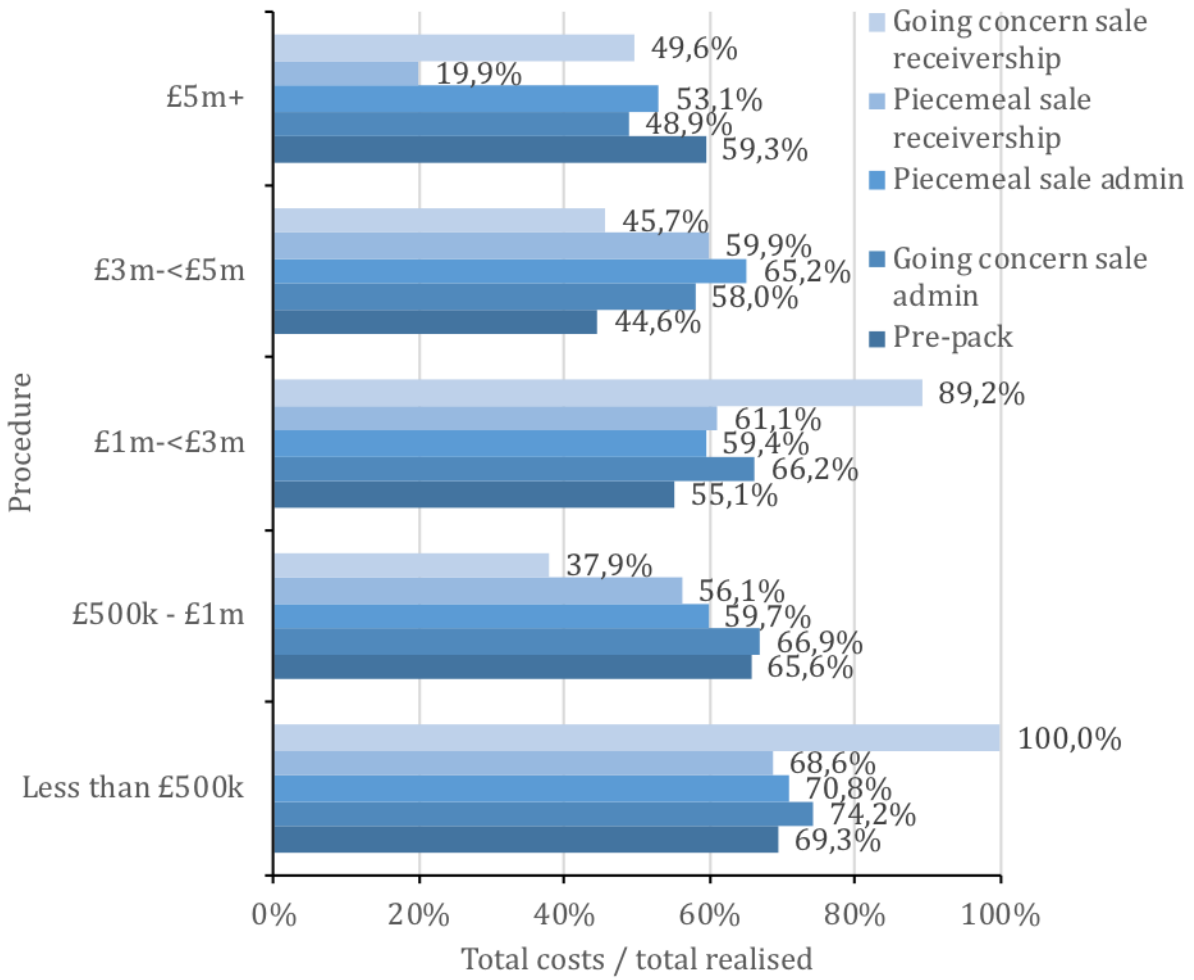

Figure 37. The relationship between the percentage of the total realised made up by costs, total debt group and procedure, derived from the fractional generalized linear model and controlling for a range of other variables

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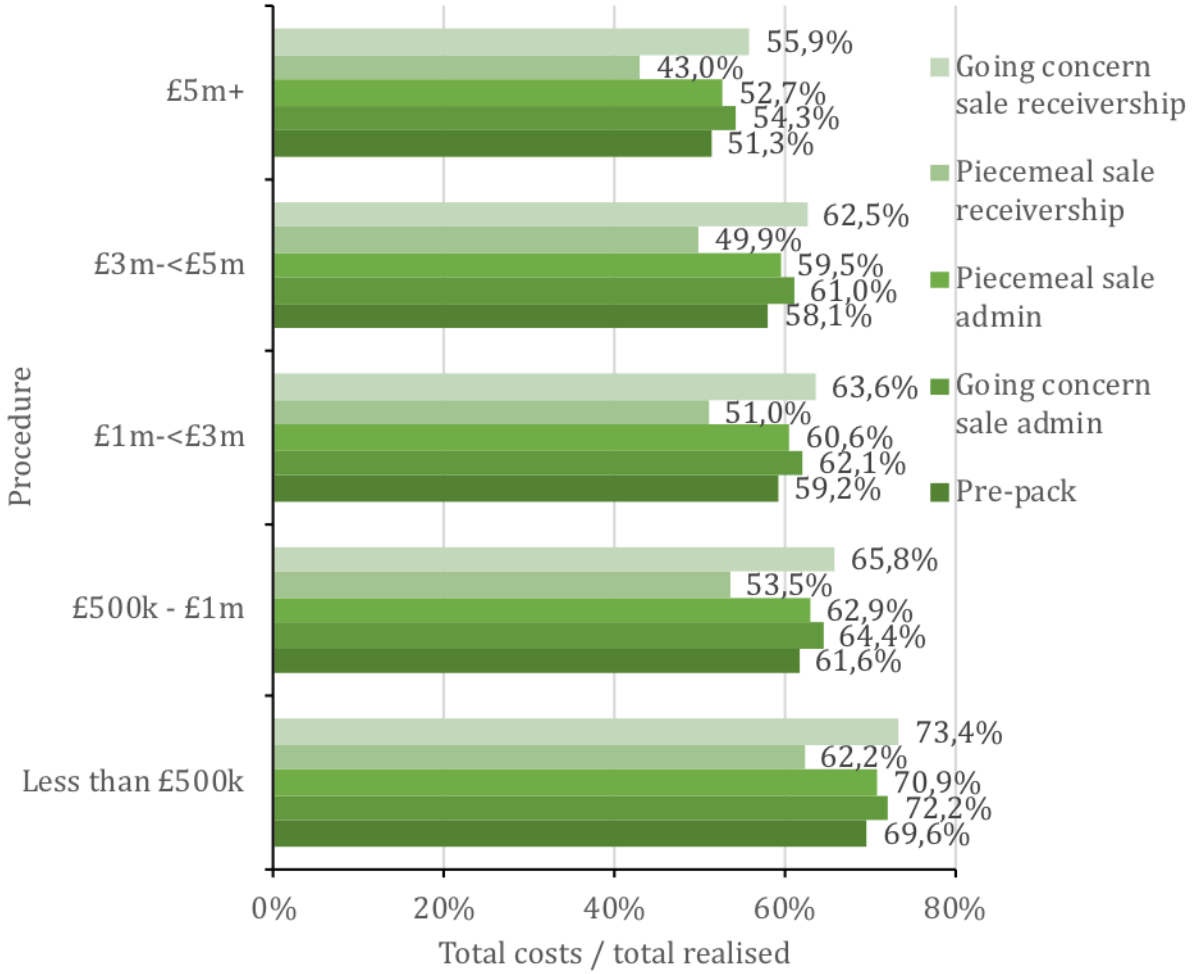

Figure 38. The relationship between the percentage of the total realised made up by costs, total debt group and procedure, derived from a fractional generalized linear model and controlling for a range of other variables (with no procedure by total debt group interaction in the model)

Finally, if procedure is replaced in the statistical model with a three category version (pre-packs, going concern/piecemeal sale administrations, going concern/piecemeal sale receiverships), and a procedure by debt interaction included, the result is Figure 39.

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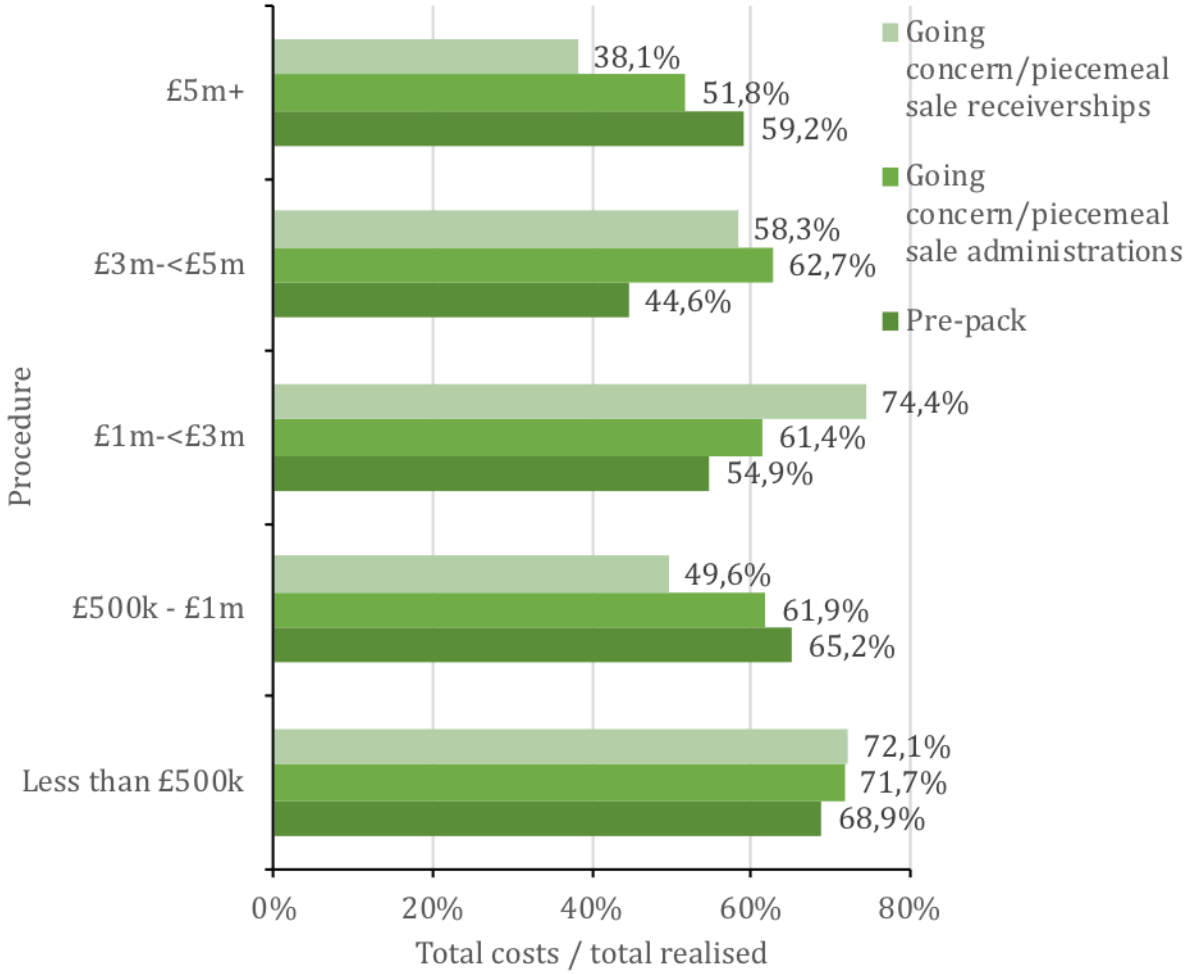

Figure 39. The relationship between the percentage of the total realised made up by costs, procedure (in three categories) and total debt group, derived from a fractional generalized linear model and controlling for a range of other variables

Whether creditors were over or under-secured and the percentage of debt which was secured

There were highly statistically significant differences in the proportion of total realised made up by costs between cases where creditors were under-secured and cases where they were over-secured.[97] Compared to under-secured cases, costs made up a significantly higher proportion of total realised for over-secured cases.[98] Figure 40 shows the difference in the proportion of the total realised made up by costs between 'under-secured' and over-secured' cases.[99]

[97] Testing the 'over-secured' and 'missing' terms; $\chi^2_2 = 34.86$, $p < 0.001$.
[98] Odds ratio = 1.55, Z = 5.24, $p < 0.001$.
[99] 259 cases where it was not known whether creditors were over or under-secured were retained in the figure, though how to interpret their proportion/percentage is not clear.

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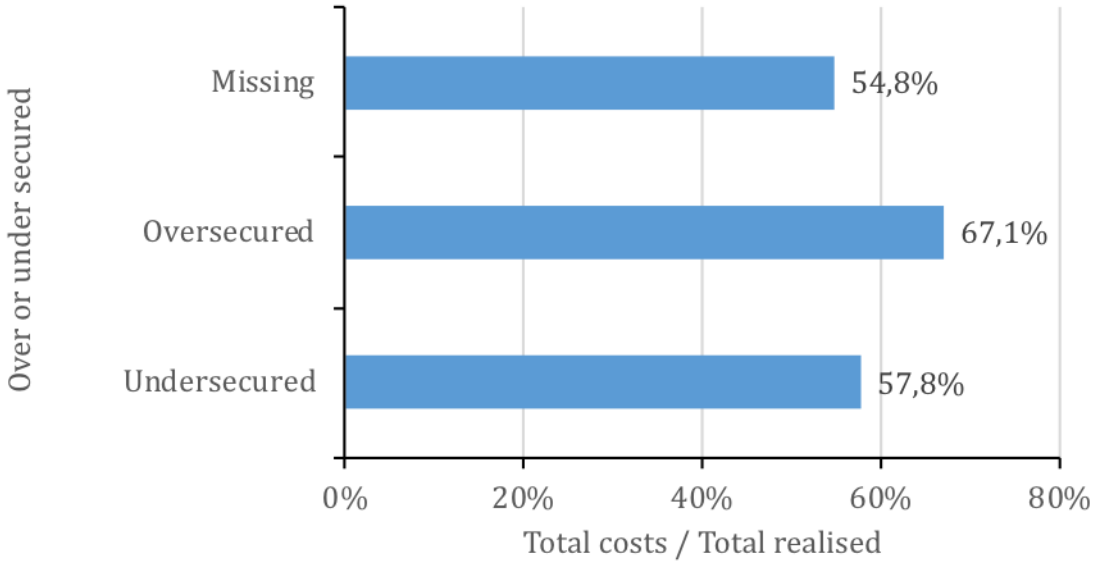

Figure 40. The relationship between the percentage of the total realised made up by costs and whether creditors were over or undersecured, derived from the fractional generalized linear model and controlling for a range of other variables

If a further model is fitted with an additional interaction included between whether creditors were over or under-secured and procedure, the result (derived from the model) is Figure 41.[100] If instead, an interaction between whether creditors were over or under-secured and total debt group is included, the result is Figure 42.

[100] Note, values could not be estimated for going concern sale receiverships.

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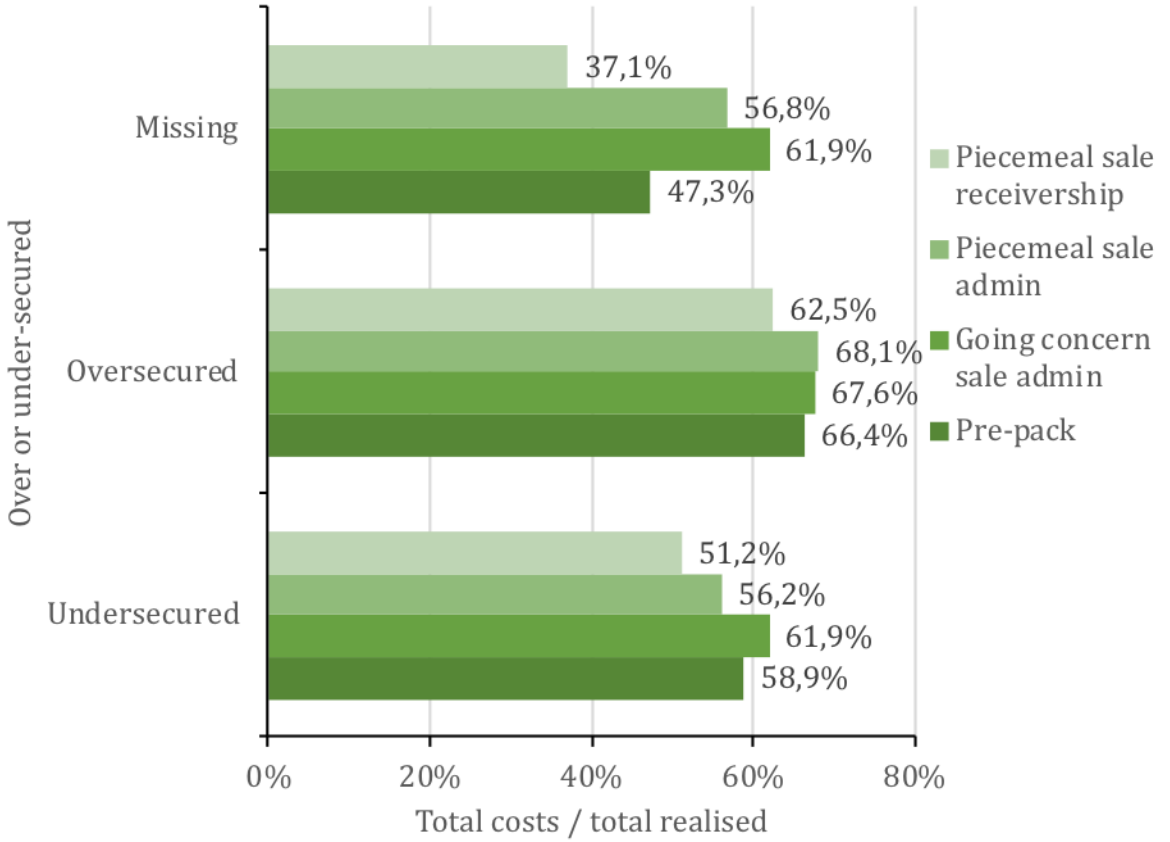

Figure 41. The relationship between the percentage of the total realised made up by costs, whether creditors were over or undersecured and procedure, derived from the fractional generalized linear model and controlling for a range of other variables

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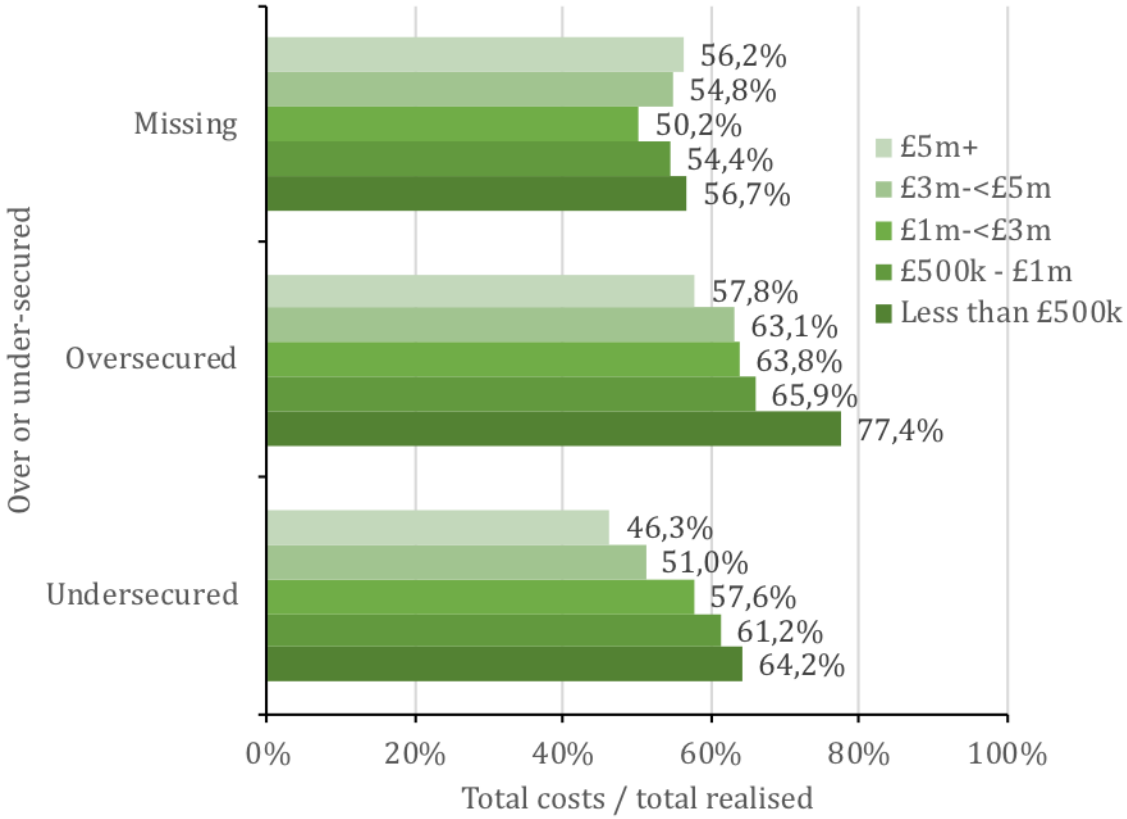

Figure 42. The relationship between the percentage of the total realised made up by costs, whether creditors were over or undersecured and total debt group, derived from the fractional generalized linear model and controlling for a range of other variables

Whether creditors were over or under-secured was then replaced in the statistical model by the percentage of secured debt (of total debt). Testing the new percentage of secured debt terms indicated a highly statistically significant relationship between costs as a proportion of the total realised and the percentage of debt which was secured.[101] In particular, the proportion made up by costs was far higher in the 'up to 25 %' category and significant higher than other percentage of secured debt categories. Figure 43 shows the relationship between the proportion of the total realised made up by costs and the percentage of secured debt, while controlling for a range of other variables.

[101] Testing the 'percentage of secured debt' terms simultaneously'; $\chi^2_4 = 153.17$, $p < 0.001$.

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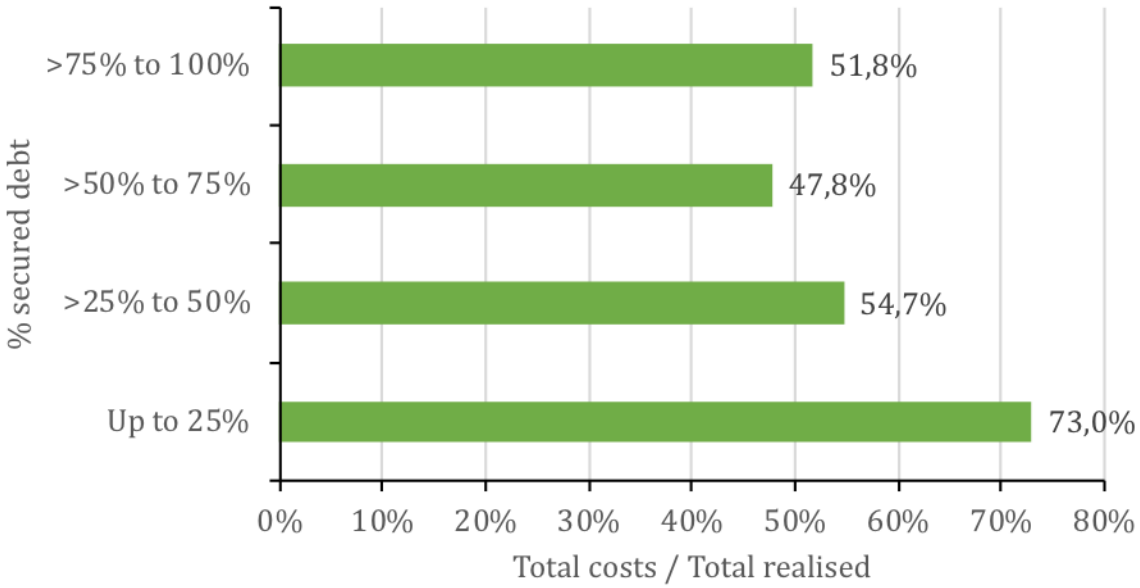

Figure 43. The relationship between the percentage of the total realised made up by costs and the percentage of secured debt, derived from the fractional generalized linear model and controlling for a range of other variables[102]

SIC sector

There were also highly statistically significant differences in the proportion of the total realised made up by costs between different sectors.[103] For example, compared to the 'manufacturing' model reference category, the proportion of the total realised made up by costs was significantly higher for businesses in the 'financial and insurance sector'[104] and significantly lower for those in 'real estate activities'.[105] These differences are illustrated in Figure 44, controlling for a range of other variables.

[102] 113 cases where percentage of secured debt could not be calculated were excluded from the figure, but retained in the statistical model. Their percentage would have been 63.8%.
[103] Testing the SIC sector terms together'; $\chi^2_{10} = 53.17$, $p < 0.001$.
[104] Odds ratio = 2.22, Z = 3.06, p = 0.002.
[105] Odds ratio = 0.36, Z = -5.30, $p < 0.001$.

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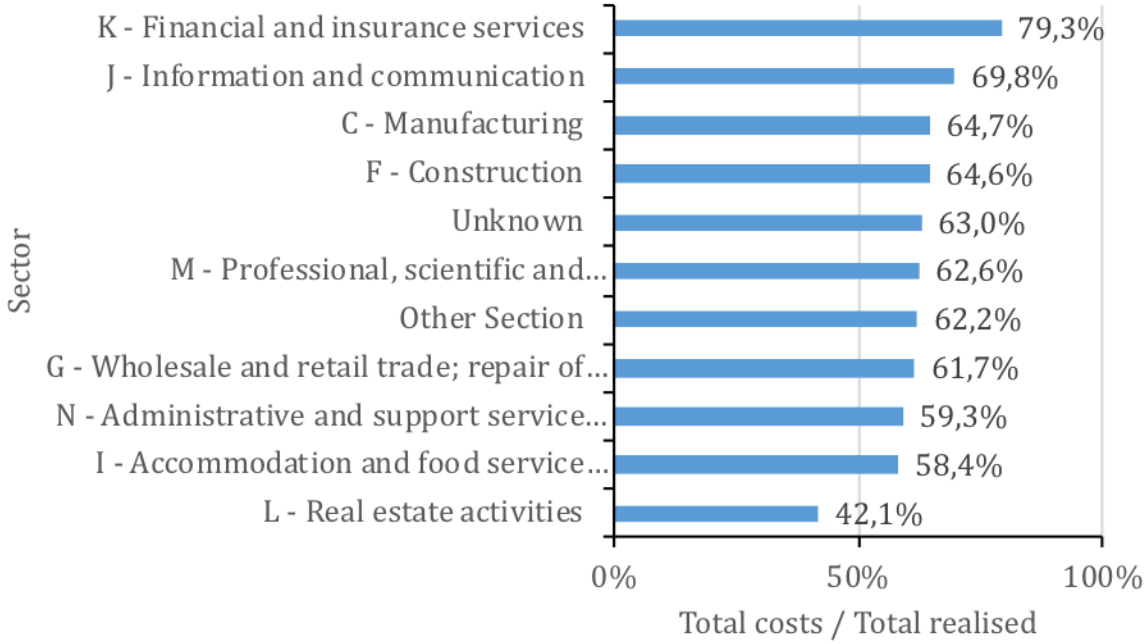

Figure 44. The relationship between the percentage of the total realised made up by costs and SIC sector, derived from the fractional generalized linear model and controlling for a range of other variables

Region

There was a highly statistically significant difference in the proportion of the total realised made up by costs between different regions.[106] Proportions were lower for regions such as the North West, West Midlands and particularly Scotland, and significantly lower than in London (the model reference category).[107] Figure 45 illustrates variation in the proportion of the total realised made up by costs by region, controlling for a range of other variables.

[106] Testing the NUTS1 region terms together'; $\chi^2_{12} = 40.66$, $p < 0.001$.
[107] Compared to London; odds ratio = 0.73, Z = -2.81, p = 0.005 (North West), odds ratio = 0.70, Z = -2.35, p = 0.019 (West Midlands), and odds ratio = 0.48, Z = -4.24, p < 0.001 (Scotland).

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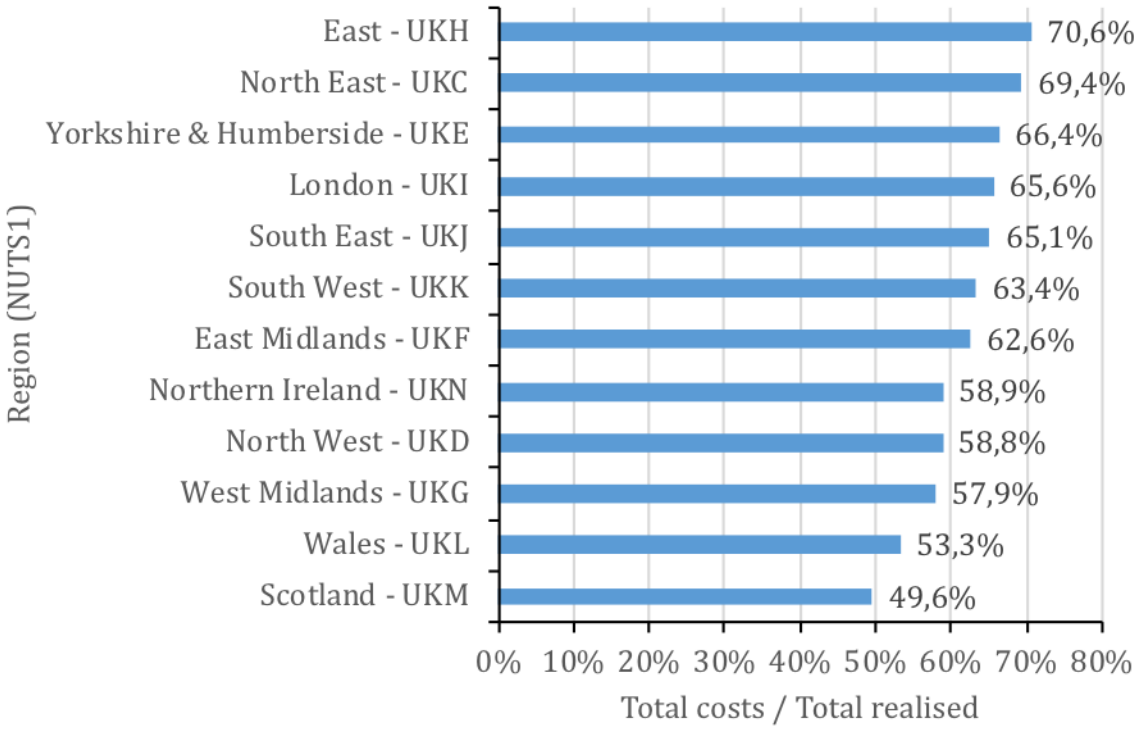

Figure 45. The relationship between the percentage of the total realised made up by costs and region (NUTS1), derived from the fractional generalized linear model and controlling for a range of other variables[108]

IP firm

There were also highly statistically significant differences in the proportion of the total realised made up by costs by IP firm.[109] Compared to 'other' IP firms, there was little or no difference in proportion for 'second tier' terms, though 'top 4' firms had a significantly lower proportion.[110] If the model reference category is changed to 'second tier', the difference between 'top 4' and 'second tier' is also statistically significant.[111] Figure 46 illustrates the very similar percentage for 'others' and 'second tier IP firms and lower percentage for 'top 4' firms having controlled for other variables.[112] Interestingly, despite highly significant differences, controlling for other variables reduced the difference between categories of IP firm to some extent. With no other variables are controlled for, the percentage for 'top 4' firms was 43.1, with 61.2 per cent for 'second tier' and 66.2 per cent for 'other' IP firms.

[108] Four cases with unknown region were excluded from the figure.
[109] Jointly testing the IP firm model terms; $\chi^2_3 = 19.67$, $p < 0.001$.
[110] Odds ratio = 0.62, Z = -4.09, $p < 0.001$.
[111] With a very similar odds ratio, test statistic and p-value to the difference between 'top 4' and 'other'; odds ratio = 0.62, Z = -3.62, $p < 0.001$.
[112] Note, that the large positive term for cases with 'unknown' IP firm in the statistical output should be treated/interpreted with caution, since they were based on comparatively small number of observations (and are excluded from Figure 46).

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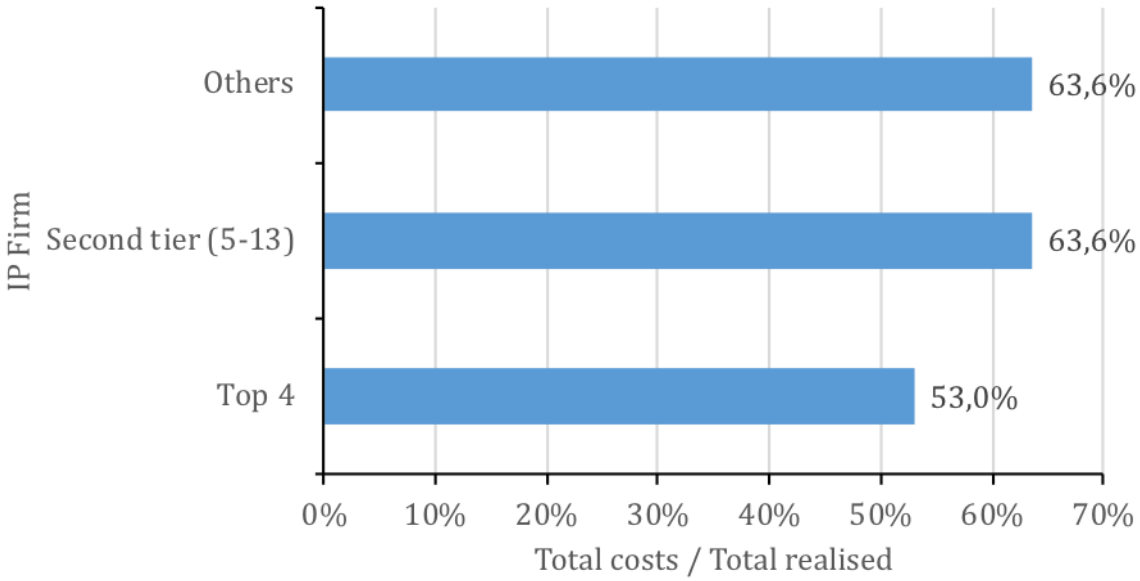

Figure 46. The relationship between the percentage of the total realised made up by costs and IP firm, derived from the fractional generalized linear model and controlling for a range of other variables[113]

If a further model is fitted with an additional interaction included between IP firm and procedure, the result (derived from the model) is Figure 47. If instead, an interaction between IP firm and total debt group is included, the result is Figure 48.

[113] Nine cases where IP firm was unknown were excluded from the figure.

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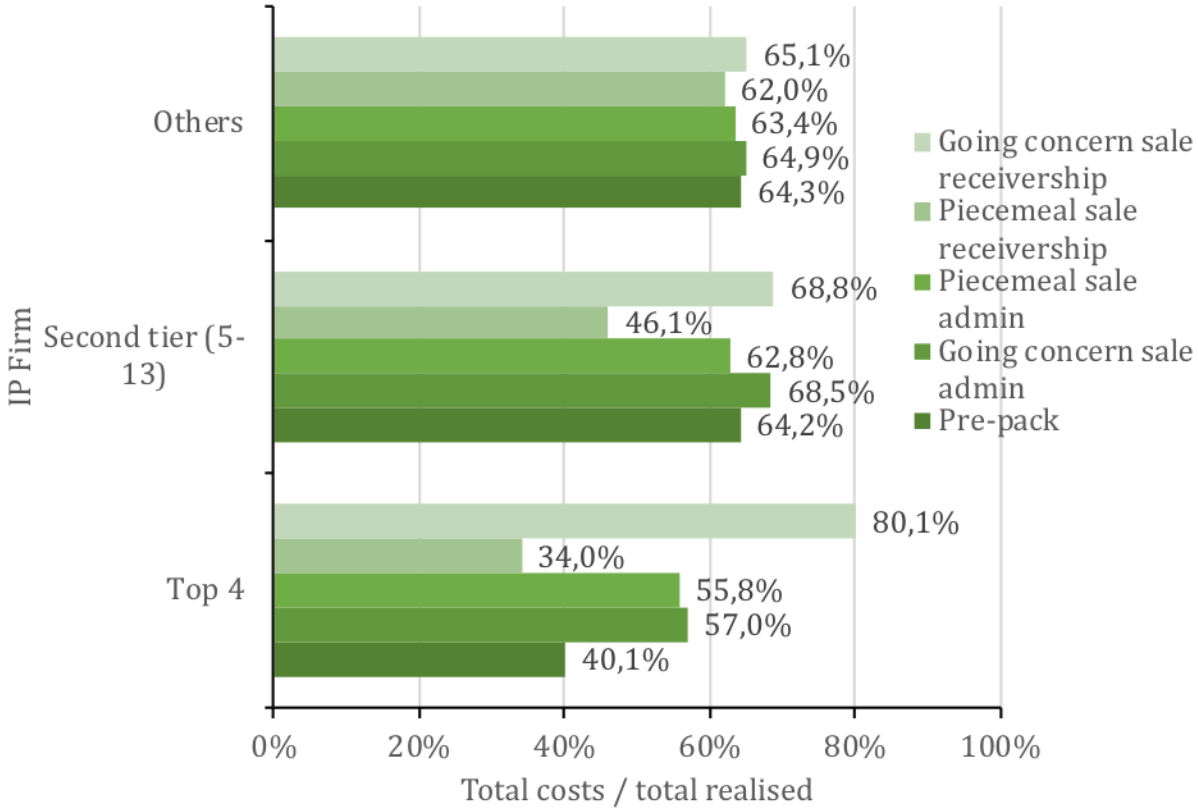

Figure 47. The relationship between the percentage of the total realised made up by costs, IP firm and procedure, derived from the fractional generalized linear model and controlling for a range of other variables

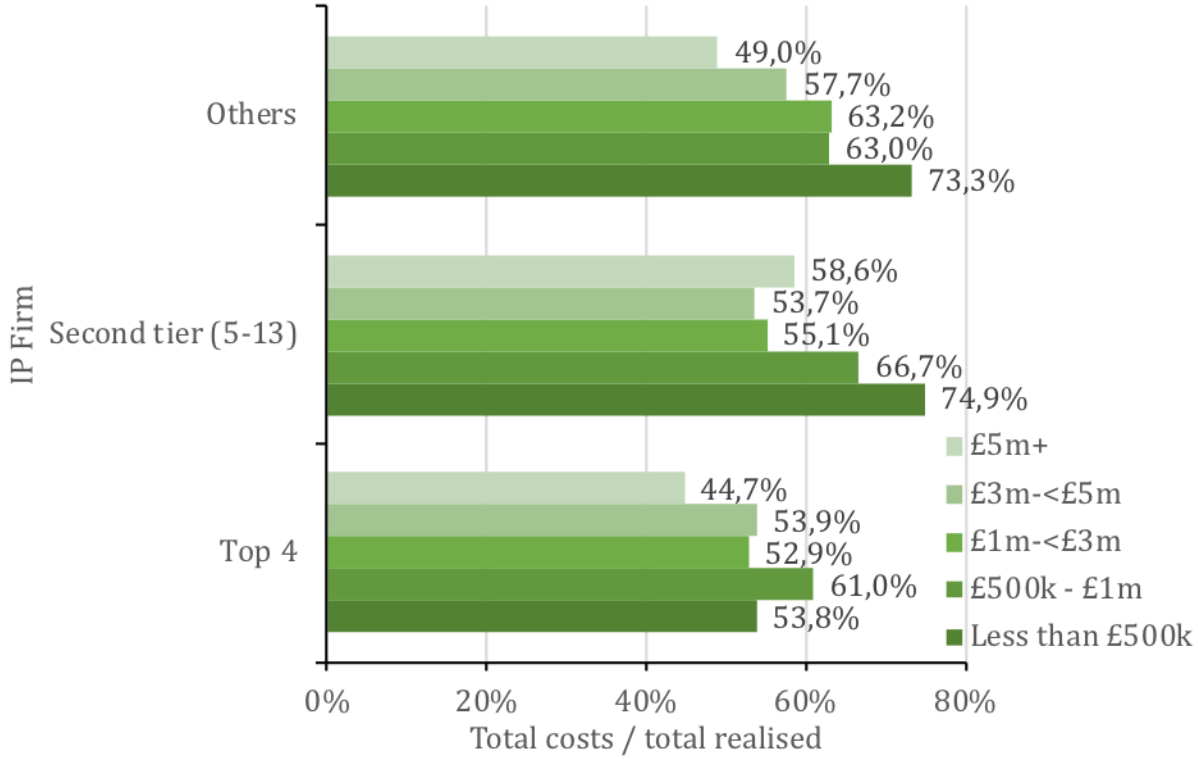

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Figure 48. The relationship between the percentage of the total realised made up by costs, IP firm and total debt group, derived from the fractional generalized linear model and controlling for a range of other variables

Presence of a purchaser and whether they were connected

There were significant differences in the proportion of the total realised made up by costs based on presence of a purchaser and whether or not the purchaser was connected.[114] Compared to other groups, 'purchaser not connected' group had a lower proportion, and significantly lower than the 'not applicable/unknown/missing' and 'purchaser connection unknown' groups.[115] The proportion of the total realised made up by costs for each purchaser/purchaser connected group is shown in Figure 49, controlling for the other variables included in the statistical model.

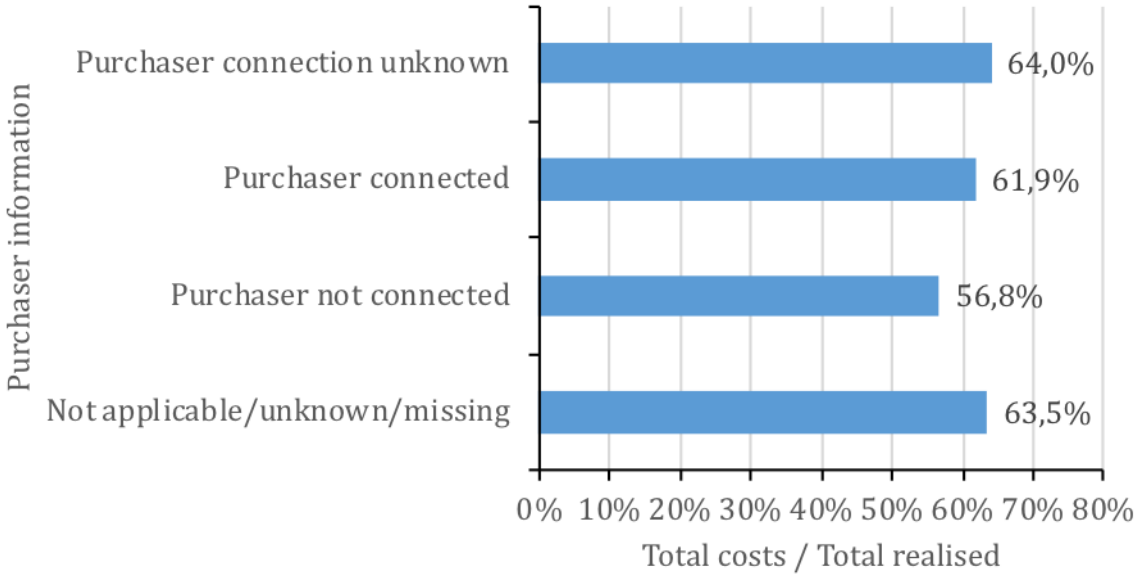

Figure 49. The relationship between the percentage of the total realised made up by costs and whether a purchaser could be identified (and whether or not they were connected), derived from the fractional generalized linear model and controlling for a range of other variables

If the current purchaser/purchaser connected variable were replaced in the model with a more detailed variable also including deferred consideration, overall differences appeared modest.[116] However, compared to the 'not applicable/unknown' reference category, there were significantly lower proportions in the 'purchaser not connected, zero deferred consideration' group.[117] Percentages of the total realised made up by costs by presence of a purchaser, whether

[114] Testing the purchaser / purchaser connected terms together; $\chi^2_3 = 9.69$, $p = 0.021$.
[115] Odds ratio = 0.73, Z = -2.87, p = 0.004 and odds ratio = 0.72, Z = -2.48, p = 0.013. The difference between 'purchaser connected' and 'purchaser not connected' fell just short of statistical significance; 0.78, Z = -1.88, p = 0.061.
[116] Jointly testing whether the new terms are equal to zero yields a non-significant result; $\chi^2_9 = 12.46$, $p = 0.19$.
[117] Odds ratio = 0.68, Z = -2.75, p = 0.006

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or not they were connected and deferred consideration (positive, zero or missing) are set out in Figure 50.

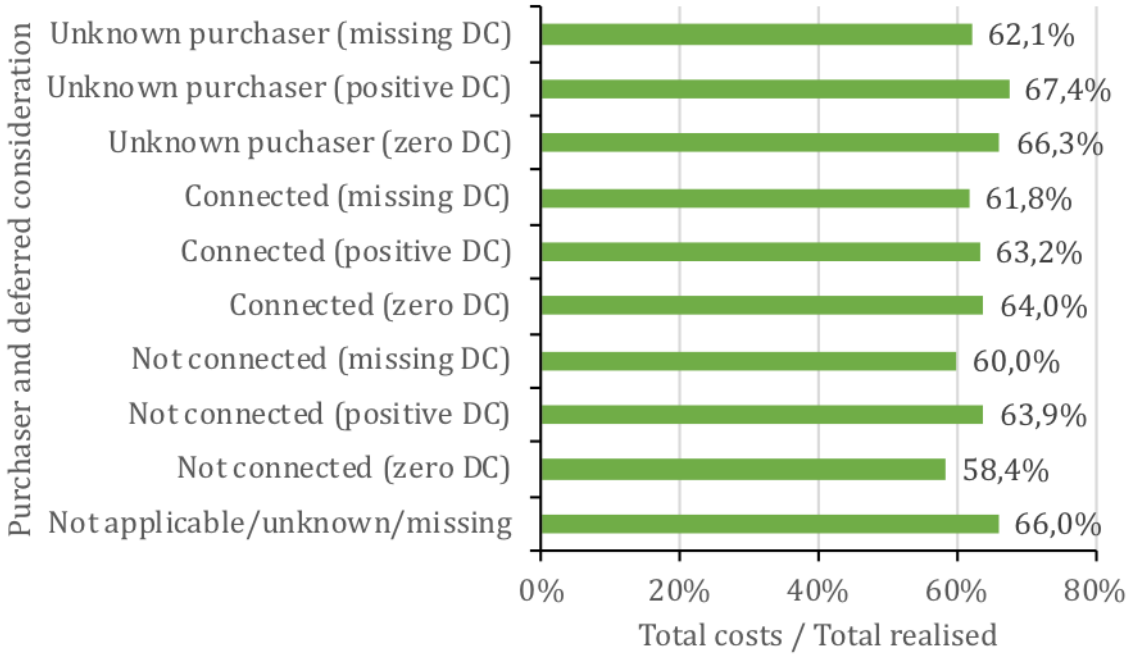

Figure 50. The relationship between the percentage of the total realised made up by costs and whether a purchaser could be identified, whether or not they were connected and deferred consideration (positive, zero or missing), derived from the fractional generalized linear model and controlling for a range of other variables

Total costs

Overall differences in the proportion of the total realised made up by costs between different 'total costs' groups fell short of statistical significance.[118] The lowest proportion was observed for the 'less than £5,000' category, especially when contrasted with the '£5,000 to less than £25,000' category.[119] Overall, however, differences between total cost groups were small and clearly non-significant. The relationship between costs as a percentage of total realised and total cost groups is shown in Figure 51, controlling for the range of variables included in the statistical model.

[118] Jointly testing the 'total costs' model terms; $\chi^2_6 = 7.99$, $p = 0.24$.
[119] Which was a significant difference; odds ratio = 1.6, $Z = 2.43$, $p = 0.015$.

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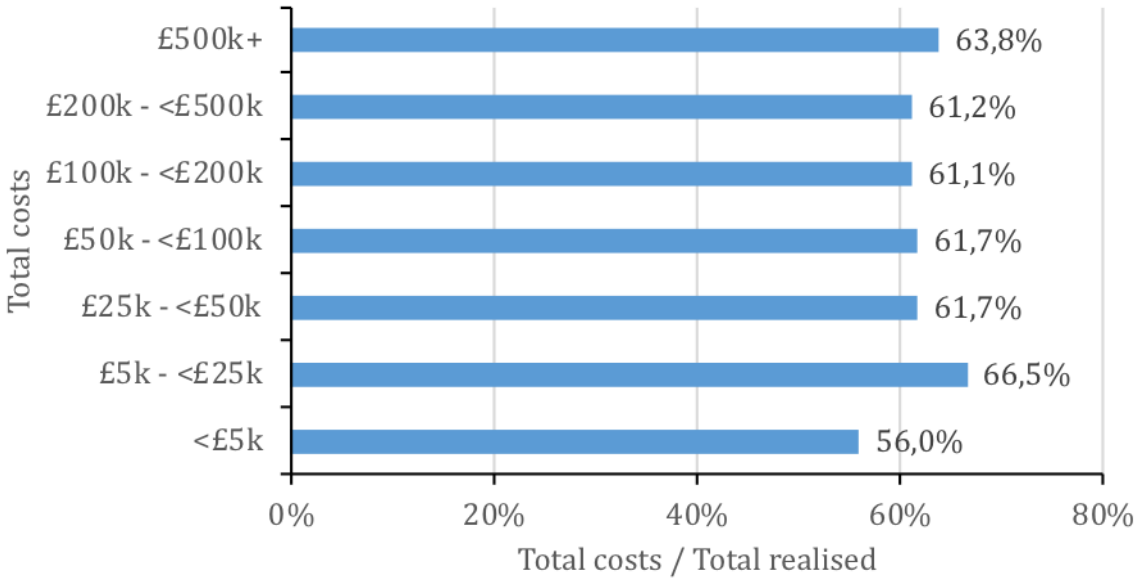

Figure 51. The relationship between the percentage of the total realised made up by costs and total costs (grouped), derived from the fractional generalized linear model and controlling for a range of other variables

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Statistical appendix

To model proportions (in this case, modelling total costs as a function of total realised) fractional generalized linear models were used. These were implemented using William's (2017) fracglm programme in Stata 13. This programme fills gaps left by other Stata commands where responses must be binary. Papke and Wooldridge (1996) also provide a widely cited paper on some of the key issues associated with fractional responses and appropriate models. In our case, we fit fractional logit models and model coefficients can be interpreted in much the same way as logistic regression. To further ease interpretation, figures of predicted proportions were calculated and used to produce figures using the 'margins' post estimation command in Stata 13.These figures allow assessment of the relationship between the dependent variable (total costs divided by total realised) and independent variables, while controlling for other independent variables. Table 8 shows fractional generalized linear model output, using a logit link, modelling the proportion of total realised made up of costs, on the basis of a range of variables.

Table 8. Fractional generalized linear (logit) model of the proportion of total realised made up of costs

Variable	Level	Est.	Robust SE	z	p
Procedure	Pre-pack	0.000	-		
	Going concern sale admin	0.259	0.236	1.100	0.273
	Piecemeal sale admin	0.076	0.182	0.420	0.676
	Piecemeal sale receivership	-0.036	0.619	-0.060	0.954
	Going concern sale receivership	10.864	1.020	10.660	0.000
Total debt	Less than £500k	0.000	-		
	£500k - £1m	-0.185	0.207	-0.890	0.372
	£1m-<£3m	-0.658	0.183	-3.600	0.000
	£3m-<£5m	-1.113	0.297	-3.750	0.000
	£5m+	-0.472	0.236	-2.000	0.046
	Unknown	0.163	0.527	0.310	0.757
Procedure X Total debt	Going concern sale admin X £500k - £1m	-0.194	0.364	-0.530	0.593

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	Going concern sale admin X £1m-<£3m	0.246	0.309	0.800	0.426
	Going concern sale admin X £3m-<£5m	0.321	0.433	0.740	0.459
	Going concern sale admin X £5m+	-0.714	0.326	-2.190	0.028
	Going concern sale admin X Unknown	-0.559	0.631	-0.890	0.376
	Piecemeal sale admin X £500k - £1m	-0.347	0.272	-1.280	0.201
	Piecemeal sale admin X £1m-<£3m	0.114	0.236	0.480	0.628
	Piecemeal sale admin X £3m-<£5m	0.832	0.370	2.250	0.024
	Piecemeal sale admin X £5m+	-0.351	0.281	-1.250	0.212
	Piecemeal sale admin X Unknown	0.019	0.587	0.030	0.974
	Piecemeal sale receivership X £500k - £1m	-0.393	0.897	-0.440	0.661
	Piecemeal sale receivership X £1m-<£3m	0.302	0.734	0.410	0.681
	Piecemeal sale receivership X £3m-<£5m	0.700	0.918	0.760	0.446
	Piecemeal sale receivership X £5m+	-1.848	0.875	-2.110	0.035
	Piecemeal sale receivership X Unknown	-0.740	0.837	-0.880	0.376
	Going concern sale receivership X £500k - £1m	-12.088	1.149	-10.520	0.000
	Going concern sale receivership X £1m-<£3m	-8.828	1.259	-7.010	0.000
	Going concern sale receivership X £3m-<£5m	-10.816	1.071	-10.100	0.000
	Going concern sale receivership X £5m+	-11.288	1.155	-9.770	0.000
	Going concern sale receivership X Unknown	-11.989	1.374	-8.730	0.000
Over/under-secured	Undersecured	0.000	-		
	Oversecured	0.437	0.083	5.240	0.000
	Missing	-0.131	0.143	-0.910	0.362

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SIC Sector	C - Manufacturing	0.000	-		
	F - Construction	-0.005	0.130	-0.040	0.968
	G - Wholesale and retail trade; repair of motor vehicles	-0.142	0.134	-1.060	0.288
	I - Accommodation and food service activities	-0.293	0.189	-1.550	0.121
	J - Information and communication	0.255	0.232	1.100	0.272
	K - Financial and insurance services	0.796	0.260	3.060	0.002
	L - Real estate activities	-1.015	0.191	-5.300	0.000
	M - Professional, scientific and technical activities	-0.101	0.170	-0.590	0.553
	N - Administrative and support service activities	-0.252	0.149	-1.690	0.092
	Other Section	-0.118	0.140	-0.840	0.401
	Unknown	-0.081	0.230	-0.350	0.725
Region (NUTS1)	London - UKI	0.000	-		
	South East - UKJ	-0.021	0.143	-0.150	0.884
	South West - UKK	-0.106	0.193	-0.550	0.582
	East - UKH	0.255	0.219	1.160	0.246
	West Midlands - UKG	-0.356	0.152	-2.350	0.019
	East Midlands - UKF	-0.140	0.198	-0.710	0.479
	Yorkshire & Humberside - UKE	0.039	0.135	0.290	0.772
	North West - UKD	-0.316	0.113	-2.810	0.005
	North East - UKC	0.192	0.278	0.690	0.488
	Scotland - UKM	-0.726	0.171	-4.240	0.000
	Wales - UKL	-0.563	0.333	-1.690	0.091

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	Northern Ireland - UKN	-0.314	0.199	-1.580	0.114
	Unknown	-1.279	0.615	-2.080	0.038
IP Firm	Other	0.000	-		
	Top 4	-0.485	0.119	-4.090	0.000
	Second tier (5-13)	-0.001	0.098	-0.010	0.994
	Unknown	0.758	0.595	1.270	0.202
Purchaser	Not applicable/unknown/missing	0.000	-		
	Purchaser not connected	-0.318	0.111	-2.870	0.004
	Purchaser connected	-0.080	0.120	-0.670	0.506
	Purchaser connection unknown	0.024	0.120	0.200	0.841
Total costs	Less than £5k	0.000	-		
	£5k - <£25k	0.500	0.206	2.430	0.015
	£25k - <£50k	0.267	0.201	1.320	0.186
	£50k - <£100k	0.267	0.195	1.370	0.172
	£100k - <£200k	0.238	0.200	1.190	0.234
	£200k - <£500k	0.240	0.202	1.190	0.236
	£500k+	0.366	0.213	1.720	0.085
Constant		0.745	0.266	2.800	0.005

1,931 cases included in the model, Log pseudolikelihood = -1,169.9, Pseudo R^2 = 0.088.

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3.2.5 Modelling IP fees as a proportion of total realised

Total IP fees as a proportion of the total realised could be calculated for 1,954 cases. Proportions varied from zero to one, with a mean proportion of 0.27 (i.e. on average, 27 per cent of the total realised was accounted for by IP fees). This section explores the relationship between IP fees as a proportion of total realised and a range of variables. The main statistical technique used was the fractional generalized linear model. Additional detail on these models and statistical output can be found in the statistical appendix, though this section summarises model output in non-technical terms.

Independent variables included in the main statistical model were procedure (excluding a small number of successful restructuring administrations), total debt (grouped), the interaction between procedure and total debt (grouped), percentage of debt which was secured (grouped), SIC sector, region (NUTS1 classification), IP firm, presence of a purchaser and whether or not they were connected and whether the creditor was over or under-secured. Additional variables, such as size based on turnover (which was available for a smaller number of cases), deferred consideration and percentage of debt which was secured were tested by making changes to the model in the statistical appendix. Percentage of debt which was secured was excluded from the initial model due to its close relationship to whether creditors were over or under-secured (because of how the over or under-secured variable was defined). Results look at each in turn rather than attempting to incorporate them into a single model. Figures derived from the main statistical model are displayed in blue with figures derived from additional models displayed in green.

Procedure

Overall differences in IP fees as a proportion of total realised between different procedures were relatively small.[120] The one exception was piecemeal sale receiverships, which had a noticeably lower IP fees as a proportion of total realised.[121] Figure 52 shows IP fees as a proportion of total realised by procedure, controlling for other variables, also including (and accounting for) the interaction between procedure and total debt. The interaction between procedure and total debt is discussed in further detail below.[122]

[120] There were a number of significant debt by procedure interaction terms, which are discussed further below, though if the interaction is removed, jointly testing the procedure terms; $\chi^2_4 = 5.58$, $p = 0.23$.

[121] Compared to pre-packs in a model without an interaction term, this difference was statistically significant; odds ratio = 0.59, Z = -2.22, p = 0.027.

[122] Note, if the procedure by total debt interaction term is removed from the model, percentages in Figure 52 would be 33.0 per cent for going concern receiverships, 19.3 per cent for piecemeal sale receiverships, 27.2 per cent for piecemeal sale administrations, 26.6 per cent for going concern sale administrations and 27.5 per cent for pre-packs.

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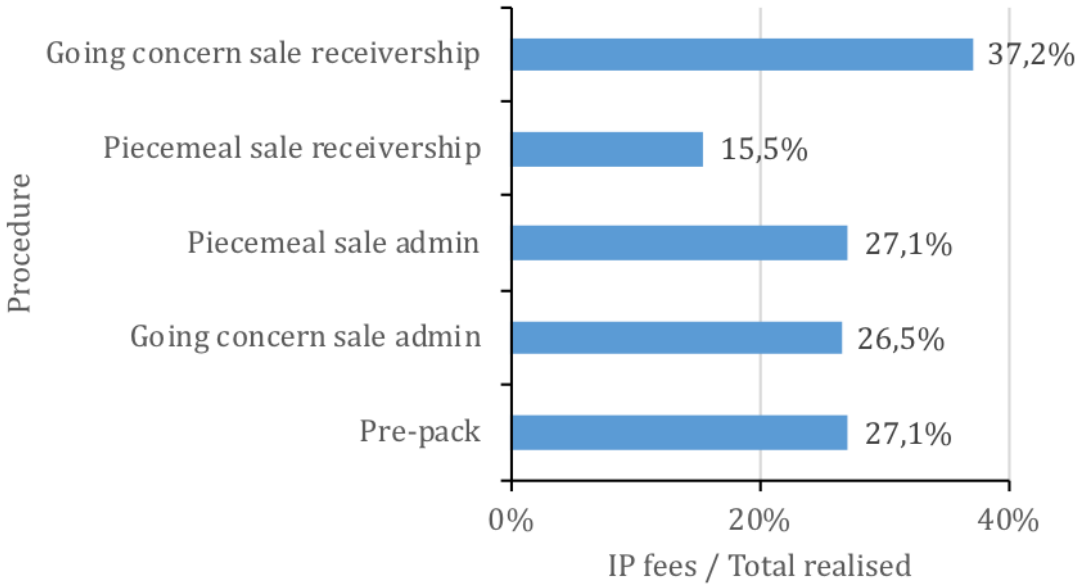
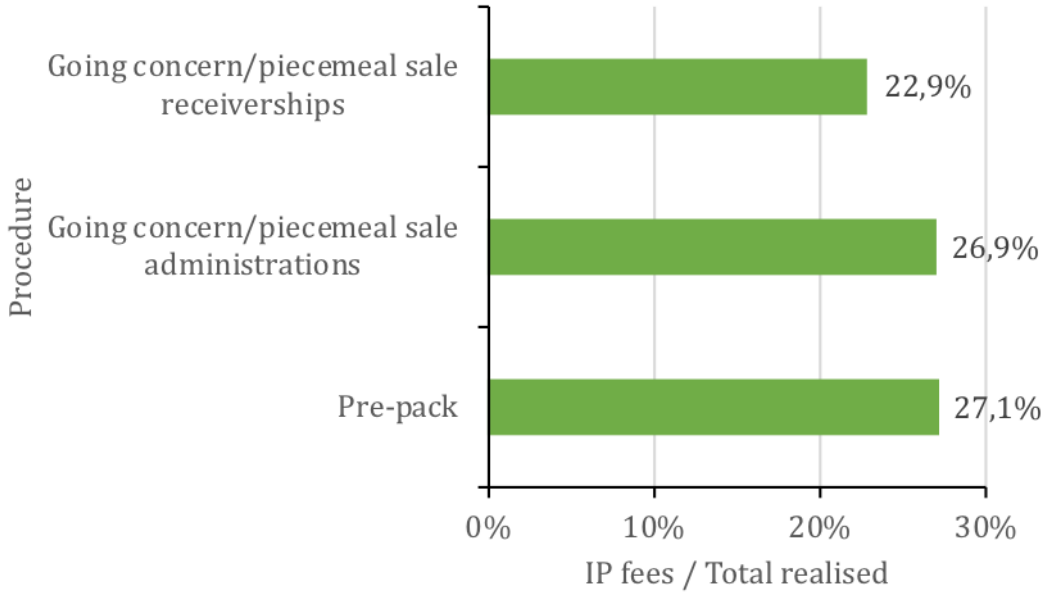


Figure 52. The relationship between IP fees as a percentage of total realised and procedure, derived from the fractional generalized linear model and controlling for a range of other variables

If procedure is replaced in the statistical model with a three category version (pre-packs, going concern/piecemeal sale administrations, going concern/piecemeal sale receiverships) the result is Figure 53.[123]



[123] Also including a procedure by debt group interaction.

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Figure 53. The relationship between IP fees as a percentage of total realised and procedure in three categories, derived from the fractional generalized linear model and controlling for a range of other variables

Debtor size

There were highly significant differences in IP fees as a percentage of total realised between total debt groups.[124] Essentially, IP fees as a percentage of total realised decreased as total debt increased (with a particularly low proportion for the '£5,000,000 or more debt group), as shown in Figure 54, controlling for other variables and accounting for the debt by procedure interaction.[125] Replacing total debt in the model with size based on turnover,[126] resulted in Figure 55. The total debt by procedure interaction is discussed further below.

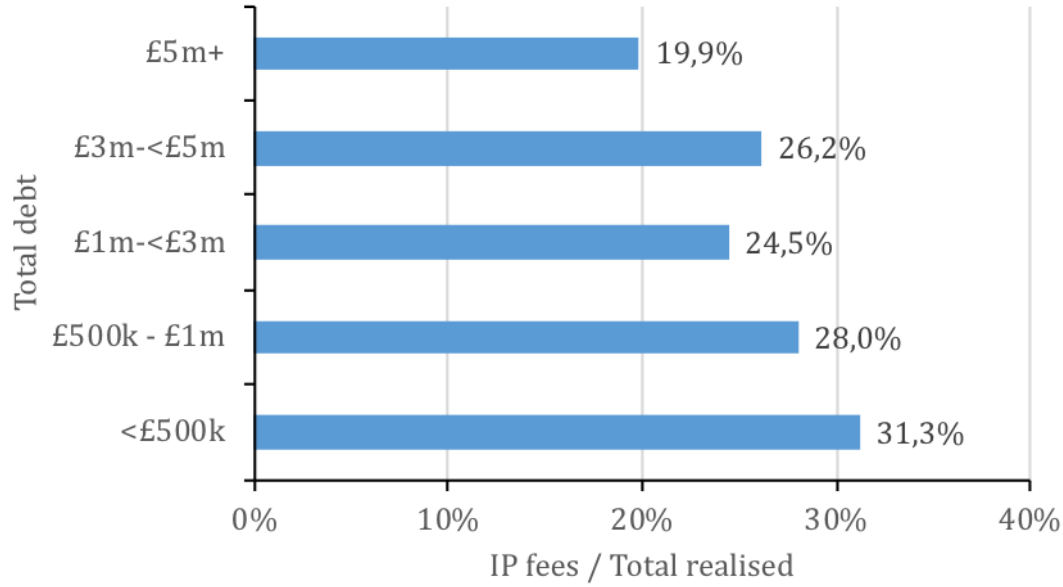

Figure 54. The relationship between IP fees as a percentage of total realised and total debt group, derived from the fractional generalized linear model and controlling for a range of other variables

[124] In addition to significant interaction terms (with procedure - discussed below), removing the interaction term and jointly testing the total debt terms was highly significant; $\chi^2_5 = 38.38$, $p < 0.001$.
[125] Note, that if the interaction term is removed from the model, the percentages in Figure 54 would be (from top to bottom), 20.2%, 27.4%, 24.6%, 28.3% and 31.6%.
[126] Without a size by procedure interaction. Note, that turnover was available for 785 cases with values for IP fees as a percentage of total realised.

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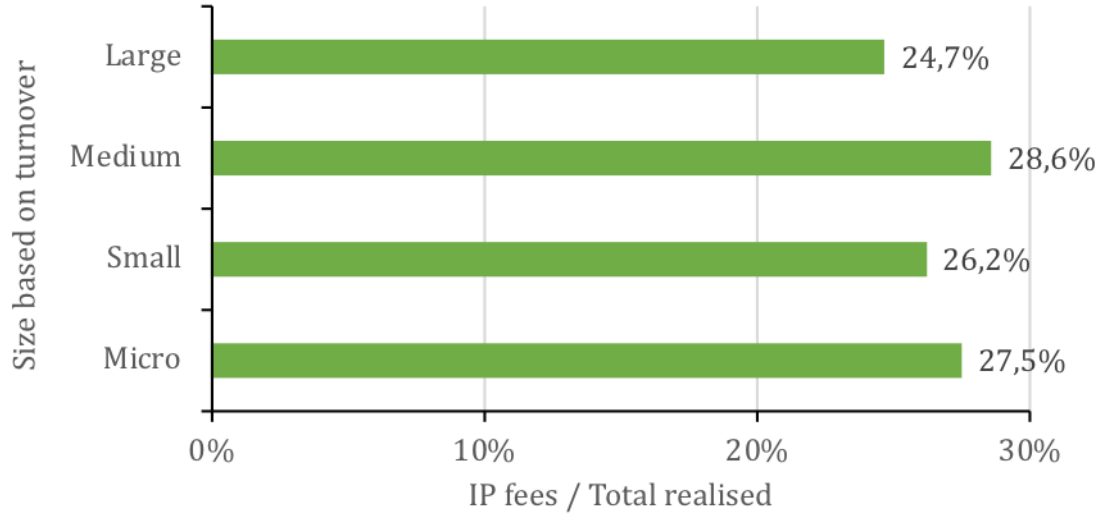

Figure 55. The relationship between IP fees as a percentage of total realised and size based on turnover, derived from the fractional generalized linear model and controlling for a range of other variables

The interaction between procedure and total debt

There was a significant interaction between procedure and total debt group in IP fees as a proportion of total realised.[127] The interaction is illustrated in Figure 56, and as shown, the relationship between total debt group and IP fees as a percentage of total realised differed between procedures. For example, compared to pre-packs (the model reference category), there was a significant increase in proportion in the '£1,000,000 - <£3,000,000' for going concern sale administrations (compared to 'less than £500,000').[128] Again, compared to pre-packs, there was also a significant increase in proportion for piecemeal sale administrations in the '£1,000,000 - <£3,000,000' [129] and '£3,000,000 - <£5,000,000' [130] total debt category (compared to 'less than £500,000'). While there also appeared to be significant differences in the relationship between IP fees as a percentage of total realised and debt for administrations and receiverships in Figure 56, apparent differences should be interpreted with caution. Overall there were only 59 piecemeal sale receiverships and 27 going concern sale receiverships included in the model. As a result Figure 57 is also provided, which removes the interaction term from the model. This prevents the relationship between IP fees as a proportion of total realised varying between total debt groups, which can be interpreted more confidently in the case of receiverships, where numbers were very small once split into debt categories.

[127] Jointly testing the interaction terms; $\chi^2_{20} = 58.56$, $p < 0.001$.
[128] Odds ratio = 1.72, Z = 2.20, p = 0.028.
[129] Odds ratio = 1.48, Z = 2.07, p = 0.039.
[130] Odds ratio = 2.37, Z = 2.42, p = 0.015.

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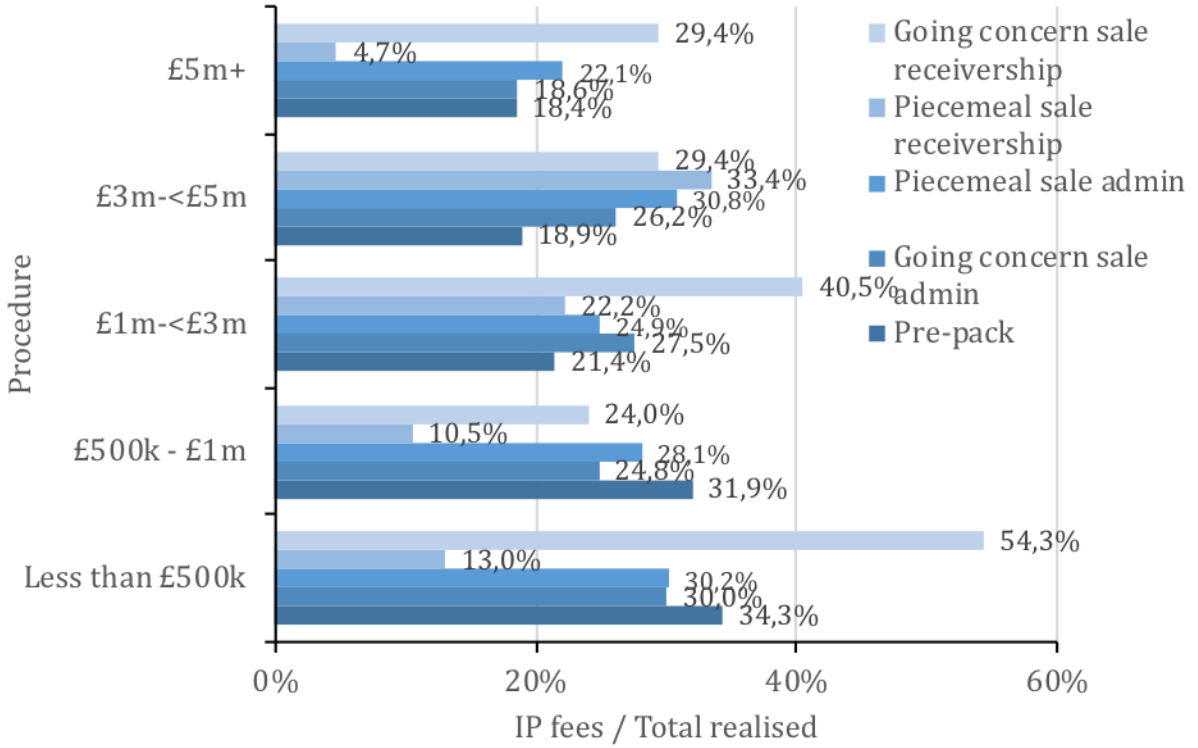

Figure 56. The relationship between IP fees as a percentage of total realised, procedure and total debt group, derived from the fractional generalized linear model and controlling for a range of other variables

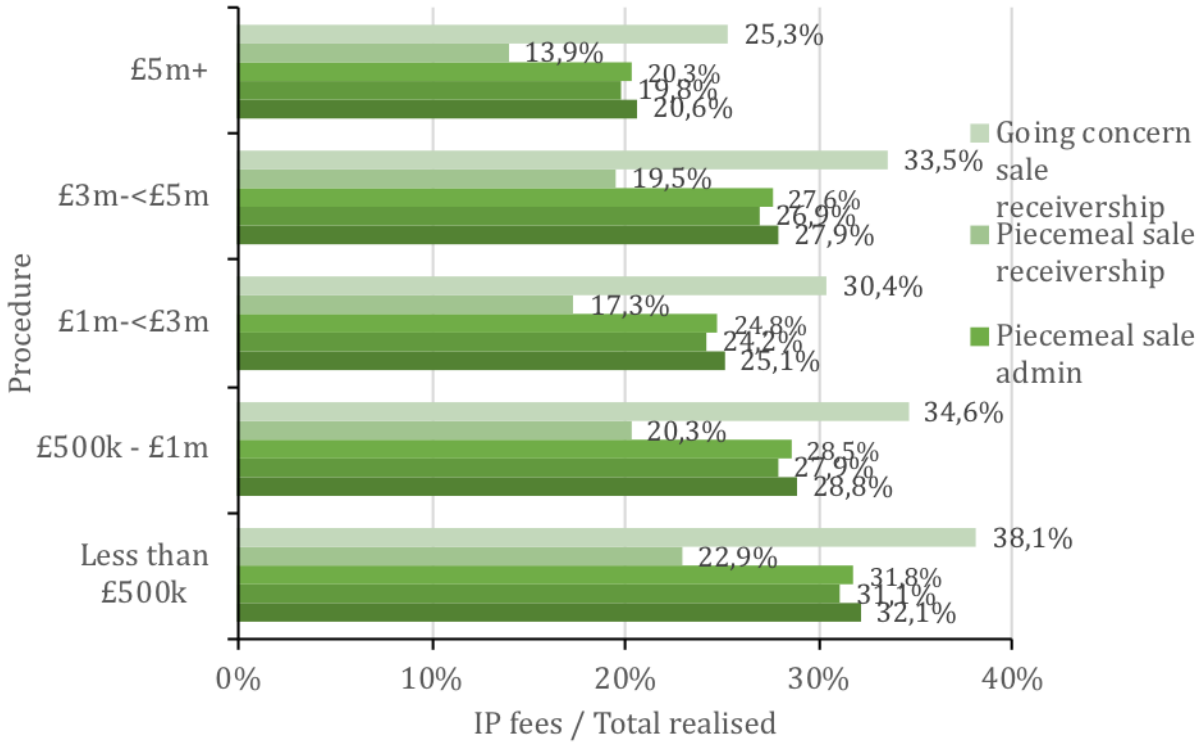

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Figure 57. The relationship between IP fees as a percentage of total realised, procedure and total debt group, derived from the fractional generalized linear model and controlling for a range of other variables (with the procedure by debt interaction removed)

Finally, if procedure is replaced in the model with the three category version (pre-packs, going concern/piecemeal sale administrations, going concern/piecemeal sale receiverships), and a procedure by debt interaction included, the result is Figure 58.

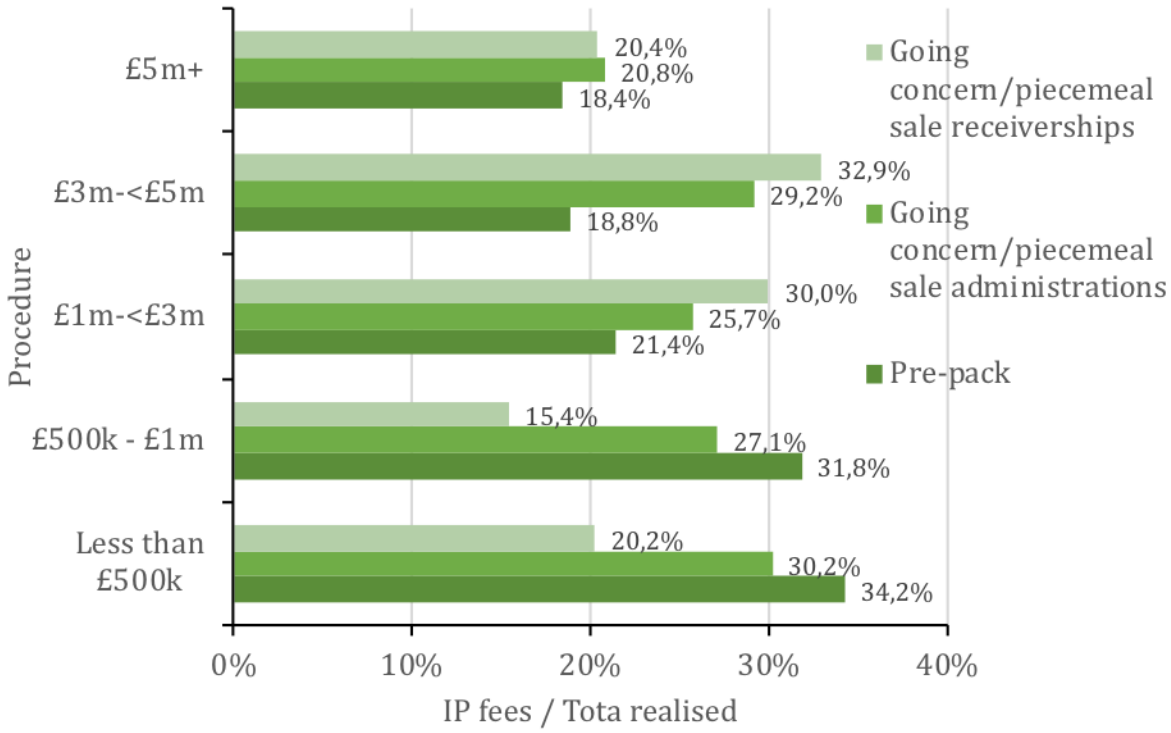

Figure 58. The relationship between IP fees as a percentage of total realised, procedure (in three categories) and total debt group, derived from the fractional generalized linear model and controlling for a range of other variables

Whether creditors were over or under-secured and the percentage of debt which was secured

There were highly significant differences in IP fees as a proportion of total realised between cases where creditors were over-secured and cases where they were under-secured.[131] Compared to under-secured cases, over-secured cases were associated with a highly significant increase in IP fees as a proportion of total realised.[132] This difference is illustrated in Figure 59, controlling for the range of variables included in the statistical model.

[131] Jointly testing the under-secured and 'missing/unknown' terms; $\chi^2_2 = 31.19$, $p < 0.001$.
[132] Odds ratio = 1.52, Z = 5.14, $p < 0.001$.

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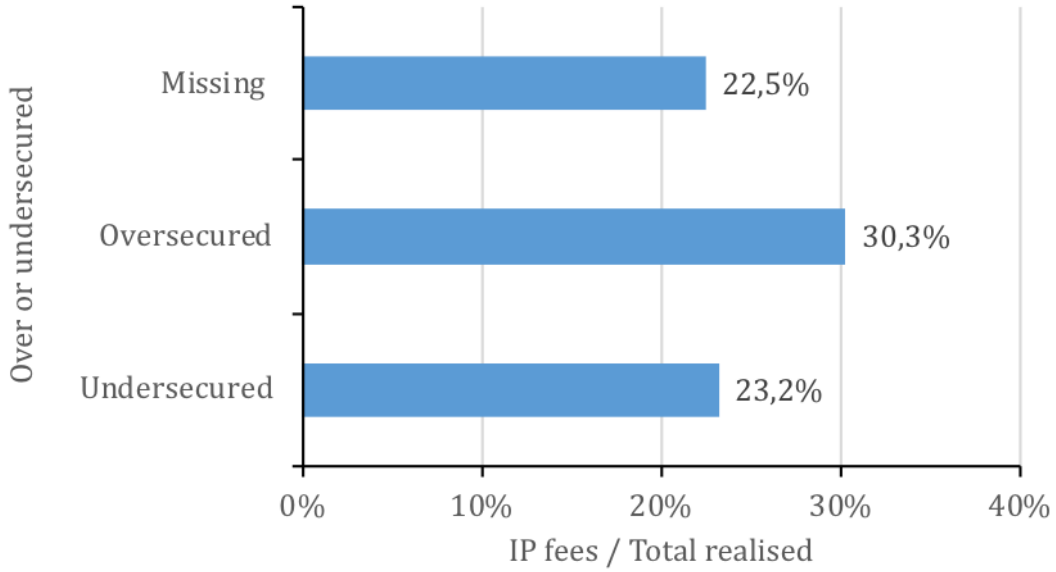

Figure 59. The relationship between IP fees as a percentage of total realised and whether creditors were over or under-secured, derived from the fractional generalized linear model and controlling for a range of other variables

If a further model is fitted with an additional interaction included between whether creditors were over or under-secured, the result (derived from the model) is Figure 60.[133] If instead, an interaction between whether creditors were over or under-secured and total debt group is included, the result is Figure 61.

[133] Note, that values for going concern sale receiverships could not be estimated in this model.

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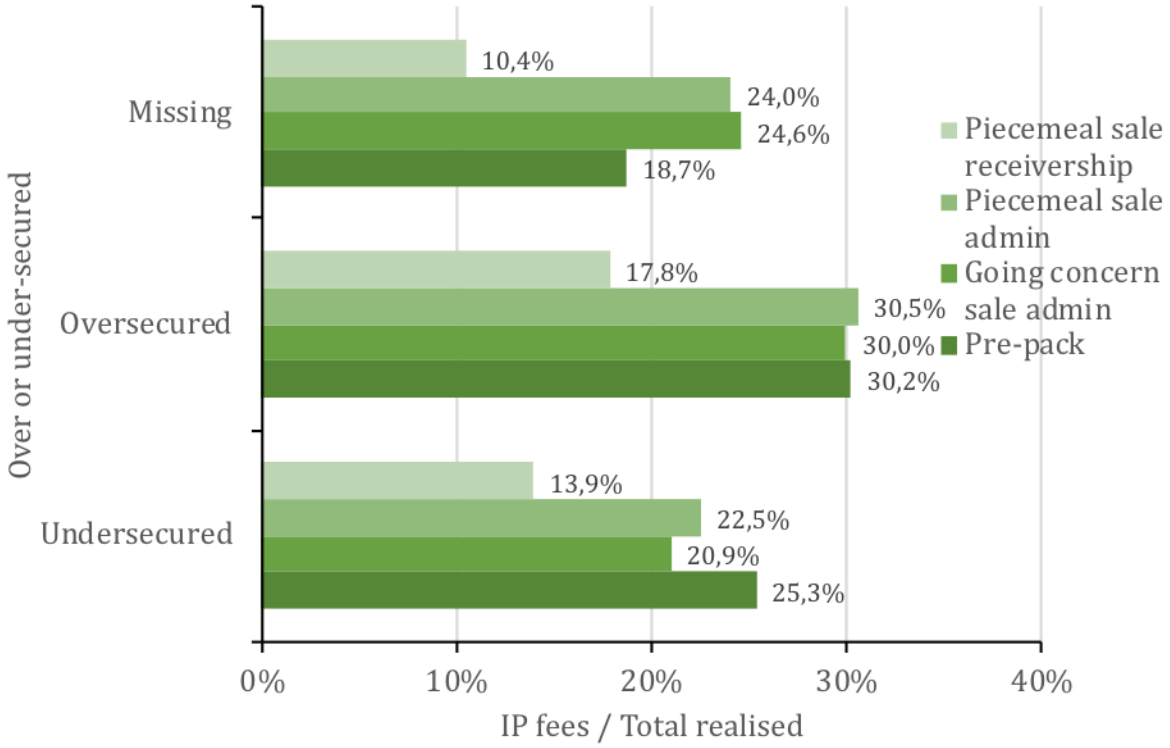

Figure 60. The relationship between IP fees as a percentage of total realised, whether creditors were over or under-secured and procedure, derived from the fractional generalized linear model and controlling for a range of other variables

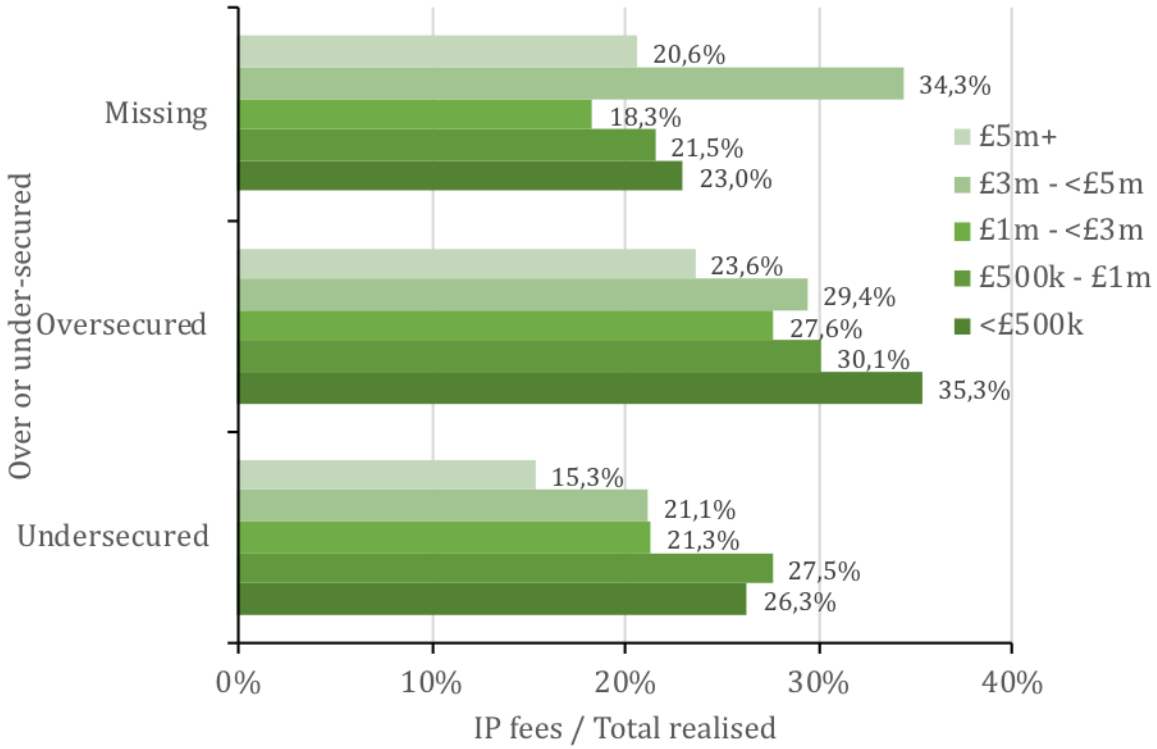

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Figure 61. The relationship between IP fees as a percentage of total realised, whether creditors were over or under-secured and total debt group, derived from the fractional generalized linear model and controlling for a range of other variables

Whether creditors were over or under-secured was then replaced by percentage of secured debt in the model. Testing the new percentage of secured debt terms indicated a highly statistically significant relationship between IP fees as a proportion of total realised and the percentage of debt which was secured.[134] Compared to 'less than 25 per cent' secured debt, IP fees made up a highly significantly lower proportion of total realised for the 'greater than 25 per cent to 50 per cent',[135] 'greater than 50 per cent to 75 per cent'[136] and 'greater than 75 per cent to 100 per cent' groups.[137] Figure 62 shows the relationship between IP fees as a percentage of total realised and the percentage of secured debt, while controlling for a range of other variables.[138] As shown, the percentage was far higher in the 'up to 25 per cent' category when compared to other percentages of secured debt.

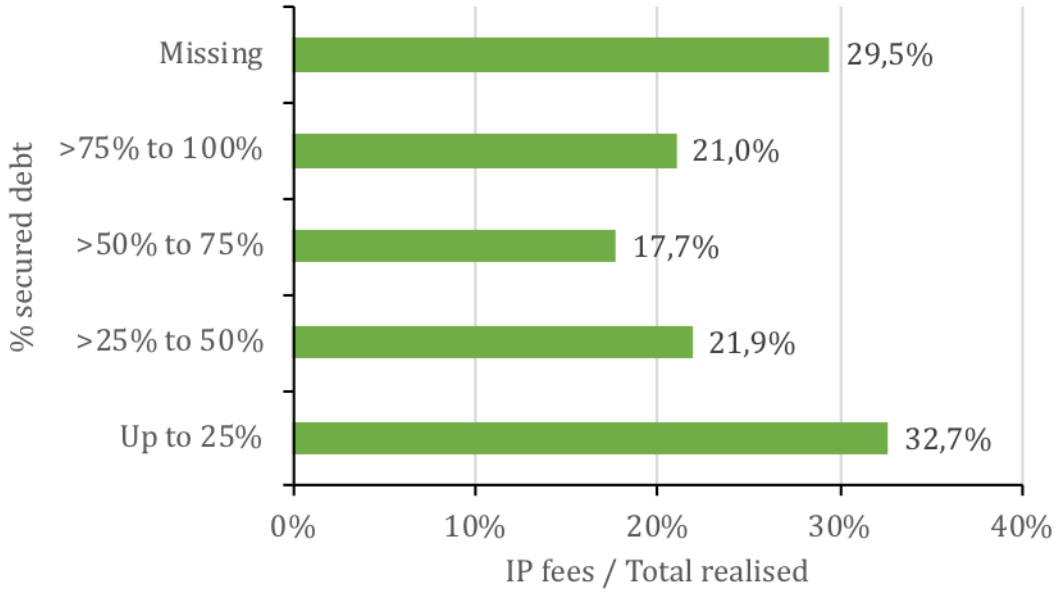

Figure 62. The relationship between IP fees as a percentage of total realised and percentage of secured debt (of total debt), derived from the fractional generalized linear model and controlling for a range of other variables

SIC sector

[134] Testing the 'percentage of secured debt' terms simultaneously'; $\chi^2_4 = 94.41$, $p < 0.001$.
[135] Odds ratio = 0.57, Z = -6.86, $p < 0.001$.
[136] Odds ratio = 0.43, Z = -7.45, $p < 0.001$.
[137] Odds ratio = 0.54, Z = -5.37, $p < 0.001$.
[138] Note, that there was a highly significant relationship regardless of whether or not other variables were controlled for in a model.

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There were also highly statistically significant differences in IP fees as a proportion of total realised between different sectors.[139] IP fees were at their highest as a function of total realised for the financial and insurance services sector,[140] and by far at their lowest for the real estate sector, and highly significantly lower than other sectors including the manufacturing reference category.[141] These differences in IP fees as a percentage of the total realised differences are illustrated in Figure 63, controlling for the range of other variables included in the model.

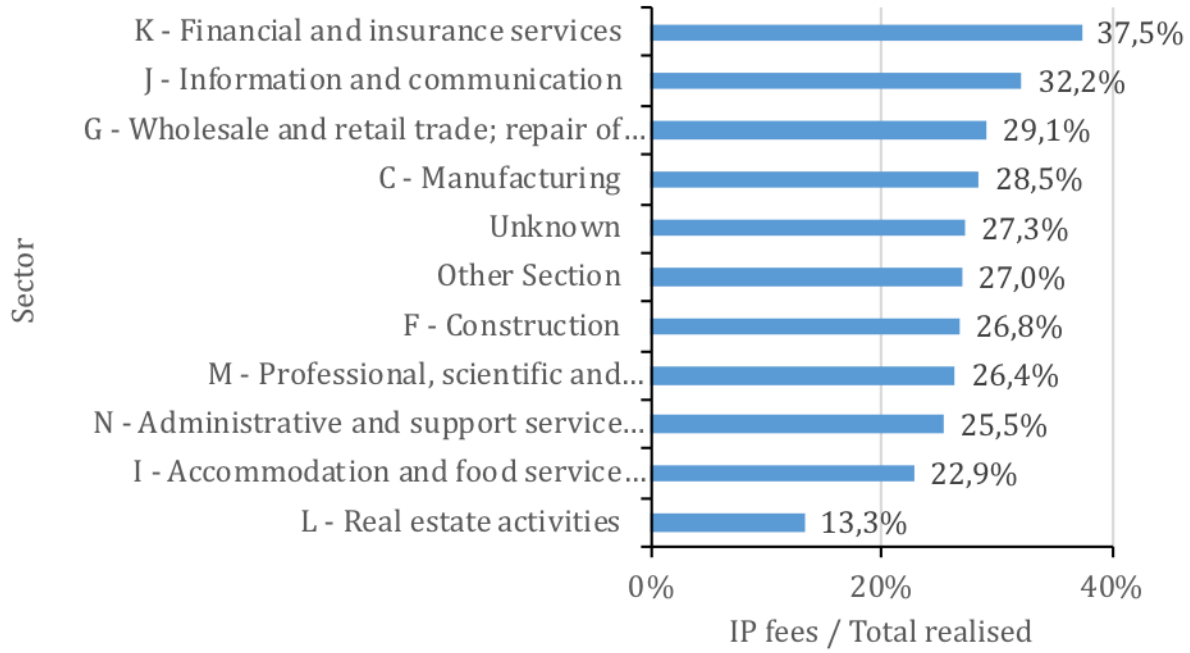

Figure 63. The relationship between IP fees as a percentage of total realised and SIC sector, derived from the fractional generalized linear model and controlling for a range of other variables

Region

There was evidence of statistically significant differences in IP fees as a proportion of total realised between different regions.[142] Compared to London (the model reference category) IP fees as a proportion of total realised were statistically significantly lower in the West Midlands[143], Scotland[144] and Northern Ireland.[145] There were also relatively low proportions (but smaller numbers of cases) in Wales, while the highest proportion was observed in the East

[139] Testing the SIC sector terms together'; $\chi^2_{10} = 38.02$, $p < 0.001$.
[140] Compared to the manufacturing reference category; odds ratio = 1.53, Z = 2.13, p = 0.033. The financial and insurance services sector also had a significantly higher proportion than a number of other sectors including construction, accommodation and food services, real estate, professional, scientific and technical activities and administrative and support services.
[141] Odds ratio = 0.37, Z = -4.67, $p < 0.001$.
[142] Testing the NUTS1 region terms together'; $\chi^2_{12} = 23.22$, p = 0.026.
[143] Compared to London; odds ratio = 0.75, Z = -2.16, p = 0.031.
[144] Compared to London; odds ratio = 0.66, Z = -2.60 p = 0.009.
[145] Compared to London; odds ratio = 0.63, Z = -2.03, p = 0.042.

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of England. Figure 64 illustrates variation in IP fees as a proportion of total realised IP fees as a proportion of total realised by (NUTS1) region, controlling for the range of other variables in the statistical model.

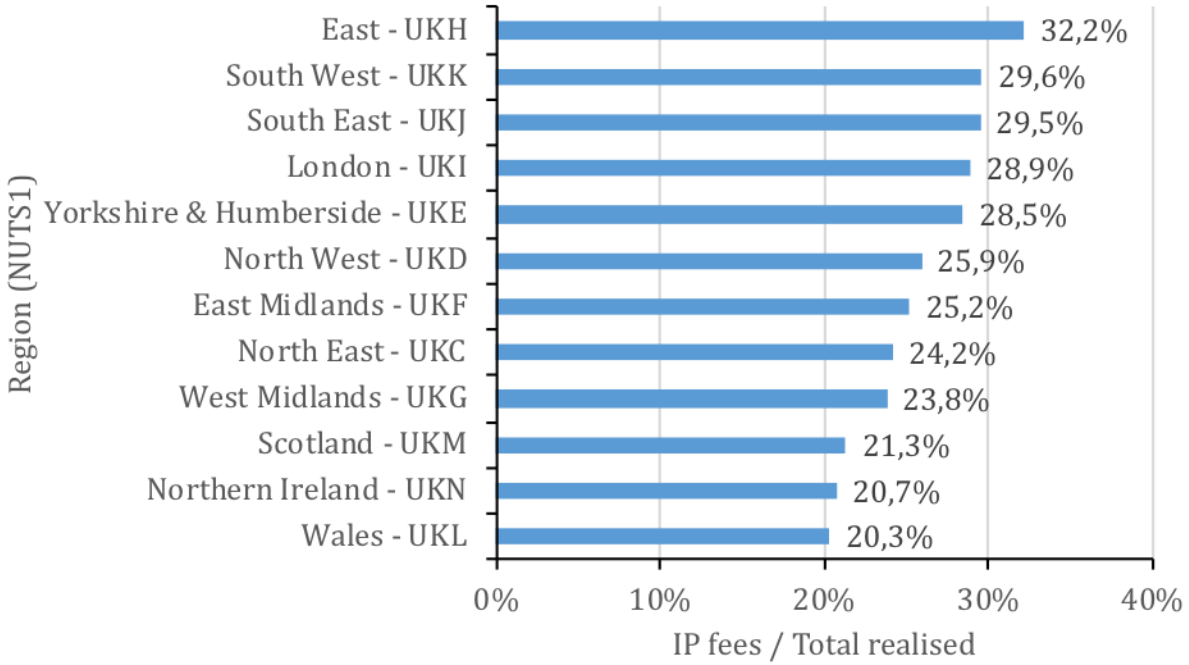

Figure 64. The relationship between IP fees as a percentage of total realised and region (NUTS1), derived from the fractional generalized linear model and controlling for a range of other variables[146]

IP firm

Differences in IP fees as a proportion of total realised between categories of IP firm were statistically significant.[147] Looking at individual IP firm model terms, compared to 'other' firms, there was a significantly smaller proportion for both second tier[148] and 'top 4' firms.[149] As with other models, 'unknown' IP firm should be treated/interpreted with caution, since they were based on comparatively small number of observations, and are excluded from Figure 65. Figure 65 illustrates IP fees as a percentage of total realised by IP firm category controlling for other variables in the model.

[146] Note, that four cases with unknown region were included in the model, but excluded from the figure.
[147] Jointly testing all of the IP firm terms; $\chi^2_2 = 11.36$, $p = 0.010$.
[148] Odds ratio = 0.79, Z = -2.72, p = 0.007.
[149] Odds ratio = 0.79, Z = -2.04, p = 0.041.

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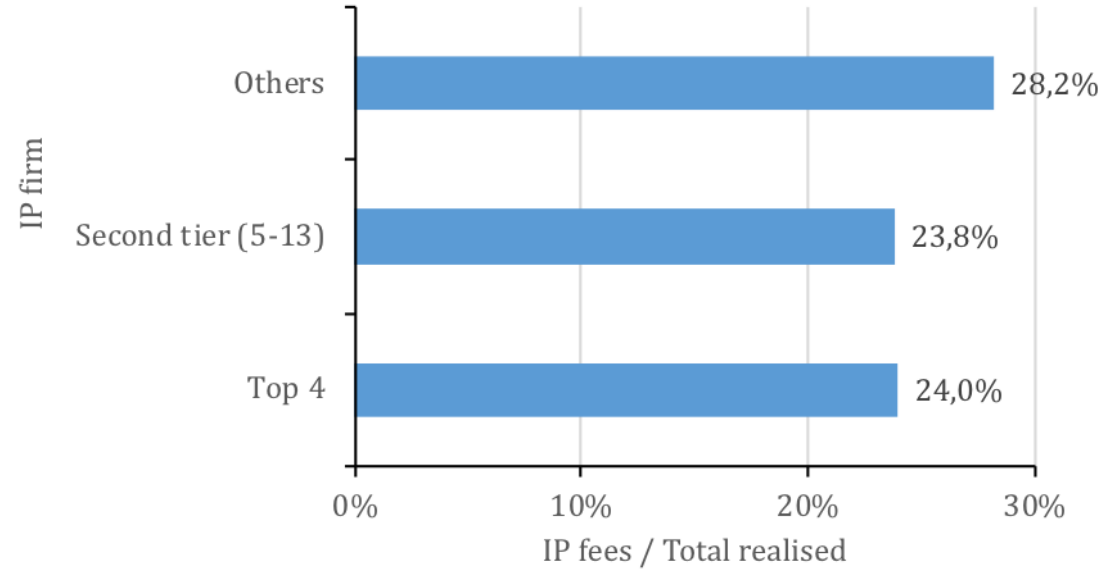

Figure 65. The relationship between IP fees as a percentage of total realised and IP firm, derived from the fractional generalized linear model and controlling for a range of other variables

If a further model is fitted with an additional interaction included between IP firm and procedure, the result (derived from the model) is shown in Figure 66. If instead, an interaction between IP firm and total debt group is included, the result is Figure 67.

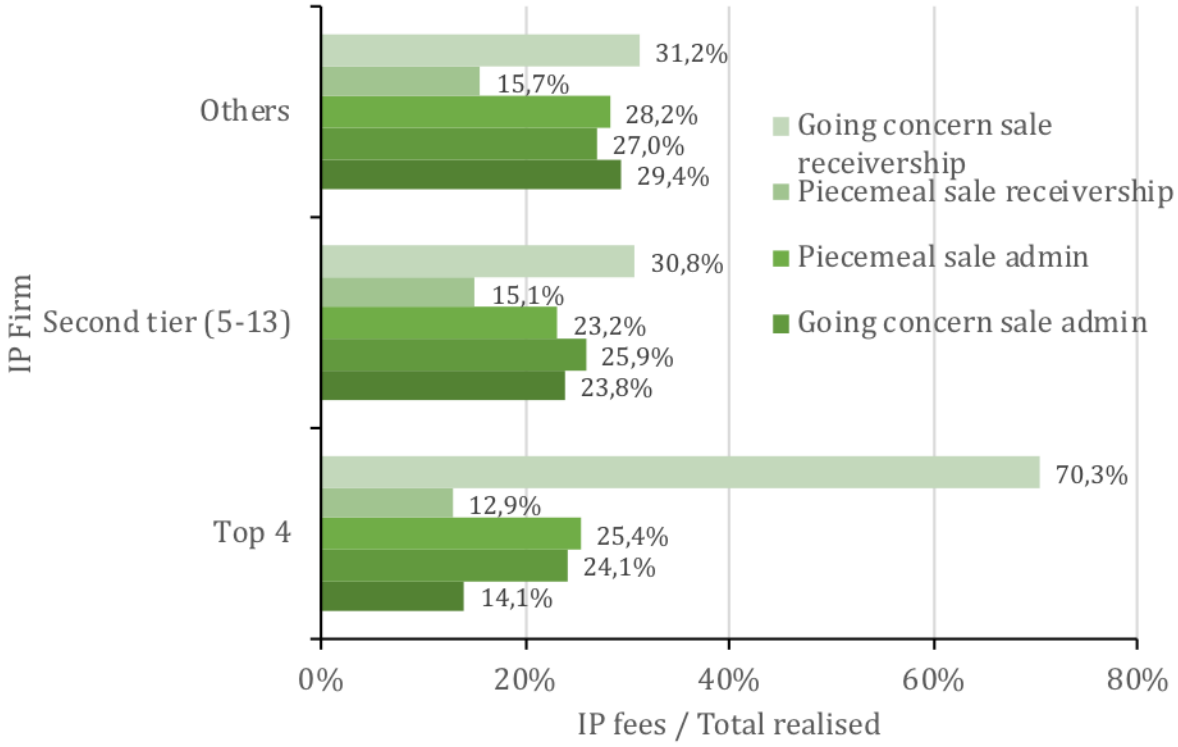

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Figure 66. The relationship between IP fees as a percentage of total realised, IP firm, and procedure derived from the fractional generalized linear model and controlling for a range of other variables

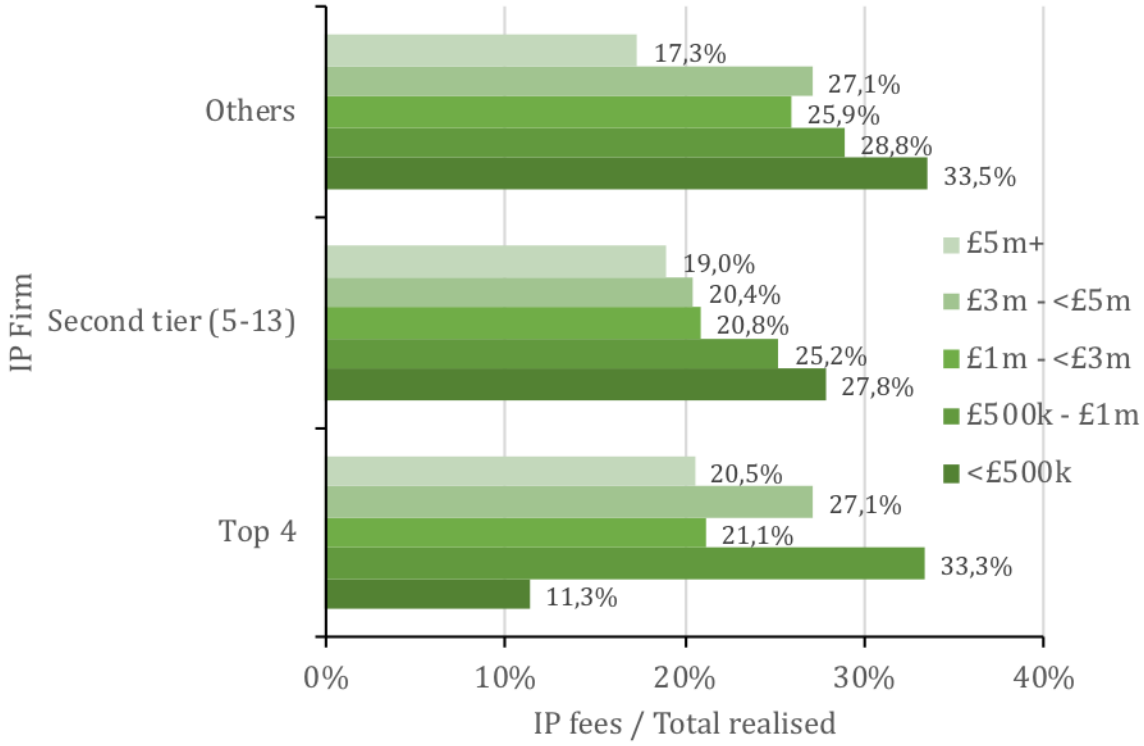

Figure 67. The relationship between IP fees as a percentage of total realised, IP firm, and total debt group derived from the fractional generalized linear model and controlling for a range of other variables

Presence of a purchaser and whether they were connected

There was no evidence of statistically significant differences IP fees as a percentage of total realised based on presence of a purchaser and whether or not the purchaser was connected.[150] The largest single difference was between the 'not applicable/unknown/missing' category and 'purchaser connected' category, and this also fell short of statistical significance.[151] IP fees as a percentage of total realised for different purchaser/purchaser connected groups is illustrated in Figure 68, controlling for other variables included in the statistical model.

[150] Jointly testing the purchaser/purchaser connected terms; $\chi^2_3 = 3.29$, $p = 0.35$.
[151] Odds ratio = 1.19, Z = 1.79, p = 0.073.

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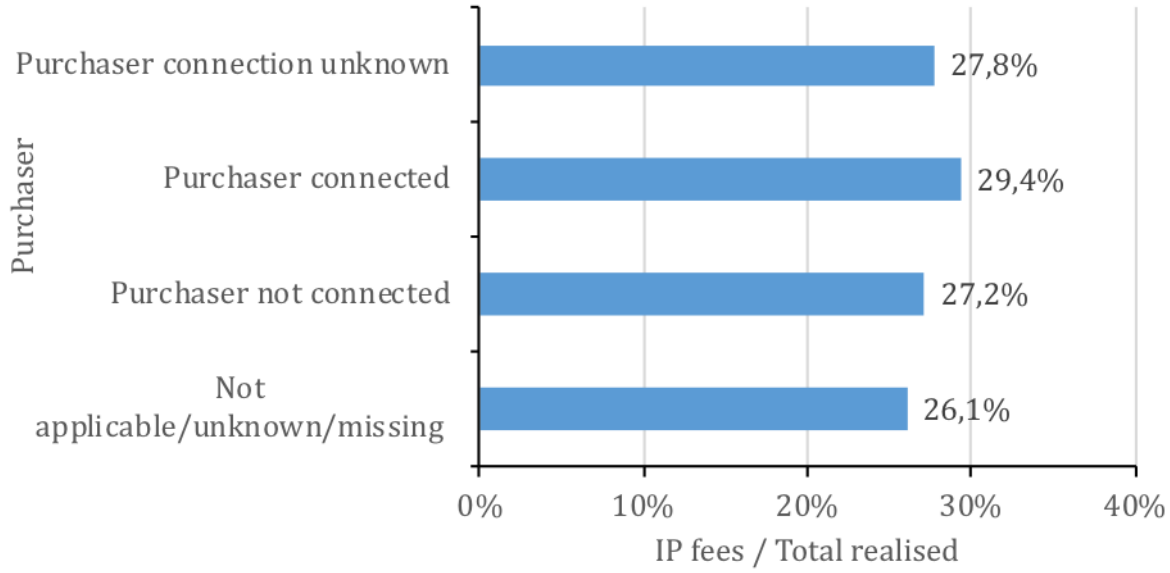

Figure 68. The relationship between IP fees as a percentage of total realised and whether a purchaser could be identified (and whether or not they were connected), derived from the fractional generalized linear model and controlling for a range of other variables

If the current purchaser/purchaser connected variable is replaced in the model with a more detailed variable also including deferred consideration, overall differences in IP fees as a percentage of total realised remain clearly non-significant.[152] Nonetheless, IP fees as a percentage of total realised by presence of a purchaser, whether or not they were connected and deferred consideration (positive, zero or missing) are set out in Figure 69.

[152] Jointly testing whether the new terms are equal to zero yields a clearly non-significant result; $\chi^2_9 = 8.10$, $p = 0.52$.

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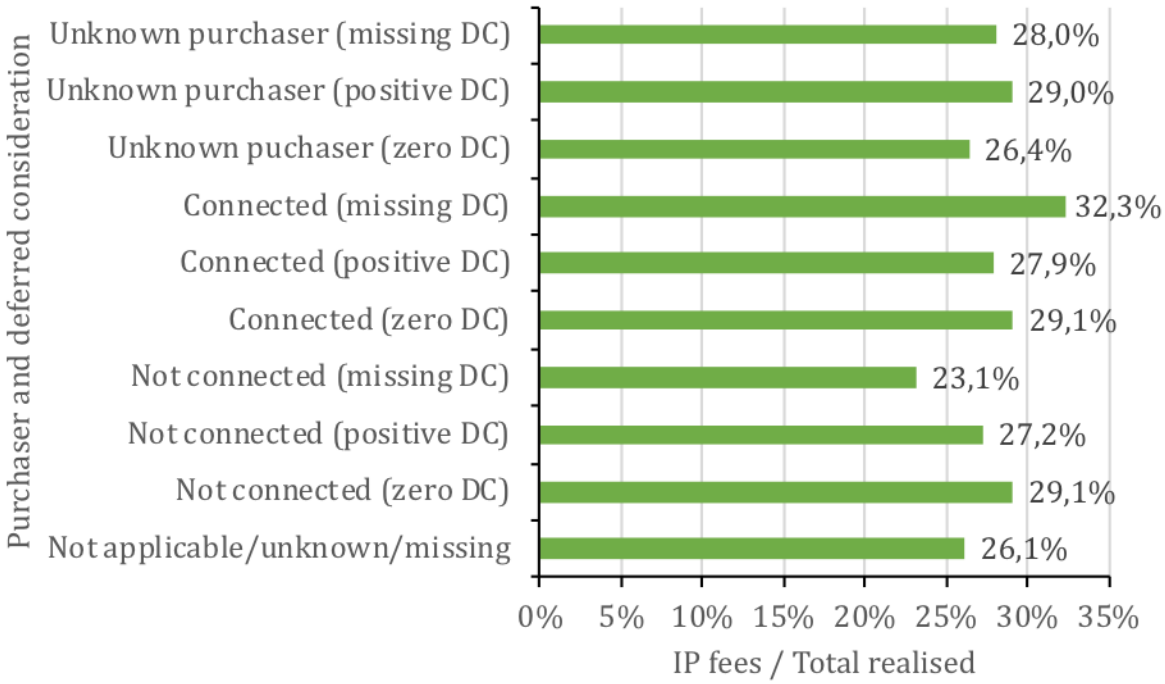

Figure 69. The relationship between IP fees as a percentage of total realised and whether a purchaser could be identified, whether or not they were connected and deferred consideration (positive, zero or missing), derived from the fractional generalized linear model and controlling for a range of other variables

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Statistical appendix

To model proportions (in this case, IP fees as a proportion of total realised), again fractional generalized linear models were used. These were implemented using William's (2017) fracglm programme in Stata 13. This programme fills gaps left by other Stata commands where responses must be binary. Papke and Wooldridge (1996) also provide a widely cited paper on some of the key issues associated with fractional responses and appropriate models. In our case, we fit fractional logit models and model coefficients can be interpreted in much the same way as logistic regression. To further ease interpretation, figures of predicted proportions were calculated and used to produce figures using the 'margins' post estimation command in Stata 13. These figures allow assessment of the relationship between the dependent variable (IP fees divided by total realised) and independent variables, while controlling for other independent variables. Table 9 shows fractional generalized linear model output, using a logit link, modelling the proportion of total realised made up by IP fees, on the basis of a range of variables.

Table 9. Fractional generalized linear (logit) model of IP fees as a proportion of total realised.

Variable	Level	Est.	Robust SE	z	p
Procedure	Pre-pack	0.000	-		
	Going concern sale admin	-0.204	0.172	-1.190	0.235
	Piecemeal sale admin	-0.196	0.131	-1.490	0.135
	Piecemeal sale receivership	-1.285	0.783	-1.640	0.101
	Going concern sale receivership	0.861	0.142	6.060	0.000
Total debt	Less than £500k	0.000	-		
	£500k - £1m	-0.111	0.143	-0.780	0.437
	£1m-<£3m	-0.670	0.138	-4.850	0.000
	£3m-<£5m	-0.835	0.306	-2.730	0.006
	£5m+	-0.863	0.213	-4.050	0.000
	Unknown	0.207	0.387	0.530	0.593
Procedure X Total debt	Going concern sale admin X £500k - £1m	-0.161	0.264	-0.610	0.542

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	Going concern sale admin X £1m-<£3m	0.545	0.247	2.200	0.028
	Going concern sale admin X £3m-<£5m	0.637	0.412	1.550	0.122
	Going concern sale admin X £5m+	0.214	0.299	0.720	0.474
	Going concern sale admin X Unknown	-0.022	0.533	-0.040	0.967
	Piecemeal sale admin X £500k - £1m	0.005	0.207	0.020	0.980
	Piecemeal sale admin X £1m-<£3m	0.394	0.191	2.070	0.039
	Piecemeal sale admin X £3m-<£5m	0.864	0.356	2.420	0.015
	Piecemeal sale admin X £5m+	0.429	0.266	1.610	0.107
	Piecemeal sale admin X Unknown	-0.214	0.434	-0.490	0.623
	Piecemeal sale receivership X £500k - £1m	-0.139	0.995	-0.140	0.889
	Piecemeal sale receivership X £1m-<£3m	1.330	0.900	1.480	0.139
	Piecemeal sale receivership X £3m-<£5m	2.076	1.017	2.040	0.041
	Piecemeal sale receivership X £5m+	-0.255	0.932	-0.270	0.784
	Piecemeal sale receivership X Unknown	0.604	0.929	0.650	0.516
	Going concern sale receivership X £500k - £1m	-1.271	0.475	-2.670	0.008
	Going concern sale receivership X £1m-<£3m	0.083	0.592	0.140	0.889
	Going concern sale receivership X £3m-<£5m	-0.261	0.368	-0.710	0.479
	Going concern sale receivership X £5m+	-0.234	0.489	0.632	-0.480
	Going concern sale receivership X Unknown	-3.138	0.716	-4.380	0.000
Over/under-secured	Oversecured	0.000	-		
	Undersecured	-0.381	0.074	-5.140	0.000
	Missing	-0.419	0.131	-3.190	0.001

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SIC Sector	C - Manufacturing	0.000	-		
	F - Construction	-0.096	0.111	-0.860	0.387
	G - Wholesale and retail trade; repair of motor vehicles	0.029	0.115	0.250	0.802
	I - Accommodation and food service activities	-0.310	0.165	-1.880	0.060
	J - Information and communication	0.189	0.166	1.140	0.256
	K - Financial and insurance services	0.424	0.199	2.130	0.033
	L - Real estate activities	-0.996	0.213	-4.670	0.000
	M - Professional, scientific and technical activities	-0.111	0.147	-0.760	0.449
	N - Administrative and support service activities	-0.172	0.129	-1.330	0.183
	Other Section	-0.079	0.121	-0.660	0.511
	Unknown	-0.070	0.185	-0.380	0.705
Region (NUTS1)	London - UKI	0.000	-		
	South East - UKJ	0.030	0.118	0.250	0.801
	South West - UKK	0.037	0.155	0.240	0.812
	East - UKH	0.163	0.162	1.000	0.315
	West Midlands - UKG	-0.276	0.128	-2.160	0.031
	East Midlands - UKF	-0.196	0.172	-1.140	0.255
	Yorkshire & Humberside - UKE	-0.022	0.113	-0.190	0.848
	North West - UKD	-0.158	0.101	-1.560	0.119
	North East - UKC	-0.254	0.214	-1.190	0.235
	Scotland - UKM	-0.422	0.162	-2.600	0.009
	Wales - UKL	-0.485	0.414	-1.170	0.241

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	Northern Ireland - UKN	-0.459	0.226	-2.030	0.042
	Unknown	-1.179	0.668	-1.760	0.078
IP Firm	Other	0.000	-		
	Top 4	-0.230	0.113	-2.040	0.041
	Second tier (5-13)	-0.240	0.088	-2.720	0.007
	Unknown	0.480	0.453	1.060	0.289
Purchaser	Not applicable/unknown/missing	0.000	-		
	Purchaser not connected	0.060	0.095	0.630	0.528
	Purchaser connected	0.174	0.097	1.790	0.073
	Purchaser connection unknown	0.090	0.100	0.900	0.367
Constant		-0.264	0.146	-1.810	0.071

Variable	Level	Est.	Robust SE	z	p
Procedure	Pre-pack	0.000	-		
	Going concern sale admin	-0.201	0.172	-1.170	0.241
	Piecemeal sale admin	-0.200	0.131	-1.530	0.126
	Piecemeal sale receivership	-1.660	0.787	-2.110	0.035
	Going concern sale receivership	0.176	0.504	0.350	0.727
Total debt	Less than £500k	0.000	-		
	£500k - £1m	-0.113	0.143	-0.790	0.428

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	£1m-<£3m	-0.667	0.138	-4.830	0.000
	£3m-<£5m	-0.828	0.306	-2.700	0.007
	£5m+	-0.857	0.214	-4.020	0.000
	Unknown	0.224	0.387	0.580	0.564
Procedure X Total debt	Going concern sale admin X £500k - £1m	-0.159	0.264	-0.600	0.547
	Going concern sale admin X £1m-<£3m	0.543	0.248	2.190	0.028
	Going concern sale admin X £3m-<£5m	0.632	0.412	1.530	0.125
	Going concern sale admin X £5m+	0.216	0.300	0.720	0.472
	Going concern sale admin X Unknown	-0.018	0.533	-0.030	0.973
	Piecemeal sale admin X £500k - £1m	0.017	0.207	0.080	0.936
	Piecemeal sale admin X £1m-<£3m	0.401	0.191	2.100	0.035
	Piecemeal sale admin X £3m-<£5m	0.866	0.357	2.430	0.015
	Piecemeal sale admin X £5m+	0.438	0.267	1.640	0.101
	Piecemeal sale admin X Unknown	-0.160	0.432	-0.370	0.712
	Piecemeal sale receivership X £500k - £1m	1.073	0.940	1.140	0.254
	Piecemeal sale receivership X £1m-<£3m	1.962	0.902	2.170	0.030
	Piecemeal sale receivership X £3m-<£5m	0.867	0.930	0.930	0.351
	Piecemeal sale receivership X £5m+	0.024	1.059	0.020	0.982
	Piecemeal sale receivership X Unknown	0.985	0.934	1.060	0.291
	Going concern sale receivership X £500k - £1m	-1.113	0.790	-1.410	0.159
	Going concern sale receivership X £1m-<£3m	1.151	0.727	1.580	0.113
	Going concern sale receivership X £3m-<£5m	0.561	0.870	0.640	0.519

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	Going concern sale receivership X £5m+	0.386	0.758	0.510	0.610
	Going concern sale receivership X Unknown	-2.447	0.858	-2.850	0.004
Over/under-secured	Oversecured	0.000	-		
	Undersecured	-0.379	0.074	-5.130	0.000
	Missing	-0.434	0.132	-3.280	0.001
SIC Sector	C - Manufacturing	0.000	-		
	F - Construction	-0.091	0.111	-0.820	0.413
	G - Wholesale and retail trade; repair of motor vehicles	0.032	0.115	0.280	0.782
	I - Accommodation and food service activities	-0.310	0.165	-1.880	0.061
	J - Information and communication	0.184	0.166	1.110	0.268
	K - Financial and insurance services	0.426	0.199	2.140	0.033
	L - Real estate activities	-0.988	0.213	-4.630	0.000
	M - Professional, scientific and technical activities	-0.108	0.146	-0.740	0.459
	N - Administrative and support service activities	-0.162	0.129	-1.260	0.209
	Other Section	-0.079	0.121	-0.650	0.514
	Unknown	-0.064	0.184	-0.350	0.726
Region (NUTS1)	London - UKI	0.000	-		
	South East - UKJ	0.029	0.118	0.250	0.805
	South West - UKK	0.057	0.154	0.370	0.711
	East - UKH	0.163	0.162	1.010	0.314
	West Midlands - UKG	-0.274	0.127	-2.160	0.031
	East Midlands - UKF	-0.206	0.173	-1.190	0.234

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	Yorkshire & Humberside - UKE	-0.003	0.112	-0.020	0.981
	North West - UKD	-0.161	0.101	-1.590	0.112
	North East - UKC	-0.252	0.214	-1.180	0.240
	Scotland - UKM	-0.424	0.162	-2.630	0.009
	Wales - UKL	-0.480	0.414	-1.160	0.247
	Northern Ireland - UKN	-0.458	0.226	-2.030	0.043
	Unknown	-1.173	0.669	-1.750	0.080
IP Firm	Other	0.000	-		
	Top 4	-0.242	0.113	-2.150	0.032
	Second tier (5-13)	-0.255	0.088	-2.880	0.004
	Unknown	0.479	0.448	1.070	0.285
Purchaser	Not applicable/unknown/missing	0.000	-		
	Purchaser not connected	0.062	0.094	0.660	0.512
	Purchaser connected	0.185	0.097	1.910	0.056
	Purchaser connection unknown	0.092	0.100	0.920	0.357
Constant		-0.272	0.146	-1.870	0.061

1,941 cases included in the model, Log pseudolikelihood = -1079.0, Pseudo R^2 = 0.048.

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3.2.6 Modelling total returns as a function of total debt

Total returns as a proportion of total debt could be calculated for 1,978 cases. Proportions varied from zero to one, with a mean proportion of 0.13 (i.e. on average, total returns made up 13 per cent of total debt). 775 of the 1,978 (39.2 per cent) has values of zero, with a positive total debt value, but no returns. This section models total returns as a proportion of total costs on the basis of a range of variables. Accounting for the excess of zeros required a slightly more complex statistical approach that the fractional generalized linear model used elsewhere (e.g. when modelling costs as a function of total realised). The main statistical technique implemented was a zero or one inflated beta regression model. Additional details on the modelling approach and statistical output can be found in the statistical appendix, though this section summarises statistical model output in lay terms.

Independent variables included in the main statistical model were procedure (excluding a small number of successful restructuring administrations), total debt (grouped), [153], percentage of debt which was secured (grouped), SIC sector, region (NUTS1 classification), IP firm and presence of a purchaser and whether or not they were connected.

Procedure

There were statistically significant differences in total returns as a proportion of total debt between different types of procedure.[154] There were significant differences between different types of procedure in the probability of having zero returns,[155] with in particular, a higher probability of zero returns for piecemeal sale receiverships.[156] Where there were positive values, there were also significant differences in total returns as a proportion of total debt between procedures.[157] Compared to pre-packs, both going concern sale administrations and piecemeal sale administrations had marginally, but not significantly higher proportions. Conversely, proportions for going concern sale receiverships were lower than pre-packs and significantly lower for piecemeal sale receiverships.[158] Differences in total returns as a proportion of total debt between different types of procedure are illustrated in Figure 70, with figures derived from the statistical model and controlling for other variables.[159] As can be seen, proportions/percentages were broadly comparable for pre-packs/administrations, with lower values for receiverships and particularly for piecemeal sale receiverships.

[153] The model would not fit with a procedure by total debt interaction included. For the main model (included in the statistical appendix), main effects only were included. However, the interaction was explored by collapsing receiverships into a single category (see below).
[154] Jointly testing the zero inflate and proportion terms for procedures; $\chi^2_8 = 27.24$, $p < 0.001$.
[155] Jointly testing the zero inflate terms for procedures; $\chi^2_4 = 12.54$, $p = 0.014$.
[156] Compared to pre-packs; odds ratio = 2.71, Z = 3.38, p = 0.001.
[157] Jointly testing the proportion terms for procedures; $\chi^2_4 = 14.70$, $p = 0.005$.
[158] Referring to the proportion term; odds ratio = 0.61, Z = -2.43, p = 0.015.
[159] As an aside, if no other variables were controlled for, with only procedure included in the model, percentages would be 13.4% for pre-packs, 16.2% for going concern sale administrations, 15.7% for piecemeal sale administrations, 8.7% for piecemeal sale receiverships and 9.6% for going concern sale receiverships.

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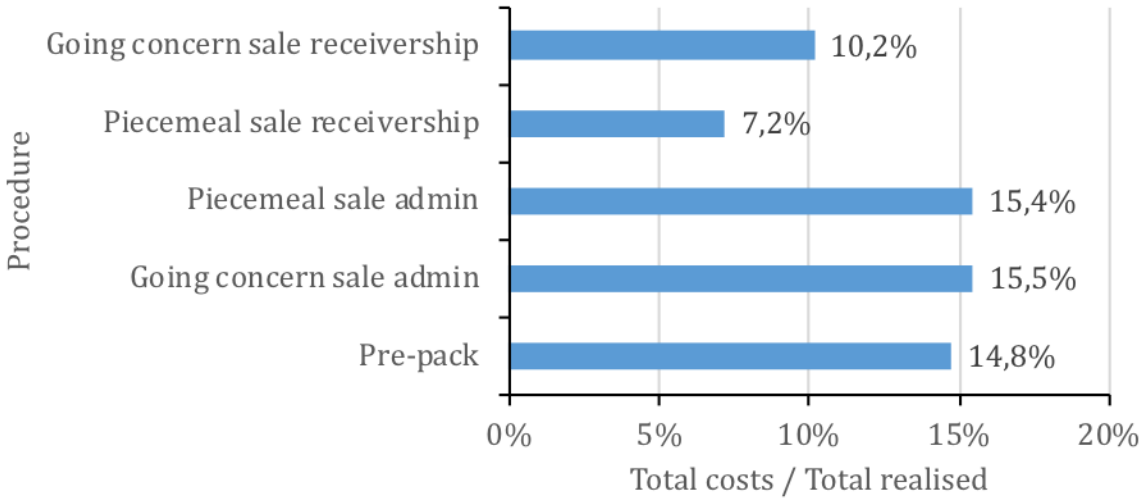

Figure 70. The relationship between total returns as a proportion of total debt and procedure, derived from the zero one inflated beta model and controlling for a range of other variables

Total debt

There were highly statistically significant differences in total returns as a proportion of total debt between different total debt groups.[160] Zero returns became increasingly less likely as total debt increased. Compared to cases with total debt 'less than £500,000', zero returns were significantly less likely for cases with debt from '£500,000 to less than £1,000,000,[161] '£1,000,000 to less than £3,000,000',[162] '£3,000,000 to less than £5,000,000'[163] and '£5,000,000 or more',[164] with the difference growing progressively larger. Interestingly, however, where there were positive values for total returns as a proportion of total debt, cases with 'less than £500,000' had the highest values, with statistically significantly lower values for '£1,000,000 to less than £3,000,000'[165] and particularly '£5,000,000 or more'.[166] Differences in total returns as a proportion of total debt between different total debt groups are shown in Figure 71 (considering the probability of zero returns and size of any positive total returns as a proportion of total debt), with figures derived from the statistical model and controlling for other variables.[167]

If total debt is removed from the model and replaced with company size (based on turnover, which was only available for 813 cases), percentage of total returns as a function of total debt (controlling for other variables) would be 14.7 per cent for micro, 16.0 per cent for small, 15.4 per cent for medium and 12.0 per cent for large.

---

[160] Jointly testing the zero inflate and proportion terms for procedures; $\chi^2_8 = 64.63$, $p < 0.001$.
[161] Referring to the zero inflate term; odds ratio = 0.72 Z = -2.15, p = 0.031.
[162] Referring to the zero inflate term; odds ratio = 0.55 Z = -4.35, p < 0.001.
[163] Referring to the zero inflate term; odds ratio = 0.45 Z = -3.65, p < 0.001.
[164] Referring to the zero inflate term; odds ratio = 0.39 Z = -5.24, p < 0.001.
[165] Referring to the proportion term; odds ratio = 0.83 Z = -2.02, p = 0.043.
[166] Referring to the proportion term; odds ratio = 0.59 Z = -4.90, p < 0.001.
[167] Note, that if no other variables were controlled for, with only total debt group included in the model, percentages would be 11.6% for 'up to £500,000', 14.8% for '£500,000 to less than £1,000,000', 15.7% for '£1,000,000 to less than £3,000,000' 17.8% for '£3,000,000 to less than £5,000,000' and 16.3% for '£5,000,000 or more'.

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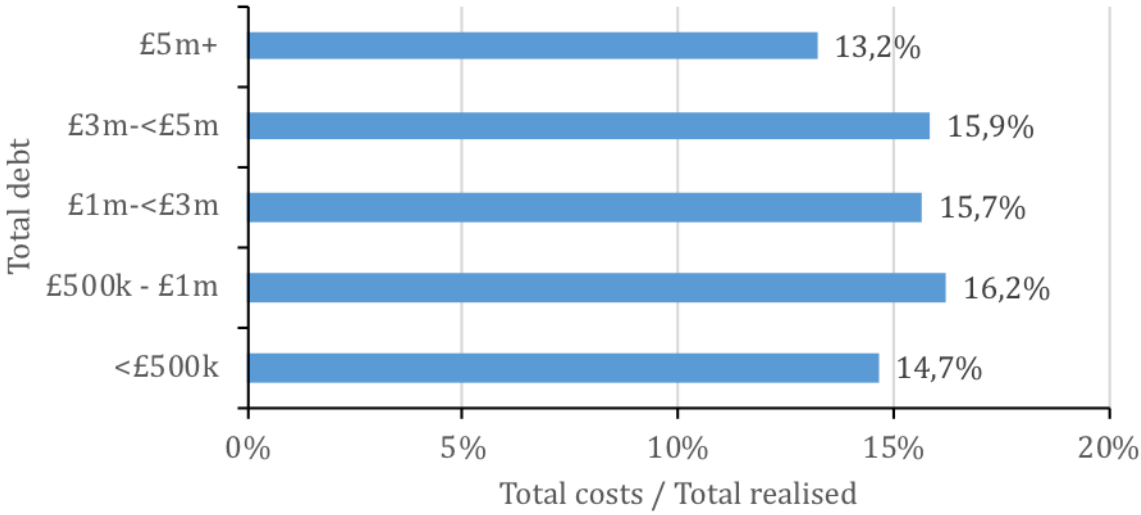

Figure 71. The relationship between total returns as a proportion of total debt and total debt group, derived from the zero one inflated beta model and controlling for a range of other variables

The interaction between procedure and total debt

The main statistical model (included in the statistical appendix for this section) did not include a procedure by total debt interaction. Without an interaction included in the model, the relationship between procedure, total debt and total returns as a proportion of total debt is as illustrated in Figure 72.

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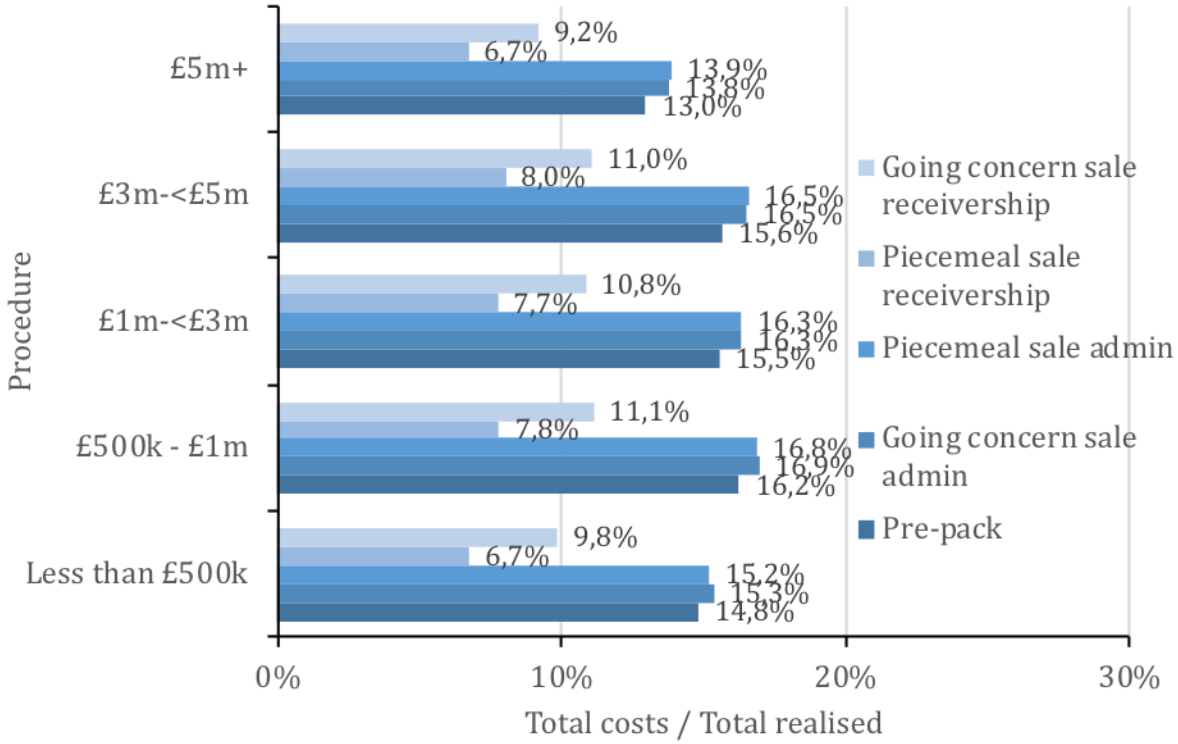

Figure 72. The relationship between total returns as a proportion of total debt, total debt group and procedure, derived from the zero one inflated beta model and controlling for a range of other variables

In order to fit an interaction term, receiverships had to be combined into a single category (due to their small numbers). Replacing procedure with this new four category version and including a procedure by dent group interaction resulted in Figure 73.

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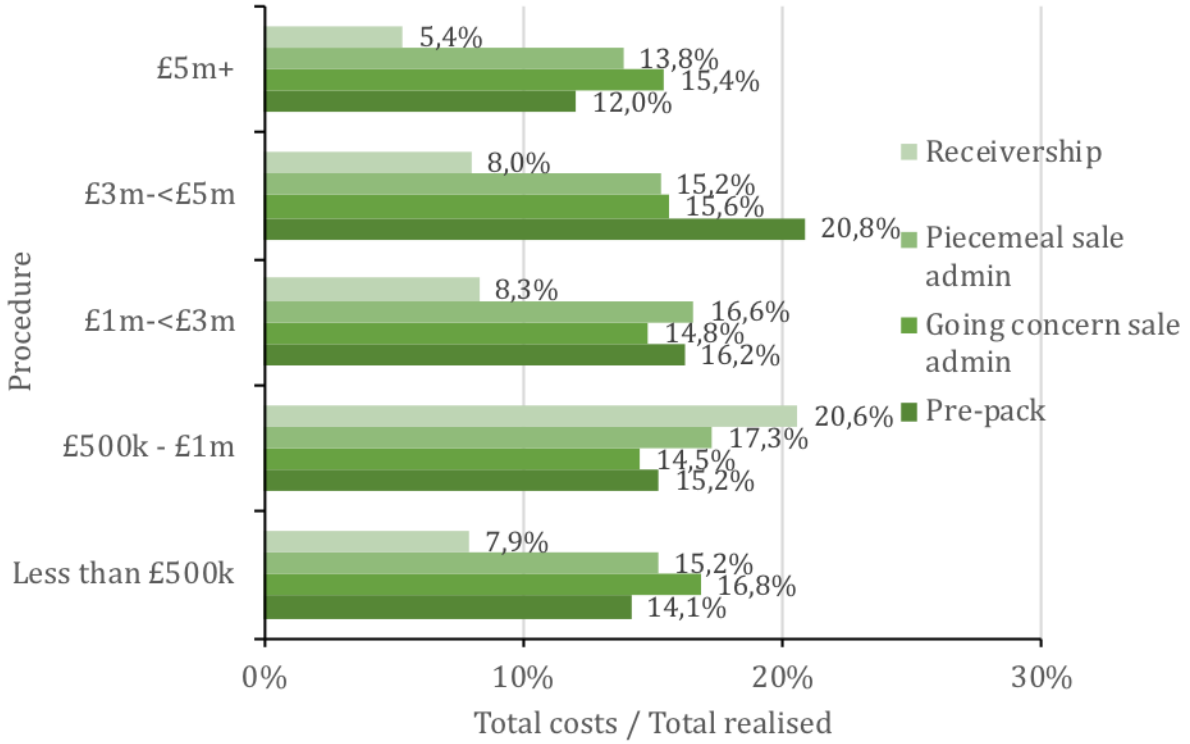

Figure 73. The relationship between total returns as a proportion of total debt, total debt group and procedure, derived from the zero one inflated beta model and controlling for a range of other variables (with a procedure by debt interaction term included and receiverships in a single category)

Testing the interaction terms together indicated that overall, they were not statistically significant.[168] In addition, the interaction between debt and procedure should be interpreted with some caution, especially when examining receiverships, since even when combined, their numbers were small (especially for individual total debt groups). It is important not to over interpret any apparent differences, since there was relatively little evidence of the relationship between total returns as a proportion of total debt and procedure varying significantly by total debt group.

Percentage of debt which was secured

There was a highly statistically significant relationship between total returns as a proportion of total debt and the percentage of debt which was secured.[169] Having more than 25 per cent secured debt made it far less likely that the case would have zero returns[170]. When not equal to zero, total returns as a proportion of total debt increases with the percentage of secured debt.[171]

[168] Jointly testing the zero inflate and proportion interaction terms; $\chi^2_{24} = 29.10$, $p = 0.21$.
[169] Jointly testing the 'percentage of secured debt' terms; $\chi^2_6 = 195.12$, $p < 0.001$.
[170] Referring to the 'zero-inflate' terms, compared to 'up to 25%'; '>25% - 50%', odds ratio = 0.35, Z = -7.69, $p < 0.001$, '>50% - 75%', odds ratio = 0.28, Z = -6.92, $p < 0.001$ and '>75% - 100%', odds ratio = 0.35, Z = -6.57, $p < 0.001$.
[171] Referring to the proportion terms, compared to 'up to 25%'; '>25% - 50%', odds ratio = 1.48, Z = 4.70, $p < 0.001$, '>50% - 75%', odds ratio = 1.84, Z = 6.22, $p < 0.001$ and '>75% - 100%', odds ratio = 2.27, Z = 8.98, $p < 0.001$.

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The overall relationship between total returns as a proportion of total debt and the percentage of debt which was secured is shown in Figure 74, with figures derived from the model and controlling for other variables.

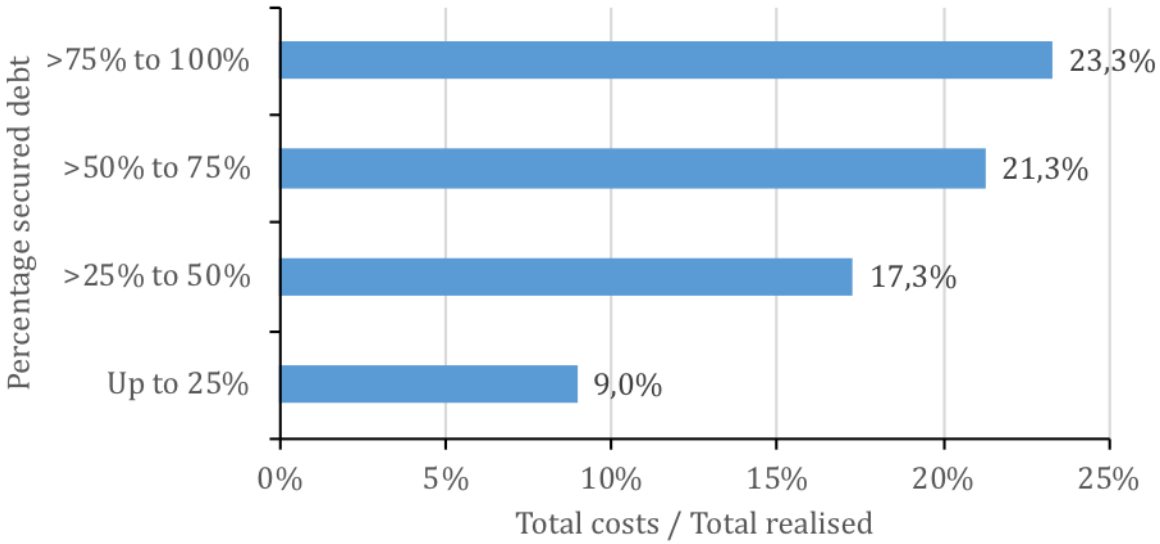

Figure 74. The relationship between total returns as a proportion of total debt and the percentage secured debt, derived from the zero one inflated beta model and controlling for a range of other variables

SIC sector

There were also highly statistically significant differences in total returns as a proportion of total debt between SIC sectors.[172] For example, compared to the 'manufacturing' model reference category, 'information and communications' and particularly 'financial and insurance services' cases were far more likely to have zero returns.[173] Where there were positive proportions, again compared to 'manufacturing', proportions were particularly high for 'real estate' cases.[174] These differences in total returns as a proportion of total debt between sectors are illustrated in Figure 75, with figures derived from the statistical model and controlling for other variables.

[172] Testing the SIC sector terms (zero-inflate and proportion) together'; $\chi^2_{20} = 75.92$, $p < 0.001$.
[173] Examining the zero-inflate terms; odds ratio = 1.78, Z = 2.10, p = 0.036 and odds ratio = 4.97, Z = 5.15, $p < 0.001$ respectively.
[174] Referring to the proportion terms; odds ratio = 2.02 Z = 4.82, $p < 0.001$.

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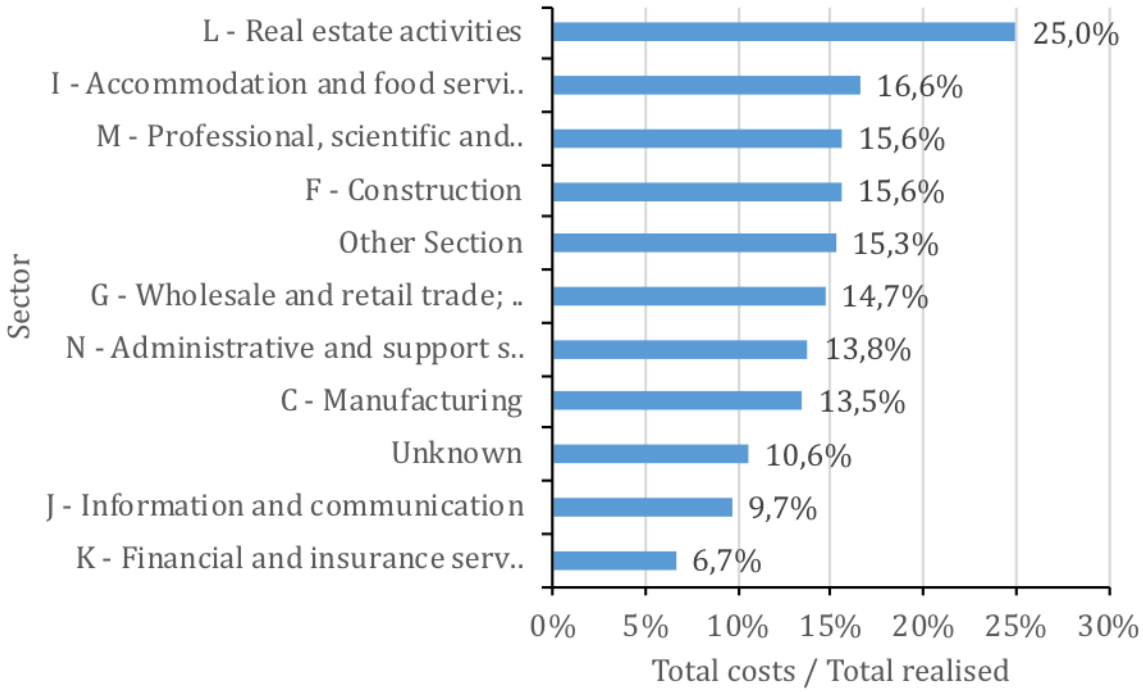

Figure 75. The relationship between total returns as a proportion of total debt and sector, derived from the zero one inflated beta model and controlling for a range of other variables

Region

There was evidence of highly statistically significant differences in total returns as a proportion of total debt between different regions.[175] Compared to London (the reference category in the statistical mode), cases in the North West[176] and Scotland[177] in particular were less likely to have zero returns. Where there were positive proportions, again compared to London, there were significantly higher proportions for the North West[178] and West Midlands.[179] The net effect, considering both the probability of zero returns and size of any positive total returns as a proportion of total debt, is shown in Figure 76, controlling for other variables included in the model. As shown, total returns as a proportion of total debt were highest in the North West and West Midlands, both of which were less likely than other regions to have zero returns and likely to have a higher proportion where returns were positive.

[175] Testing the proportion and zero-inflated NUTS1 region terms together'; $\chi^2_{23} = 54.03$, $p < 0.001$.
[176] Referring to the zero-inflate term; odds ratio = 0.59, Z = -3.38, $p < 0.001$.
[177] Referring to the zero-inflate term; odds ratio = 0.42, Z = -3.08, $p = 0.002$.
[178] Referring to the proportion term; odds ratio = 1.39, Z = 3.37, $p = 0.001$.
[179] Referring to the proportion term; odds ratio = 1.52, Z = 3.34, $p = 0.001$.

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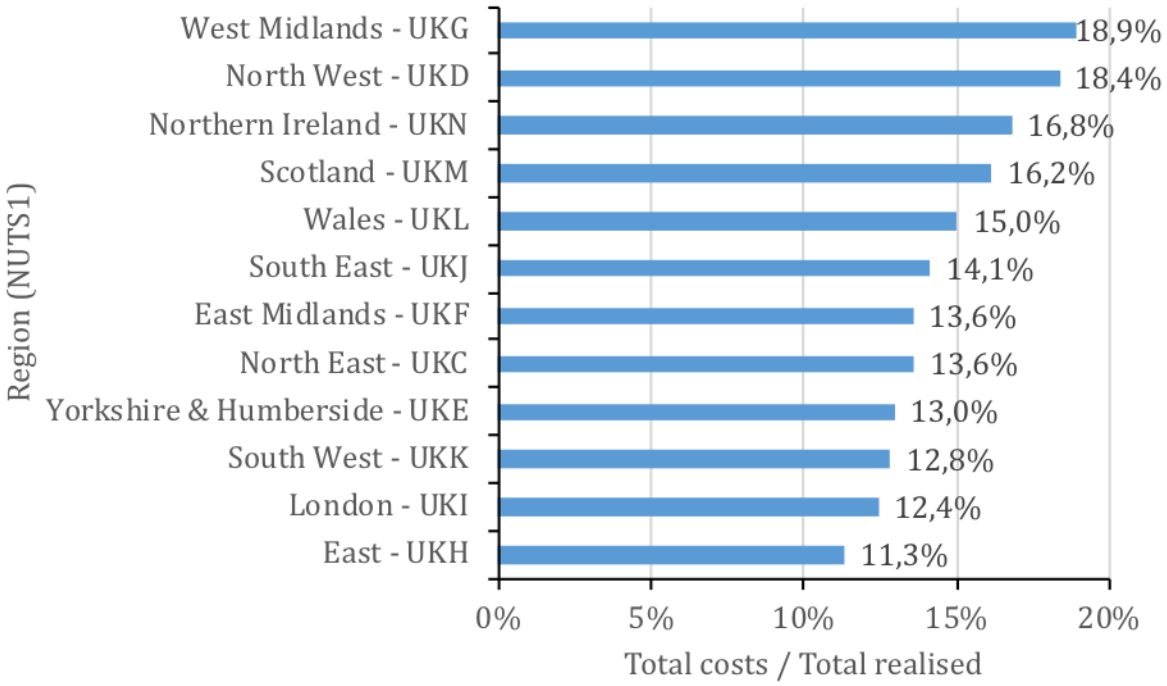

Figure 76. The relationship between total returns as a proportion of total debt and region, derived from the zero one inflated beta model and controlling for a range of other variables

IP firm

Overall differences in total returns as a proportion of total debt between categories of IP firm were not statistically significant,[180] with modest differences in both the probability of zero returns[181] and the proportion for positive returns.[182] Total returns as a proportion of total debt between categories of IP firm are shown in Figure 77,[183] with figures derived from the statistical model and controlling for other variables. As shown the proportion/percentage of total returns as a function of total debt were broadly comparable between groups of IP firm. was somewhat higher for top 4 firms, with this a result of a decreased probability of zero returns compared to other groups rather than higher positive proportions. Interestingly, if other variables are not controlled for, differences by IP firm group are statistically significant, with zero returns less common for second tier and particularly top 4 firms when compared to 'other' firms. This highlights the importance of controlling for other variables.[184]

[180] Jointly testing the proportion and zero-inflated IP firm terms; $\chi^2_6 = 6.45$, $p = 0.37$.
[181] Jointly testing the zero-inflated terms; $\chi^2_3 = 3.72$, $p = 0.29$.
[182] Jointly testing the proportion terms; $\chi^2_3 = 2.73$, $p = 0.43$.
[183] A small number of unknown IP firms (n = 8) were included in the model, but excluded from the figure to ease interpretation.
[184] If only IP firm group is included in the model, percentages in Figure 77 would be 17.7% for top 4, 16.0% for second tier and 13.8% for other IP firms.

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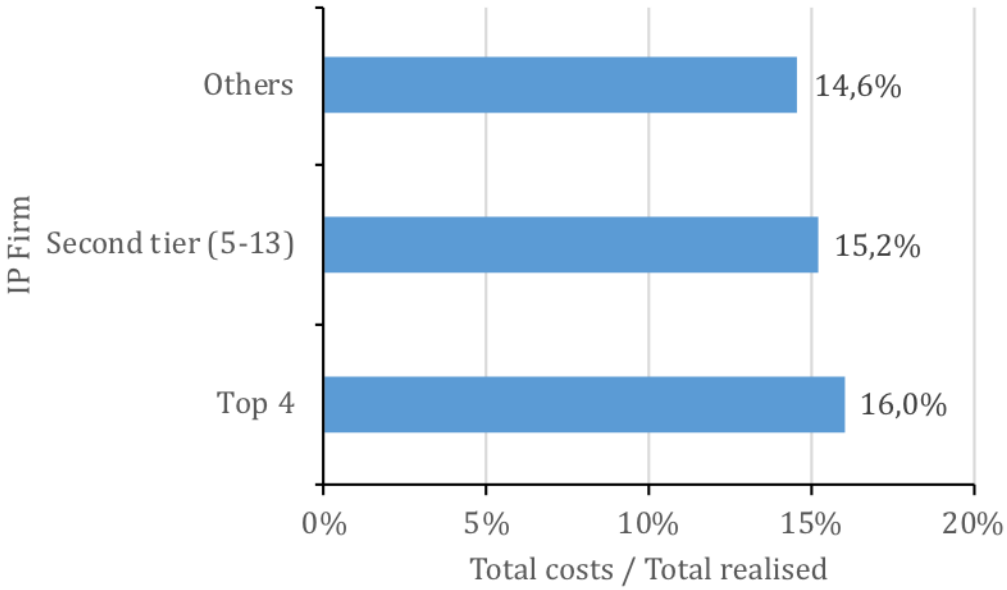

Figure 77. The relationship between total returns as a proportion of total debt and IP firm, derived from the zero one inflated beta model and controlling for a range of other variables

Presence of a purchaser and whether they were connected

There were statistically significant differences in total returns as a proportion of total debt by presence of a purchaser and whether or not the purchaser was connected.[185] Compared to the 'not applicable/unknown/missing' group, zero returns were somewhat less likely for both 'purchaser not connected'[186] and 'purchaser connected' groups.[187] However, where total returns as a proportion of total debt were positive only the 'purchaser not connected group' had higher proportions.[188] The net effect, considering both the probability of zero returns and size of any positive total returns was a higher percentage for 'purchaser not connected' cases compared to other groups (as shown in Figure 78, controlling for other variables included in the model).

[185] Testing the proportion and zero-inflated purchaser/purchaser connected terms together'; χ^2_6 = 19.65, p = 0.003.
[186] Referring to the zero-inflate term; odds ratio = 0.74, Z = -1.92, p = 0.054 (marginally short of statistical significance).
[187] Referring to the zero-inflate term; odds ratio = 0.73, Z = -1.92, p = 0.055 (again marginally short of statistical significance).
[188] Significantly higher than the 'not applicable/unknown/missing' group. Referring to the proportion term; odds ratio = 1.29, Z = 2.86, p = 0.004.

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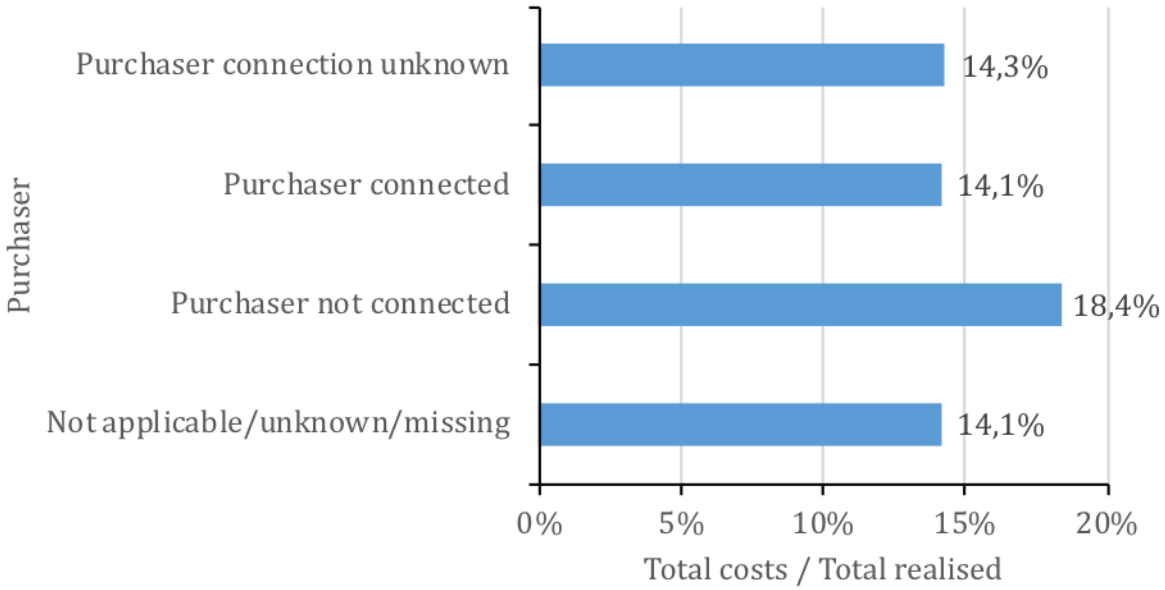

Figure 78. The relationship between total returns as a proportion of total debt and whether a purchaser could be identified (and whether or not they were connected), derived from the zero one inflated beta model and controlling for a range of other variables

If the current purchaser/purchaser connected variable is replaced in the model with a more detailed variable also including deferred consideration, some differences remain,[189] with these illustrated in Figure 79. In particular, a higher proportion (where there was a positive return) for 'purchaser not connected, zero deferred consideration' resulted in the higher percentage illustrated in Figure 79.

[189] Jointly testing whether the new terms are equal to zero; $\chi^2_{18} = 29.40$, $p = 0.044$.

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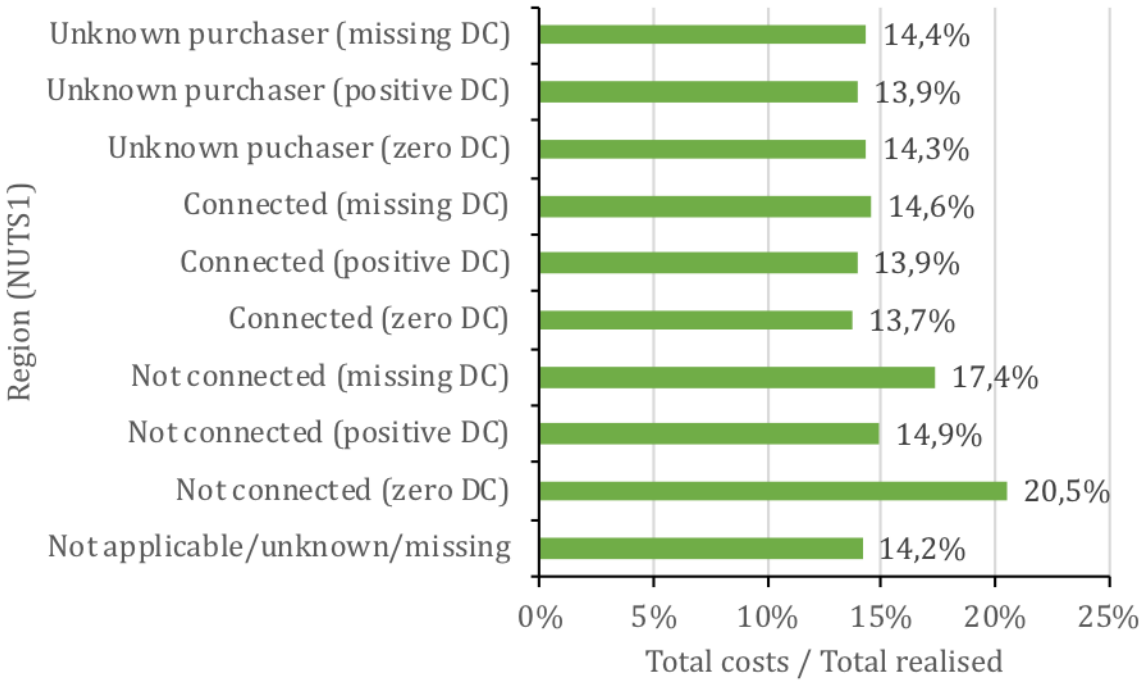

Figure 79. The relationship between total returns as a proportion of total debt and whether a purchaser could be identified, whether or not they were connected and deferred consideration (positive, zero or missing), derived from the zero one inflated beta model and controlling for a range of other variables

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Statistical appendix

To model proportions with excess zeros, (in this case, modelling total returns as a function of total debt) zero one inflated beta models were used (Ospina and Ferrari, 2012). These were implemented using Buis's (2010) zoib programme in Stata 13. The model is a mixture model consists of three parts that run simultaneously; first, a logistic regression model for whether or not the proportion equals zero (zero inflate below), second, a logistic regression model for whether or not the proportion equals one (one inflate below) and third, a beta model for the proportions between zero and one (proportion) below). The model is useful where your zero values (with no returns but some debt) may be functionally different from positive proportions (i.e. governed by different processes). Each of the three parts/models can have their own set of predictors, but in our case, the zero-inflated and proportion parts have identical sets. The different parts can also yield distinct useful information. For example, we might find higher returns as a function of total realised for pre-packs compared to going concern sale administration. The zero one inflated beta model allows assessment of how much of the overall difference might be due to pre-packs being more likely to have non-zero values, and how much might be a result of higher positive proportions (where the proportion is greater than zero). To further ease interpretation, figures of predicted proportions were calculated and used to produce figures using the 'margins' post estimation command in Stata 13 to yield estimates for levels of a given independent variable while controlling for other independent variables Table 10 shows zero one inflated betamodel output, modelling total returns as a function of total debt, on the basis of a range of variables.

Table 10. Zero or one inflated beta model of total returns as a proportion of total debt.

Variable	Level	Est.	Robust SE	z	p
Proportion					
Procedure	Pre-pack	0.000	-		
	Going concern sale admin	0.105	0.096	1.090	0.276
	Piecemeal sale admin	0.138	0.085	1.620	0.106
	Piecemeal sale receivership	-0.497	0.205	-2.430	0.015
	Going concern sale receivership	-0.283	0.244	-1.160	0.247
Total debt	Less than £500k	0.000	-		

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	£500k - £1m	-0.015	0.102	-0.150	0.882
	£1m-<£3m	-0.183	0.091	-2.020	0.043
	£3m-<£5m	-0.240	0.134	-1.790	0.073
	£5m+	-0.525	0.107	-4.900	0.000
% Secured debt	Up to 25%	0.000	-		
	>25% to 50%	0.390	0.083	4.700	0.000
	>50% to 75%	0.608	0.098	6.220	0.000
	>75% to 100%	0.819	0.091	8.980	0.000
	Missing	1.815	0.567	3.200	0.001
SIC Sector	C - Manufacturing	0.000	-		
	F - Construction	0.237	0.110	2.160	0.031
	G - Wholesale and retail trade; repair of motor vehicles	0.159	0.111	1.430	0.152
	I - Accommodation and food service activities	0.356	0.155	2.290	0.022
	J - Information and communication	-0.196	0.196	-1.000	0.319
	K - Financial and insurance services	-0.073	0.256	-0.290	0.775
	L - Real estate activities	0.705	0.146	4.820	0.000
	M - Professional, scientific and technical activities	0.354	0.147	2.400	0.016
	N - Administrative and support service activities	0.106	0.123	0.860	0.388
	Other Section	0.228	0.116	1.970	0.049
	Unknown	0.004	0.210	0.020	0.984
Region (NUTS1)	London - UKI	0.000	-		
	South East - UKJ	0.082	0.127	0.640	0.520

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	South West - UKK	0.032	0.175	0.180	0.854
	East - UKH	-0.181	0.182	-0.990	0.320
	West Midlands - UKG	0.417	0.125	3.340	0.001
	East Midlands - UKF	-0.080	0.169	-0.480	0.635
	Yorkshire & Humberside - UKE	0.020	0.114	0.180	0.861
	North West - UKD	0.328	0.097	3.370	0.001
	North East - UKC	0.017	0.224	0.080	0.939
	Scotland - UKM	0.031	0.133	0.230	0.817
	Wales - UKL	0.539	0.414	1.300	0.193
	Northern Ireland - UKN	0.221	0.179	1.240	0.215
	Unknown	0.744	0.784	0.950	0.342
IP Firm	Other	0.000	-		
	Top 4	-0.004	0.099	-0.040	0.968
	Second tier (5-13)	0.060	0.084	0.710	0.476
	Unknown	-0.803	0.554	-1.450	0.147
Purchaser	Not applicable/unknown/missing	0.000	-		
	Purchaser not connected	0.256	0.090	2.860	0.004
	Purchaser connected	-0.122	0.099	-1.230	0.219
	Purchaser connection unknown	-0.029	0.104	-0.280	0.777
Constant		-1.799	0.148	-12.140	0.000
One inflate					
Constant		-5.699	0.501	-11.380	0.000

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Zero inflate					
Procedure	Pre-pack	0.000	-		
	Going concern sale admin	0.103	0.161	0.640	0.520
	Piecemeal sale admin	0.188	0.142	1.330	0.183
	Piecemeal sale receivership	0.997	0.295	3.380	0.001
	Going concern sale receivership	0.531	0.376	1.410	0.158
Total debt	Less than £500k	0.000	-		
	£500k - £1m	-0.323	0.150	-2.150	0.031
	£1m-<£3m	-0.603	0.139	-4.350	0.000
	£3m-<£5m	-0.807	0.221	-3.650	0.000
	£5m+	-0.947	0.181	-5.240	0.000
% Secured debt	Up to 25%	0.000	-		
	>25% to 50%	-1.051	0.137	-7.690	0.000
	>50% to 75%	-1.268	0.183	-6.920	0.000
	>75% to 100%	-1.051	0.160	-6.570	0.000
	Missing	1.815	0.567	3.200	0.001
SIC Sector	C - Manufacturing	0.000	-		
	F - Construction	0.105	0.182	0.580	0.563
	G - Wholesale and retail trade; repair of motor vehicles	0.112	0.185	0.610	0.545
	I - Accommodation and food service activities	0.179	0.269	0.670	0.505
	J - Information and communication	0.575	0.274	2.100	0.036
	K - Financial and insurance services	1.603	0.311	5.150	0.000

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	L - Real estate activities	-0.521	0.329	-1.590	0.113
	M - Professional, scientific and technical activities	0.363	0.229	1.580	0.113
	N - Administrative and support service activities	0.197	0.202	0.980	0.329
	Other Section	0.155	0.192	0.810	0.421
	Unknown	0.741	0.289	2.560	0.010
Region (NUTS1)	London - UKI	0.000	-		
	South East - UKJ	-0.215	0.190	-1.140	0.256
	South West - UKK	-0.027	0.250	-0.110	0.915
	East - UKH	-0.133	0.263	-0.500	0.614
	West Midlands - UKG	-0.406	0.210	-1.930	0.053
	East Midlands - UKF	-0.491	0.275	-1.790	0.074
	Yorkshire & Humberside - UKE	-0.084	0.175	-0.480	0.631
	North West - UKD	-0.537	0.159	-3.380	0.001
	North East - UKC	-0.246	0.349	-0.710	0.481
	Scotland - UKM	-0.877	0.285	-3.080	0.002
	Wales - UKL	0.469	0.629	0.750	0.456
	Northern Ireland - UKN	-0.465	0.332	-1.400	0.162
	Unknown	-19.940			
IP Firm	Other	0.000	-		
	Top 4	-0.332	0.194	-1.710	0.088
	Second tier (5-13)	0.016	0.139	0.120	0.908
	Unknown	0.536	0.817	0.660	0.512

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Purchaser	Not applicable/unknown/missing	0.000	-		
	Purchaser not connected	-0.302	0.157	-1.920	0.054
	Purchaser connected	-0.311	0.162	-1.920	0.055
	Purchaser connection unknown	-0.104	0.170	-0.620	0.538
Constant		0.579	0.227	2.550	0.011
ln Phi					
Constant		0.919	0.040	22.880	0.000

1,966 cases included in the model, Log pseudolikelihood = -345.74

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3.2.7 Modelling secured returns as a function of secured debt

Secured returns as a proportion of secured debt could be calculated for 1,508 cases. These are cases with positive secured debt and secured returns greater than or equal to zero. Proportions varied from zero to one, with a mean proportion of 0.36 (i.e. on average, secured returns made up 36 per cent of secured debt). This section models secured returns as a proportion of secured debt on the basis of a range of predictor variables. Modelling uses a fractional generalized linear model, as was used when modelling total costs as a function of total realised. Further detail, along with statistical output, can be found in the statistical appendix. This section summarises findings from the statistical model in non-technical terms.

Independent variables included in the main statistical model were procedure (excluding a small number of successful restructuring administrations), total debt (grouped), the interaction between procedure and total debt (grouped), percentage of debt which was secured (grouped), SIC sector, region (NUTS1 classification), IP firm and presence of a purchaser and whether or not they were connected.

Procedure

There were significant differences in secured returns as a percentage of secured debt between different procedures.[190] While proportions were broadly comparable between pre-packs, piecemeal sale administrations and going concern sale administrations, they were lower for going concern sale receiverships and particularly piecemeal sale receiverships. Figure 80 shows secured returns as a percentage of secured debt by procedure, controlling for other variables, including the interaction between procedure and total debt. The interaction between procedure and total debt is discussed in further detail below.[191]

[190] There were a number of significant debt by procedure interaction terms (discussed below), though if the interaction is removed, jointly testing the procedure terms; $\chi^2_4 = 14.49$, $p = 0.006$.

[191] Note, if the procedure by total debt interaction term is removed from the model, percentages in Figure 80 would be 27.4 per cent for going concern receiverships, 18.6 per cent for piecemeal sale receiverships, 35.6 per cent for piecemeal sale administrations, 36.8 per cent for going concern sale administrations and 39.6 per cent for pre-packs. Raw figures (not controlling for other variables) are 25.5 per cent for going concern receiverships, 15.8 per cent for piecemeal sale receiverships, 34.2 per cent for piecemeal sale administrations, 36.6 per cent for going concern sale administrations and 43.2 per cent for pre-packs.

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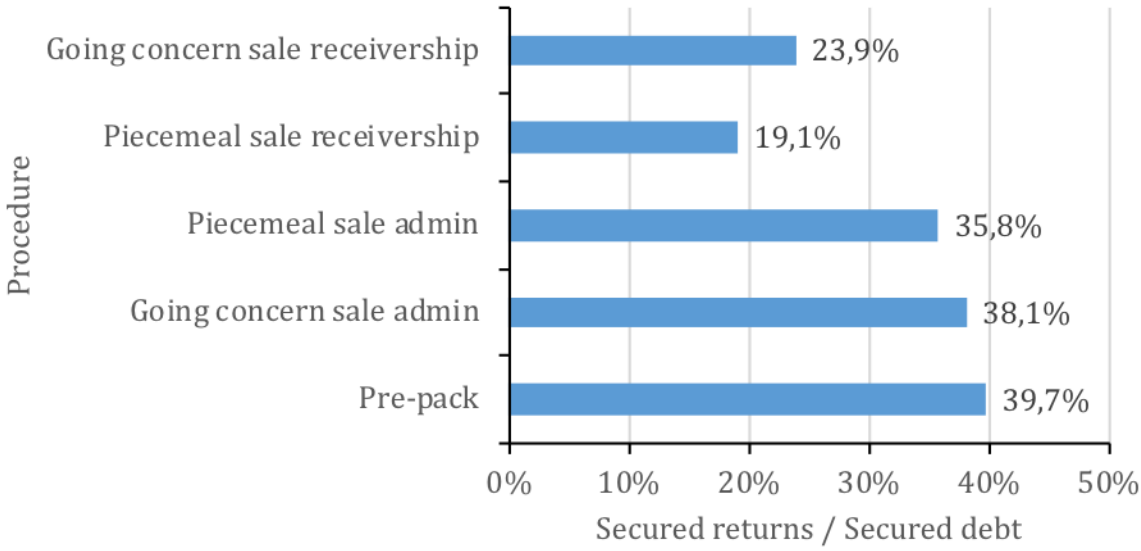

Figure 80. The relationship between secured returns as a percentage of secured debt and procedure, derived from the fractional generalized linear model and controlling for a range of other variables

If procedure is replaced in the model with a three category version (pre-packs, going concern/piecemeal sale administrations, going concern/piecemeal sale receiverships) the result is Figure 81.[192]

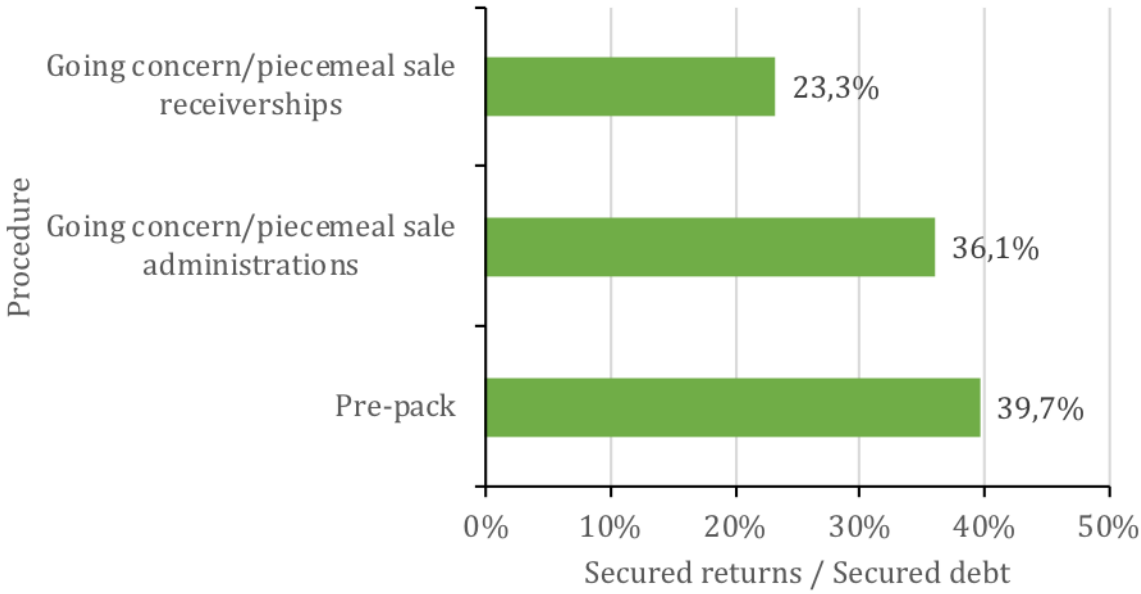

Figure 81. The relationship between secured returns as a percentage of secured debt and procedure in three categories, derived from the fractional generalized linear model and controlling for a range of other variables

[192] Also including a procedure by debt group interaction.

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Debtor size

There were some differences in secured returns as a percentage of secured debt between total debt groups.[193] In particular, secured returns as a percentage of secured debt were lower in the '£5,000,000 or more' category, when compared to the lowest 'less than £500,000' category. Secured returns as a percentage of secured debt for each total debt group is illustrated in Figure 82,[194] controlling for other variables, including the interaction with procedure. Replacing total debt in the model with size based on turnover,[195] resulted in Figure 83. The total debt by procedure interaction is discussed below.

Figure 82. The relationship between secured returns as a percentage of secured debt and total debt, derived from the fractional generalized linear model and controlling for a range of other variables

[193] While removing the interaction term suggested that, overall, total debt was non-significant; $\chi^2_4 = 6.55$, $p = 0.16$, there were some indications of a significantly lower proportion for the £5,000,000 or more group, in addition to significant interaction terms (discussed further below).

[194] Note, that if the interaction term is removed from the model, the percentages in Figure 82 would be (from top to bottom), 31.0%, 37.7%, 36.4%, 37.2% and 39.3%.

[195] Without a size by procedure interaction, which could not be estimated for large firms. Note, that turnover was only available for 640 cases with values for secured returns as a proportion of secured debt.

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Figure 83. The relationship between secured returns as a percentage of secured debt and organisation size based on turnover, derived from the fractional generalized linear model and controlling for a range of other variables

The interaction between procedure and total debt

There was evidence of a statistically significant interaction between procedure and total debt group in secured returns as a proportion of secured debt.[196] The interaction is illustrated in Figure 84, and as shown, the relationship between total debt group and the percentage of the total realised made up by costs differed between procedures. Compared to the proportions for pre-packs (the model reference category) across debt categories (see Figure 84), going concern sale administrations had a lower proportion for the '£1,000,000 to less than £3,000,000' category,[197] and a significantly lower proportion in the '£3,000,000 to less than £5,000,000' category.[198] Again, compared to pre-packs, piecemeal sale receiverships had a significantly lower proportion in the '£5,000,000 or more' total debt category.[199] There were also highly significant interaction terms (compared to pre-packs) for going concern sale receiverships for each of the four total debt groups (compared to 'up to £500,000). This was a result of the zero value for going concern sale receiverships in the 'less than £500,000' category. However, as elsewhere in this report, interactions between total debt and procedure should be interpreted with caution, particularly for receiverships, where numbers are low (especially once they are split into discrete total debt categories). For example, the zero value for going concern sale receiverships in the 'less than £500,000' category was based on only three observations.

[196] Jointly testing the interaction terms; $\chi^2_{16} = 486.15$, $p < 0.001$.
[197] Compared to '<£500,000'; odds ratio = 0.41, Z = -1.91, p = 0.056.
[198] Again, compared to '<£500,000'; odds ratio = 0.28, Z = -2.08, p = 0.037.
[199] Again, compared to '<£500,000'; odds ratio = 0.090, Z = -2.86, p = 0.004.

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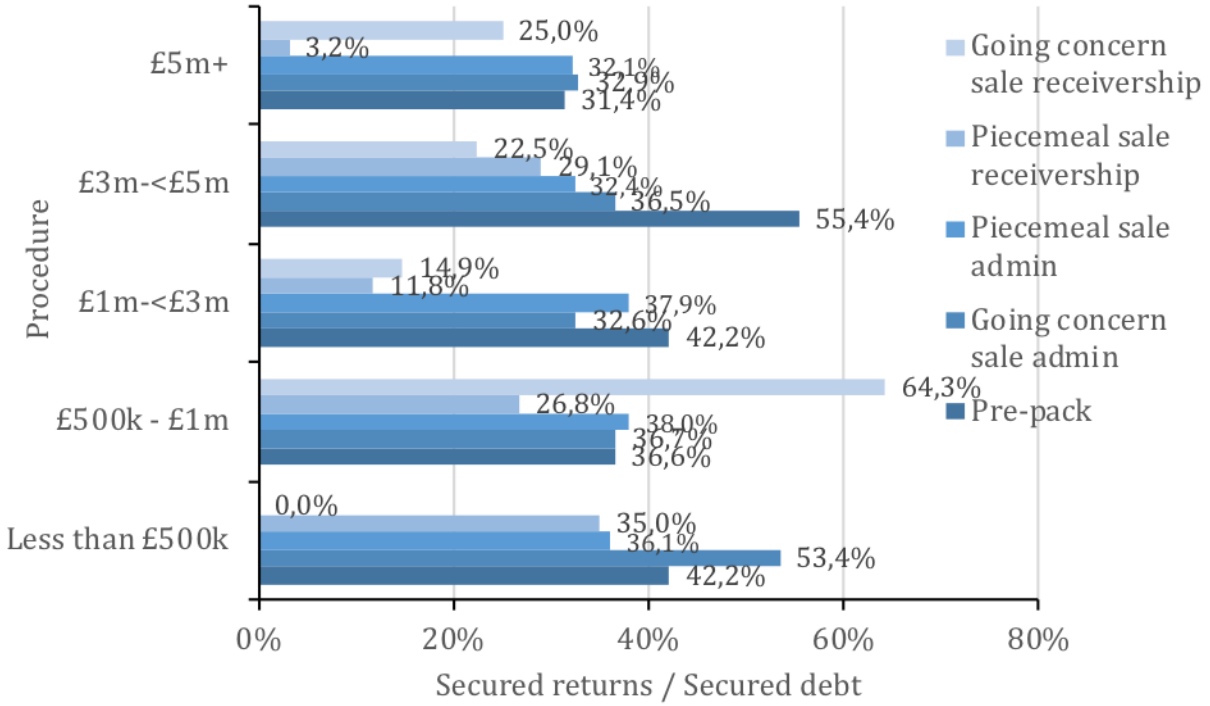

Figure 84. The relationship between secured returns as a percentage of secured debt, total debt and procedure, derived from the fractional generalized linear model and controlling for a range of other variables

Overall there were only 70 piecemeal sale receiverships and 37 going concern sale receiverships with a value for secured returns as a proportion of secured debt. As a result Figure 85 is also provided, which removes the interaction term from the model. This prevents the relationship between secured returns as a proportion of secured debt and procedure varying between total debt groups, which may be more realistic in the case of receiverships, where numbers were small once split into debt categories.

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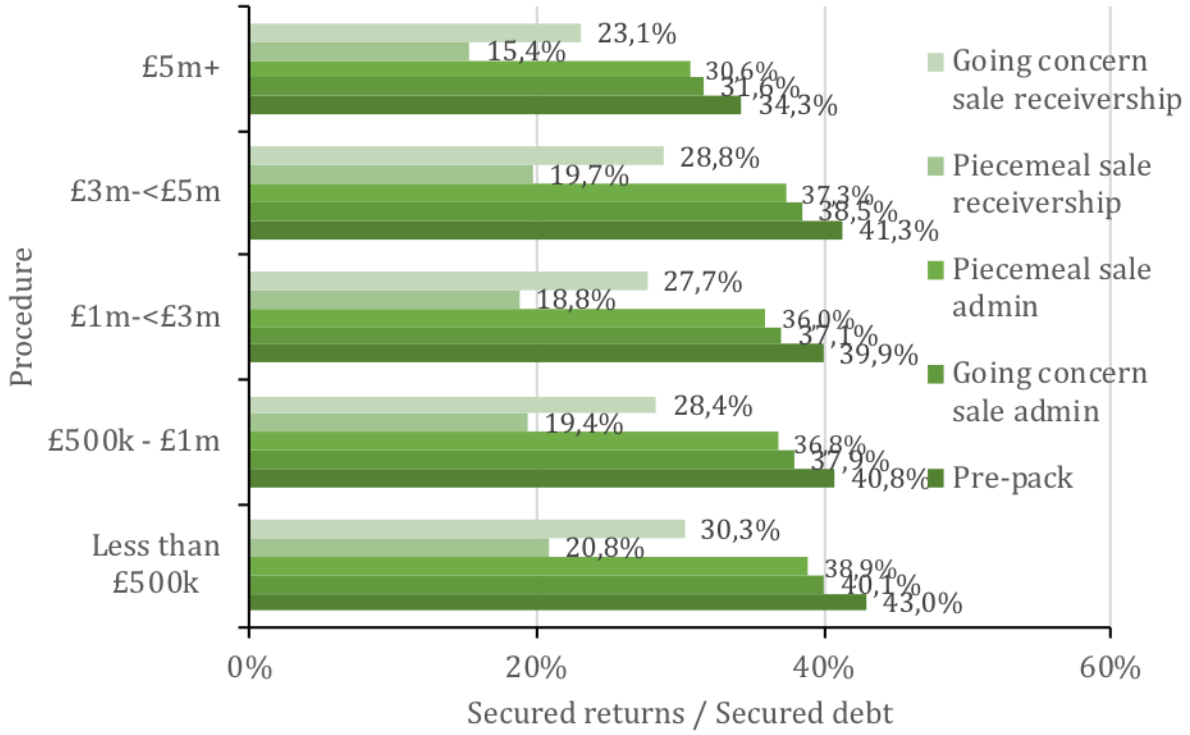

Figure 85. The relationship between secured returns as a percentage of secured debt, total debt and procedure, derived from the fractional generalized linear model and controlling for a range of other variables (with the debt by procedure interaction removed)

If procedure is again replaced in the model with a three category version (pre-packs, going concern/piecemeal sale administrations, going concern/piecemeal sale receiverships), and a procedure by debt interaction included again, the result is Figure 86.

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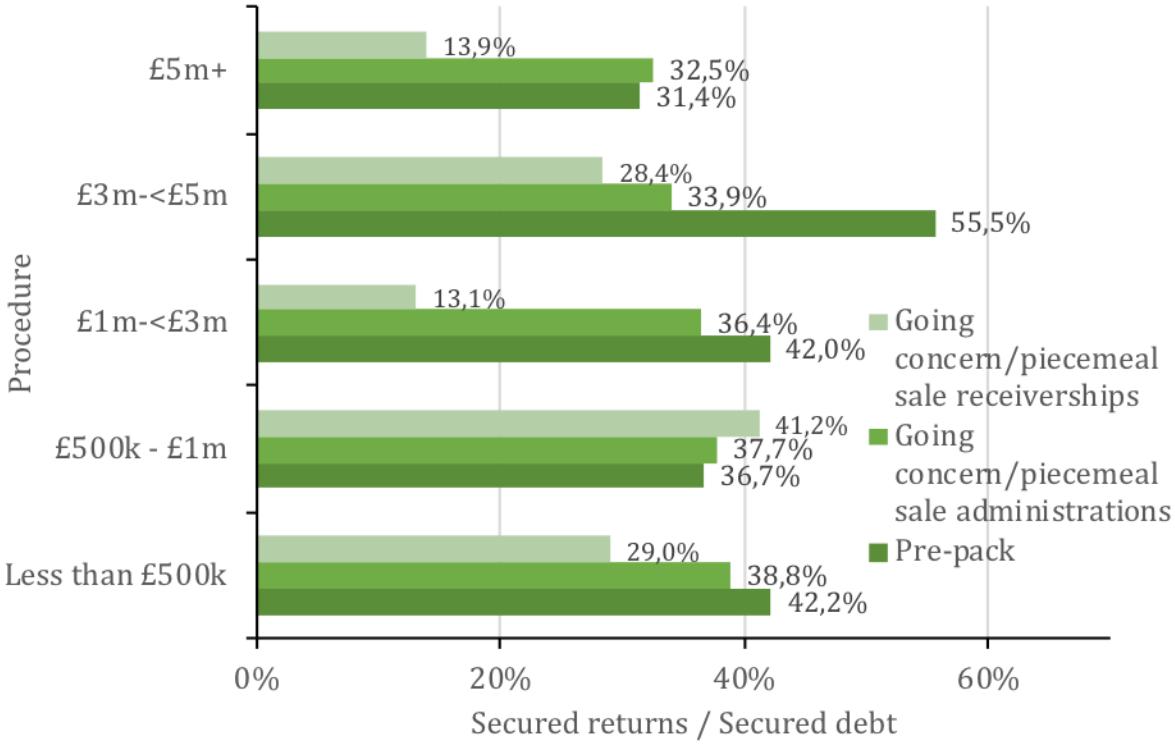

Figure 86. The relationship between secured returns as a percentage of secured debt, total debt and procedure (in three categories), derived from the fractional generalized linear model and controlling for a range of other variables

Percentage of debt which was secured

There was a highly statistically significant relationship between secured returns as a proportion of secured debt and the percentage of debt which was secured.[200] As the percentage of secured debt increased, the proportion of secured debt made up by secured returns decreased.[201] Figure 87 shows the relationship between secured returns as a proportion of secured debt and the percentage of secured debt (of all debt), while controlling for a range of other variables.[202]

[200] Testing the three 'percentage of secured debt' terms simultaneously'; $\chi^2_3 = 24.64$, $p < 0.001$.
[201] Compared to the 'up to 25%' group, decreases became progressively larger; odds ratio = 0.72, Z = -2.64, p = 0.008 (>25% - 50%), odds ratio = 0.65, Z = -2.98, p = 0.003 (>50% - 75%), odds ratio = 0.51, Z = -4.90, p < 0.001 (>75% - 100%).
[202] Note, that there was a highly significant relationship between proportion of total realised made up by costs and the percentage of debt which was secured regardless of whether or not other variables were controlled for in a model.

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Figure 87. The relationship between secured returns as a percentage of secured debt and the percentage of secured debt, derived from the fractional generalized linear model and controlling for a range of other variables

SIC sector

There were some differences in secured returns as a proportion of secured debt between different sectors.[203] In particular, proportions were highest in the real estate sector, and significantly higher than some other sectors.[204] Secured returns as a proportion of secured debt is illustrated for different sectors in Figure 88, controlling for a range of other variables. As shown, proportion/percentage was broadly comparable for a number of sectors, but noticeably higher for 'real estate activities'.

[203] While testing the SIC sector terms together fell just short of significance; $\chi^2_{10} = 17.61$, $p = 0.062$, there were some significant differences between individual sectors.
[204] For example, compared to the manufacturing reference category; odds ratio = 1.93, Z = 2.91, p = 0.004.

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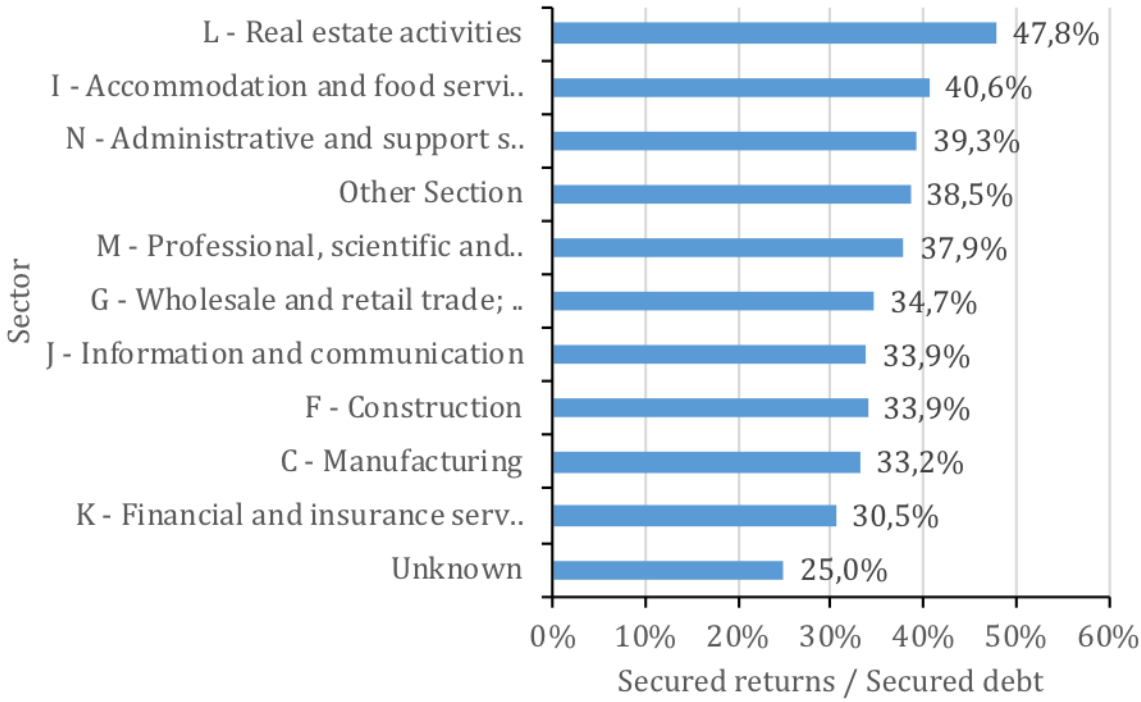

Figure 88. The relationship between secured returns as a percentage of secured debt and SIC sector, derived from the fractional generalized linear model and controlling for a range of other variables

Region

There were statistically significant differences in secured returns as a proportion of secured debt between different regions.[205] Compared to London (the model reference category) proportions were higher in the West Midlands[206] and particularly in the North West.[207] Figure 89 illustrates variation in secured returns as a proportion of secured debt by region, controlling for a range of other variables. As can be seen, the proportion/percentage was particularly high in the North West, and lower in regions such as the East of England, South West and London.

[205] Testing the NUTS1 region terms together'; $\chi^2_{12} = 72.85$, $p < 0.001$.
[206] Though the difference fell just short of statistical significance; odds ratio = 1.38, Z = 1.75, p = 0.081.
[207] A highly statistically significant increase; odds ratio = 1.72, Z = 3.79, $p < 0.001$.

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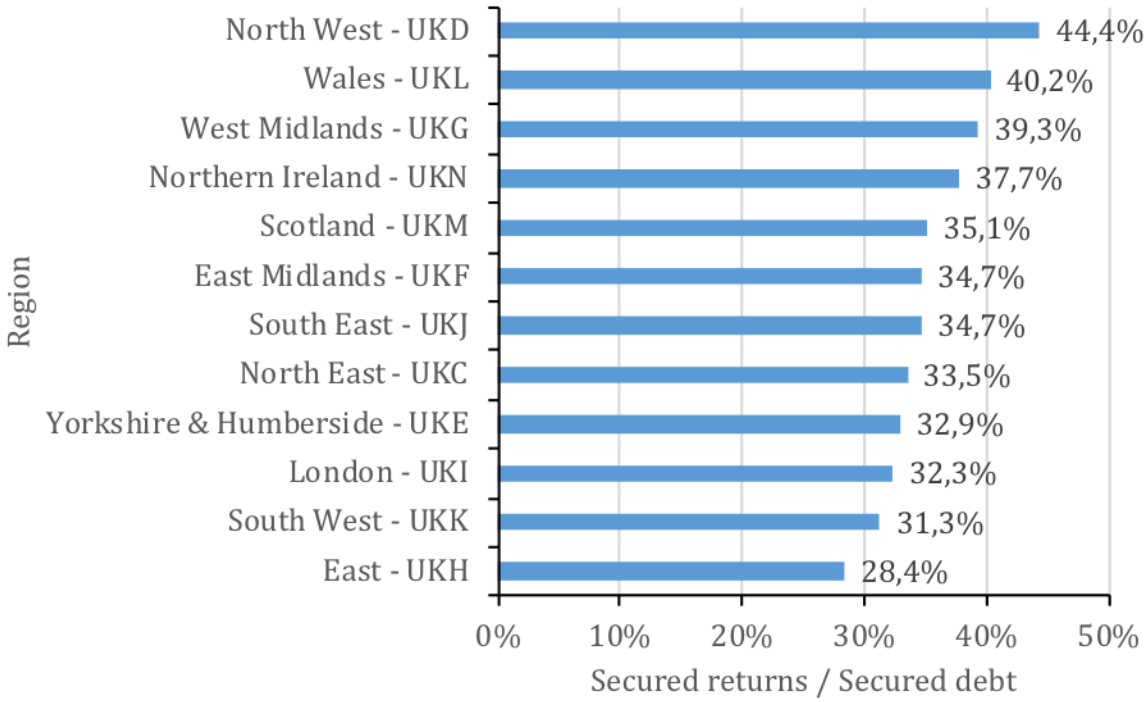

Figure 89. The relationship between secured returns as a percentage of secured debt and region (NUTS1), derived from the fractional generalized linear model and controlling for a range of other variables

IP firm

Differences in secured returns as a proportion of secured debt between different IP firms were fairly small and not statistically significant.[208] While there was a slightly higher proportion for 'top 4' firms, it was not statistically significantly greater than either 'second tier'[209] or 'other' IP firms.[210] Figure 90 shows secured returns as a proportion of secured debt by IP firm, controlling for a range of other variables.[211]

[208] Testing the IP firm terms together'; $\chi^2_3 = 3.67$, $p = 0.30$.
[209] Odds ratio = 1.31, Z = 1.66, p = 0.096.
[210] Odds ratio = 1.22, Z = 1.42, p = 0.16.
[211] A small number of 'unknown IP' cases were included in the model, but excluded from the figure.

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Figure 90. The relationship between secured returns as a percentage of secured debt and IP firm, derived from the fractional generalized linear model and controlling for a range of other variables

Presence of a purchaser and whether they were connected

There were statistically significant differences in secured returns as a percentage of secured debt based on presence of a purchaser and whether or not the purchaser was connected.[212] Statistical significance was predominantly a consequence of a higher proportion for the 'purchaser not connected' group, with a significantly higher proportion than the other three groups.[213] Figure 91 shows secured returns as a proportion of secured debt by presence of a purchaser and whether they were connected. As can be seen, the percentage / proportion was noticeably higher for cases with a non-connected purchaser.

[212] Jointly testing the purchaser/purchaser connected terms; $\chi^2_3 = 16.12$, $p = 0.001$.
[213] A highly significantly higher proportion than the 'not applicable/unknown/missing' reference category; odds ratio = 1.64, Z = 3.69, $p < 0.001$, 'purchaser connected'; odds ratio = 1.50, Z = 2.42, $p = 0.015$ and 'purchaser connection unknown', odds ratio = 1.75, Z = 3.21, $p = 0.001$ groups.

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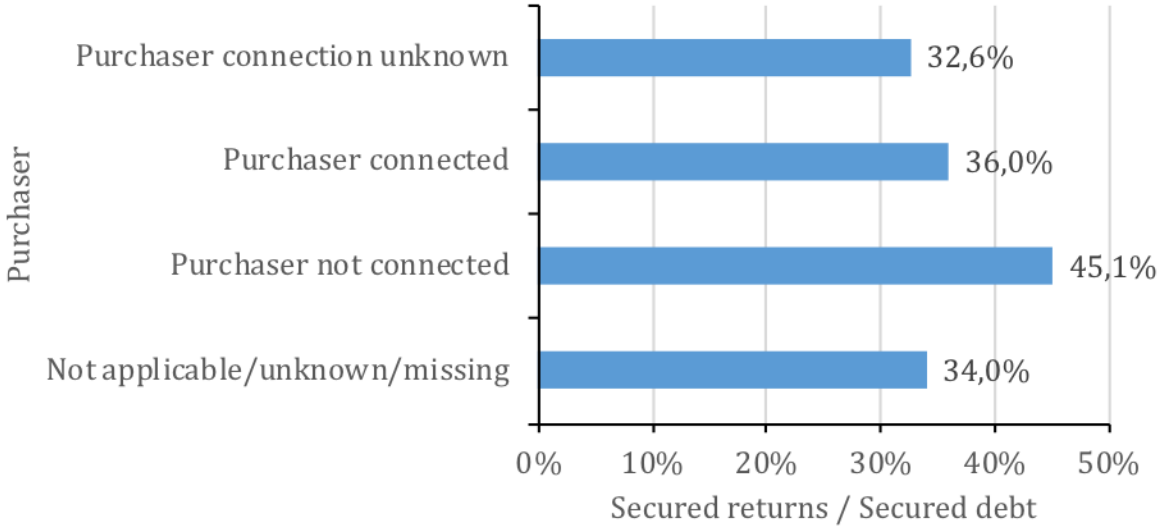

Figure 91. The relationship between secured returns as a percentage of secured debt and whether a purchaser could be identified (and whether or not they were connected), derived from the fractional generalized linear model and controlling for a range of other variables

If the current purchaser/purchaser connected variable is replaced in the model with a more detailed variable also including deferred consideration, differences remain statistically significant.[214] Secured returns as a percentage of secured debt were particularly high for 'purchaser not connected' groups with missing deferred consideration[215] or zero deferred consideration.[216] Secured returns as a percentage of secured debt by presence of a purchaser, whether or not they were connected and deferred consideration (positive, zero or missing) are set out in Figure 92.

[214] Jointly testing whether the new terms are equal to zero; $\chi^2_9 = 23.35$, $p = 0.006$.
[215] Compared to the 'not applicable/unknown/missing' reference category; odds ratio = 1.77, Z = 2.59, p = 0.010, a significant increase.
[216] Compared to the 'not applicable/unknown/missing' reference category; odds ratio = 1.72, Z = 3.24, p = 0.001, a significant increase.

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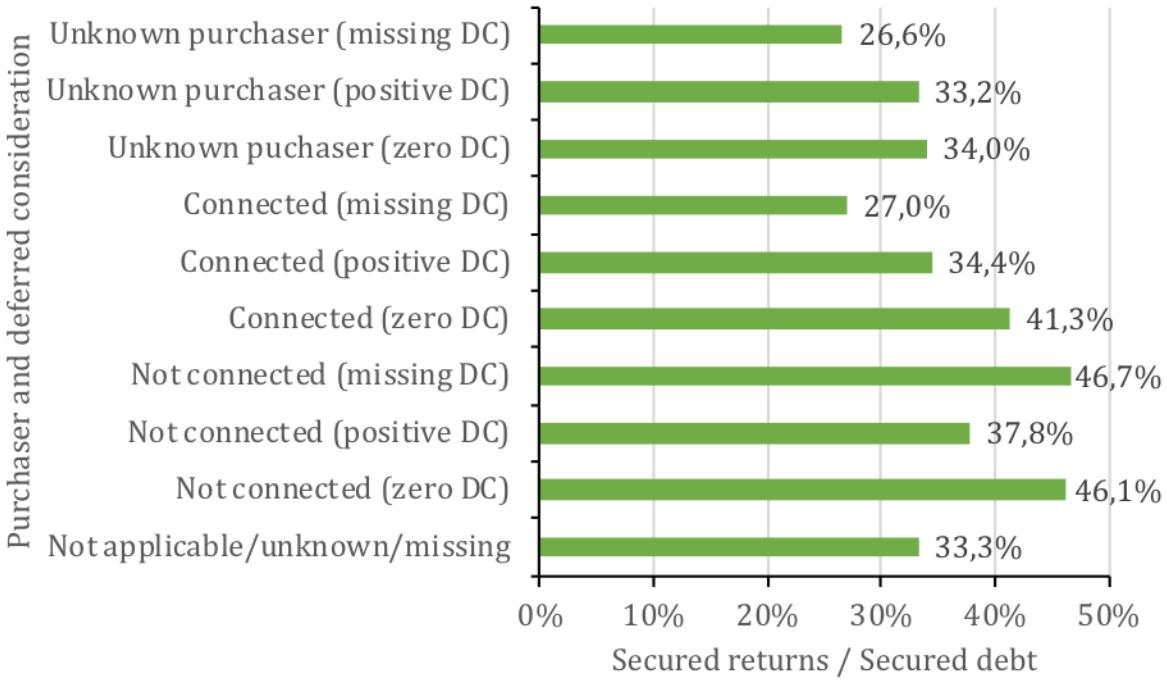

Figure 92. The relationship between secured returns as a percentage of secured debt and whether a purchaser could be identified, whether or not they were connected and deferred consideration (positive, zero or missing), derived from the fractional generalized linear model and controlling for a range of other variables

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Statistical appendix

To model proportions (in this case, modelling secured returns as a function of secured debt) fractional generalized linear models were fitted. These were implemented using William's (2017) fracglm programme in Stata 13, which fills gaps left by other Stata commands where responses must be binary. Papke and Wooldridge (1996) provide a widely cited paper on some of the key issues associated with fractional responses and appropriate models. One assumption in this case is that zero and one values are created by the same process as other proportions (e.g. Papke and Wooldridge, 1996). A further option would be to explore use of a zero one inflated beta model as used for modelling total returns as a function of total debt. In this example it is likely that such a model would require a complex specification, with a full set of covariates for zero inflate, one inflate and proportion parts of the mixed model. This may be worth exploring, though the current analysis adopts a somewhat simpler approach. Fractional logit models and model coefficients can be interpreted in much the same way as logistic regression. As elsewhere in the report, to further ease interpretation, figures of predicted proportions were calculated and used to produce figures using the 'margins' post estimation command in Stata 13 yield estimates for levels of a given independent variable while controlling for other independent variables. Table 11 shows fractional generalized linear model output, using a logit link, modelling the proportion of secured returns as a function of secured debt.

Table 11. Fractional generalized linear (logit) model of secured returns as proportion of secured debt.

Variable	Level	Est.	Robust SE	z	p
Procedure	Pre-pack	0.000	-		
	Going concern sale admin	0.472	0.404	1.170	0.243
	Piecemeal sale admin	-0.266	0.238	-1.120	0.263
	Piecemeal sale receivership	-0.313	0.571	-0.550	0.583
	Going concern sale receivership	-15.046	0.651	-23.100	0.000
Total debt	Less than £500k	0.000	-		
	£500k - £1m	-0.244	0.251	-0.970	0.330
	£1m-<£3m	0.001	0.230	0.000	0.998
	£3m-<£5m	0.556	0.371	1.500	0.134
	£5m+	-0.482	0.290	-1.660	0.096

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Procedure X Total debt	Going concern sale admin X £500k - £1m	-0.467	0.507	-0.920	0.358
	Going concern sale admin X £1m-<£3m	-0.899	0.470	-1.910	0.056
	Going concern sale admin X £3m-<£5m	-1.275	0.613	-2.080	0.037
	Going concern sale admin X £5m+	-0.404	0.487	-0.830	0.407
	Piecemeal sale admin X £500k - £1m	0.331	0.333	0.990	0.320
	Piecemeal sale admin X £1m-<£3m	0.081	0.297	0.270	0.785
	Piecemeal sale admin X £3m-<£5m	-0.727	0.463	-1.570	0.117
	Piecemeal sale admin X £5m+	0.300	0.356	0.840	0.400
	Piecemeal sale receivership X £500k - £1m	-0.160	0.869	-0.180	0.854
	Piecemeal sale receivership X £1m-<£3m	-1.436	0.804	-1.790	0.074
	Piecemeal sale receivership X £3m-<£5m	-0.841	0.999	-0.840	0.399
	Piecemeal sale receivership X £5m+	-2.368	0.828	-2.860	0.004
	Going concern sale receivership X £500k - £1m	16.229	0.949	17.100	0.000
	Going concern sale receivership X £1m-<£3m	13.569	0.951	14.270	0.000
	Going concern sale receivership X £3m-<£5m	13.534	0.765	17.700	0.000
	Going concern sale receivership X £5m+	14.717	0.821	17.920	0.000
% Secured debt	Up to 25%	0.000	-		
	>25% to 50%	-0.324	0.123	-2.640	0.008
	>50% to 75%	-0.430	0.144	-2.980	0.003
	>75% to 100%	-0.668	0.136	-4.900	0.000
SIC Sector	C - Manufacturing	0.000	-		
	F - Construction	0.036	0.164	0.220	0.827

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	G - Wholesale and retail trade; repair of motor vehicles	0.072	0.164	0.440	0.660
	I - Accommodation and food service activities	0.340	0.225	1.510	0.132
	J - Information and communication	0.033	0.282	0.120	0.907
	K - Financial and insurance services	-0.129	0.359	-0.360	0.719
	L - Real estate activities	0.657	0.226	2.910	0.004
	M - Professional, scientific and technical activities	0.220	0.227	0.970	0.333
	N - Administrative and support service activities	0.283	0.181	1.560	0.118
	Other Section	0.248	0.174	1.420	0.154
	Unknown	-0.424	0.295	-1.440	0.151
Region (NUTS1)	London - UKI	0.000	-		
	South East - UKJ	0.111	0.194	0.570	0.569
	South West - UKK	-0.051	0.252	-0.200	0.839
	East - UKH	-0.198	0.291	-0.680	0.497
	West Midlands - UKG	0.321	0.184	1.750	0.081
	East Midlands - UKF	0.110	0.255	0.430	0.666
	Yorkshire & Humberside - UKE	0.028	0.166	0.170	0.869
	North West - UKD	0.542	0.143	3.790	0.000
	North East - UKC	0.054	0.322	0.170	0.867
	Scotland - UKM	0.132	0.190	0.690	0.488
	Wales - UKL	0.362	0.504	0.720	0.472
	Northern Ireland - UKN	0.251	0.254	0.990	0.321
	Unknown	2.408	0.328	7.340	0.000

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IP Firm	Other	0.000	-		
	Top 4	0.208	0.147	1.420	0.156
	Second tier (5-13)	-0.059	0.121	-0.480	0.629
	Unknown	-0.860	0.991	-0.870	0.385
Purchaser	Not applicable/unknown/missing	0.000	-		
	Purchaser not connected	0.495	0.134	3.690	0.000
	Purchaser connected	0.092	0.153	0.600	0.548
	Purchaser connection unknown	-0.065	0.157	-0.410	0.678
Constant		-0.416	0.250	-1.660	0.097

1,500 cases included in the model, Log pseudolikelihood = -929.51, Pseudo R^2 = 0.052.

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