What is the distribution of the rate of profit?

Some preliminary results

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Introduction

Several contributors to past IWGVT conferences have commented favourably on Farjoun and Machover's view (1983) that profit-rate equalisation has proved an unhelpful concept in Marxist economics. Little work, however, appears to have been done to test their hypothesis that the profit rate should take the form of the gamma distribution.

Indeed, there appears to very little work done (from any theoretical perspective) on the possible shape of this distribution *at the company level* and below, which is what Farjoun and Machover's work refers to. The only other known definite proposal as to its functional form has been that of Gibrat (1931) (he thought it should be log-normal).

Singh and Whittington (1968) have calculated dispersions of company profit rates these were of time averages, not of data for individual years; other workers who have taken an interest in the dispersion of time averages of the profit rate have been interested in that between industries, not between companies (for example, and notably, (Glick 1985); also the contributions in Papadimitriou (1992), and Maldonado-Filho (1998)). Moreover, their work has been confined to considering measures of dispersion only, without regard to possible functional form. (Glick's thesis (1985) does briefly consider the problem of skewness (page 74), but his comments are opaque).

Previous to Farjoun and Machover, the nearest approach to a proper consideration of the shape of the profit rate distribution appears to be Stigler (1963), who presents empirical distributions of *sectoral* profit rates *based on* company-level data.

But even if Farjoun and Machover are right only to the extent that the distribution is skewed in some way, any study whose focus of interest is "the" rate of profit may be flawed: if the distribution across the population (whether of sectors, firms, or units of capital) is skewed to the right, the mean is a misleading indicator of the rate of profit experienced by a typical member of the population – a highly-misleading one, if the variance is large.

Moreover, since there are more ways than one to measure profits, the possibility arises that different measures will have different variances as well as different means, adding a further dimension to disputes over the merits of alternative methods.

These points apply not only to the studies of competition mentioned above but to attempts to discover the secular trend of the profit rate and to studies of the business cycle.

This paper stems from a project investigating Farjoun and Machover's conjecture using a very large set of company accounts data. The quantitative part of this project is still at an early stage; nonetheless, even preliminary exploration of the data sheds interesting light on the issues.

Empirical results

This section draws on company accounts data from the FAME database (Financial Analysis Made Easy) published by Bureau van Dijk.[1] The database includes details of over 100,000 companies; since publication of the data concerned is a statutory requirement for limited liability enterprises it is thus in effect census data. However, in what follows the possible distinctions that might arise from treating it as representing the population of companies, or as a sample, will be left to one side.

The approach will be ostensive and qualitative; we start by exhibiting empirical distributions at the firm level for various profit-rate measures, first for the economy as a whole, then for broad one-digit industrial sectors, and thirdly for the manufacturing sector, composed of 20 industries at the two-digit level of the 1981 U.K. SIC system. We then derive capital-weighted versions of selected measures for the manufacturing sector as a whole and show that – with some notable exceptions – this procedure does not appear to change the qualitative results for the profit-rate measures considered.

The profit measures

A very wide range of profit-rate measures has been advocated in different connections. Here we consider measures intended as analogues of those used by Gillman (1956), together with four measures of performance commonly used by orthodox financial analysts (described in Appendix A, Table 1: the numbering system is derived from that of the five appendices in which Gillman reports the computed results for his different tests of the falling-rate-of-profit hypothesis, emended as noted. Precise formulations are reported in Appendix A, Table 2 below). Some of these measures approximate some of those examined by Glick (1985), who

[1] I am indebted to Roberto Simonetti for making this available already prepared in the form of Excel spreadsheets.

worked with both company accounts data (the Value Line data) and NIPA data; comparisons with his Value Line measures are noted in Table 1.

Each of the above measures has been calculated for all companies covered by FAME for which the required data is available. Less onerous reporting requirements for smaller firms mean that some measures are in principle only available for larger firms. Nonetheless results are available for between 40,000 and 80,000 firms across the economy as a whole, depending on the particular measure, and these should account for the vast bulk of the genuinely capitalist corporate sector (many small limited liability firms are of course essentially shells for the activities of individual professional contractors).

Charts of basic all-industry measures

Here we present histograms of the distribution across companies of each of our 13 measures (Appendix B, Figures 1 and 2). Each chart is reproduced at the same physical scale, so the distributions are immediately comparable.

Profit rates are calculated as ratios rather than percentages, so – for example – the chart for P_1 shows the density over profit rates from –50 per cent to 150 per cent; histogram bins in all charts are one percentage point wide. In each case, the distribution is over all companies for which the given measure can be calculated.

Histograms can be shown to be appropriate empirical estimates of density functions (Härdle 1991). Hence the vertical axes measure the proportion of the total observations falling in each bin, not the number.[2] Given the relative narrowness of the bins the histograms' bias will be small (it is in any case zero at the mid-point of each bin). Although narrow bins increase the variance of the estimate – and a fair degree of noise is evident – nonetheless a definite portrait emerges of the basic shape of each distribution.

[2] The charts were prepared using the S-plus statistics program. Strictly speaking, given the particular choices made in their construction, the densities are relative to the number of firms whose profit rates fall within the ranges shown. However, given that (for all except the first group of measures discussed below) the tails outside the range depicted are exiguous, this is not a material difference. In any case, for present purposes we are interested in making broad comparisons of shape, not in estimating the precise probability of particular ranges of profitability.

The first salient feature is the enormous disparity in the degree of dispersion produced by the different measures; however, it will be noted that these can be divided into four groups:

(1) very large dispersion, highly asymmetric: P_3 and P_4 (Gillman's two basic stock measures) and $P_{AsstTurn}$ (also a stock measure). Arguably $P_{AsstTurn}$ forms a sub-class of its own, given its evident bi-modality

(2) fairly-widely dispersed (and highly skewed): P_1 and P_2 (Gillman's basic flow measures) and P_{ORE} (stock)

(3) moderately-concentrated and asymmetric: P_{5s} and P_{7s} (Gillman's successive approaches to conventional rate-of-return measures)

(4) highly-concentrated: P_{5f} and P_{7f}, P_6 (also flow), and P_{ROCE} (stock) and P_{NPM} (flow). These are only *relatively* highly-concentrated: as can be seen they still cover rates of return ranging from –50 per cent to +50 per cent). Closer inspection reveals that the symmetry which appears to characterise this group on first glance is also relative to the other distributions illustrated; all members have fatter right-hand shoulders than left-hand ones.

An obvious question is, what essential feature or features characterise each particular group? As can be seen, it does not appear to be the distinction between stock and flow measures since groups (2) and (4) contain both types, and although groups (1) and (3) are both exclusively composed of stock measures they are radically different in shape.

Rather, we note that the degree of concentration increases as the composition of the numerator changes: of the six measures in groups (1) and (2) four deduct only the direct cost of sales (and $P_{AsstTurn}$ deducts nothing) from turnover, while the measures in groups (3) and (4) deduct unproductive expenditures (and tax, in the case of P_{7s} and P_{7f}). On the other hand, P_{ORE} (group (2)) is an anomaly from this point of view, since its numerator is shared with P_{NPM} and P_{ROCE} (group (4)); in passing, note also the spike at $0<P_{ORE}<1$.

Table 1 below attempts to organise these results; its basis is a 2x2 matrix whose axes are the inclusiveness of the profit measure (i.e. size of numerator, dichotomised into high and low), and the nature of the denominator (stock or flow). Compartment (1, 1) is thus those stock measures with large numerators, and as indicated it comprises those measures we have designated as group (1) above; compartment (2, 1) contains the flow measures with high

numerators from group (2); compartment (2, 2) contains the flow measures with low numerators from group (4).

Lastly, compartment (1, 2) contains stock measures with low numerators and includes members of groups (2), (3) and (4) as indicated; from this perspective P_{ORE} and P_{ROCE} represent, respectively, upper and lower extremes of dispersion of this compartment, rather than being deviant members of groups (2) and (4).

Table 1

<table>
<tr><th>Type of measure</th><th>S_{high}</th><th colspan="2">S_{low}</th></tr>
<tr><td rowspan="2">stock</td><td rowspan="2">P_3 P_4 $P_{AsstTurn}$
1</td><td colspan="2">P_{5s} P_{7s}
3</td></tr>
<tr><td>P_{ORE} 2</td><td>P_{ROCE} 4</td></tr>
<tr><td>flow</td><td>P_1 P_2
2</td><td colspan="2">P_{5f} P_{7f} P_6 P_{NPM}
4</td></tr>
</table>

In relation to previous empirical work, we note that those measures regarded as instantiating a 'traditional' Marxian viewpoint – e.g. P_1 (Gillman) and P_{5s} (Glick) – have relatively wide dispersions. However, Gillman's preferred measure for testing the secular trend in profitability, P_{7s}, is not very different in character to P_{5s}, while his P_{5f}, rejected by him as 'less pertinent' to running a capitalist enterprise, falls in the group with the narrowest dispersions.

None of the measures found to have low dispersions by Glick have been explicitly examined here; but we note how deducting taxes appears to concentrate the distribution (compare P_{5s} with P_{7s}, and P_{5f} with P_{7f}), and that adding tax (and interest) to P_{ORE} would

make it equivalent to $Glick_6$, which he found to have the third-smallest variance between long-run industry average rates of profit.

On the other hand, we also note that – given the same qualifications just mentioned – P_{NPM} is close to $Glick_7$, a measure rejected by him as having little theoretical justification as a candidate for long-run equalisation. Nonetheless, P_{NPM} falls in the group with the narrowest cross-sectional distribution.

Comparisons for one-digit sectors

A standard strategy when faced with asymmetric and/or multi-modal distributions is to consider the possibility that the data comes from a mixture of distributions. Thus we next exhibit density estimates of selected measures conditioned by broad industrial sectors, defined by the one-digit level of the 1981 U.K. SIC system (Appendix B, Figures 3 to 8; Appendix A, Table 3 gives details of the classification system).

In these charts we show, as before, the distribution for each measure across all firms for which that measure can be computed. To avoid bewildering the reader with a multitude of charts whose differences may be neither immediately apparent nor obviously significant we select, as representative of their respective groups, measures P_1, P_4, P_6 and P_{5s}, in order of increasing concentration, and choose $P_{AsstTurn}$ and P_{ORE} as apparent anomalies.

As well as the histograms we show kernel density estimates (KDEs).[3] One attraction of KDEs is that they are impervious to the histogram's susceptibility to unlucky choices of bin width and origin. Our present histograms are not likely to suffer these problems, given their high number of narrow bins; the KDEs are given here in order to establish a baseline against which to compare subsequent charts for industrial sectors with relatively sparse membership,

[3] KDEs are essentially generalisations of the histogram, and likewise are asymptotically unbiased as their bandwidth $h \to 0$; however, their bias is also a function of the curvature of the density function (Härdle (1991) pages 55-56) and thus they underestimate sharp peaks and overestimate valleys, as can be clearly seen – by comparison with the histogram bars – in the charts. However, once again we are not really interested in the precise probabilities but in the general shape and location of the distributions. All kernels are Gaussian, and for P_1, P_{5s} and P_6 $h = 0.2$, while for P_4 and $P_{AsstTurn}$ $h = 0.6$. Binwidth of all histograms is 0.01 as before. Technical difficulties with S-plus, as yet unresolved, have produced clearly inconsistent results in some panels.

which is precisely the circumstance in which KDEs are superior density estimators to histograms.

In considering the charts ('trellis charts', in S-plus terminology), the SIC depicted in each panel of the trellis is identified in the panel heading: thus SIC811: 0 indicates the agricultural, forestry and fishing sector. When comparing trellis charts for different measures, or comparing the trellis charts with those for the whole economy already considered, note particularly that the scales for both *x*- and *y*-axes are constrained to fit a common aspect ratio regardless of their ranges, which have been chosen to exhibit as much as possible of the significant parts of the overall distributions.

We first show the trellis chart for $P_{AsstTurn}$ (Appendix B, Figure 3); evidently this measure is highly anomalous, in that the economy-wide distribution is evidently a mixture of sectoral distributions which are widely-different in kind; indeed, only one sector (8, financial and business services) resembles the overall distribution. (Further work not reported here gives some reason to think that sector 8 is in turn characterised by a mixture of, on the one hand, general business services, with a distribution similar to those of other service industries (sectors 6 and 9) and transport and communications (sector 7) and, on the other hand, the financial sector proper, contributing the spike seen here at around the 10 per cent mark.)

The results for $P_{AsstTurn}$ should be compared with those for P_4 (Figure 4); though there are obvious difference between the sectors they are nothing like as extreme, and in fact none of the other measures considered (including those not depicted here) have individual sectoral distributions as blatantly dissimilar to the overall one as does $P_{AsstTurn}$.

However, it is of interest to compare the charts for P_1 and P_{ORE} (Figures 5 and 6 in Appendix B); above, we suggested that despite their broad similarity (Appendix B, Figure 1) it might be considered that the latter measure was better thought of as an anomalous member of the top-right panel of Table 1 above (a point which might also be suggested by considering their different values in the ranges –50 to zero per cent, and zero to 20 per cent). As the trellis charts show, each measure is composed of industrial distributions of varying kurtosis, but while the three manufacturing sectors (2, 3 and 4) are roughly comparable, the non-manufacturing sectors show opposing patterns of variation – P_1 shows high kurtosis where P_{ORE} has low, and *vice versa*.

Comparisons for two-digit industries

Here we consider the 20 manufacturing industries defined at the two-digit level of the 1981 U.K. SIC system; we thus include part of sector 2 illustrated above, as well as the whole of sectors 3 and 4. In this section we show only results for the set of 10,303 firms for which *all* the 13 profit measures considered above can be computed (Appendix B, Figures 9 to 14).

In the previous section we noted the general similarity of the distributions of each measure for the three one-digit sectors containing manufacturing industries; here we see that this general similarity holds up, at any rate as regards shape and scale, for the two-digit industries.

This seems to be so even for those industries with particularly sparse populations (44 and, especially, 26), when we consider the KDEs rather than the histograms (whose upper parts have been substantially amputated in these charts). Even where a first glance might suggest otherwise – for example, the distribution of P_1 for industry 26 – the differences in KDE are largely due to the same narrow bandwidth being used for each industry; widening the window for sparse industries can be expected to produce KDEs similar to those for dense ones.

Capital-weighted measures

Farjoun and Machover's claim that one should expect the profit rate distribution to follow a gamma distribution relates not to the distribution across firms, but across capital; for them, the probability that the profit rate lies in any particular range is given by the proportion between the total capital of those firms achieving rates of return within the range and the total capital deployed in the economy.

Evidently such weighted distributions might differ substantially from firm-level ones if there is any tendency for the rate of return, as instantiated by some particular measure, to be correlated with the size of firm. For example, Singh and Whittington (1968) found that larger firms achieved smaller rates of return; this would tend to make a weighted distribution more skewed than its unweighted right-skewed equivalent.

In this section we construct such weighted versions of the measures discussed in the previous two sections (this time for the whole 20-industry manufacturing sector). To distinguish these from the unweighted versions we label them R_i, in conformity with Farjoun

and Machover's notation for their rate of profit (in what they refer to as the firm space, although arguably it is really a capital space). Formally, $p(a<R<b)=(\Sigma K_i)/K_T$, where the K_i are the capitals of the i firms with profit rates $a<R<b$ and K_T is the total capital of the sector.

In the accompanying charts the empirical densities are given by the histograms, while the continuous lines are constructed by applying Friedman's super-smoothing (FSS) algorithm to the empirical data.[4] In this case, the histograms show densities relative to the whole data set, not just the ranges illustrated, but in fact these account for the following percentages of the total capital of the sector: R_4, 96.30; R_{5s}, 99.43; R_6, 99.97; R_{ORE}, 93.48; $R_{AsstTurn}$, 70.35. All charts show the range from R = –0.5 to 1.5; vertical axes vary; once again binwidths are one per cent.

The first striking result is the increase in noise. Compare Figure 1 below, which shows the full vertical range of R_1, with Figure 9 in Appendix B, the chart of P_1 for the two-digit manufacturing industries; none of the latter – even the more sparsely-populated two-digit manufacturing sectors – show such relatively large and isolated spikes as appear in R_1.[5]

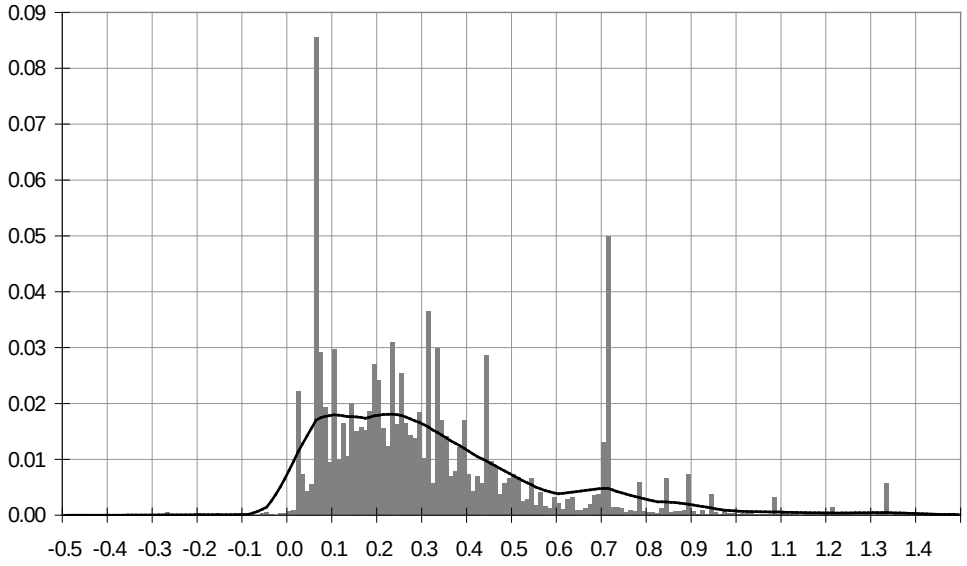


Figure 1

[4] FSS is a kernel estimator with varying bandwidth.

But the second striking feature is how similar the two distributions are overall character. In Appendix B, Figure 17 amputates the grosser spikes and vertically re-scales Figure 1 above to the same range as similar graphs for P_1; compare it with Appendix B, Figure 4, showing the one-digit distributions of P_1, and the same general shape is apparent. Like comparisons can be made for the other measures.

Weighting for capital size does not appears to alter the broad character of the distributions found for each measure. However, there is still the question of whether the degree of skewness is affected, and accordingly we now present the only quantitative comparisons in this paper.[6]

Here the results are mixed (and unexpectedly so in the light of Singh and Whittington's results). In practice, we find

(i) for the group (1) measures, as defined above, namely R_4 and $R_{AsstTurn}$, the modes are either comparable or lower, compared with the one-digit distributions. For both P_4 and R_4 they are in the range 40 to 50 per cent, while the modes of $P_{AsstTurn}$ range from 125 to 150 per cent, compared to130 per cent for $R_{AsstTurn}$).

(ii) for the group (2) measures, R_1 and R_{ORE}, the modes are comparable or *higher*. For P_1 the modes are of the order of 25 of 30 per cent, and for R_1 (neglecting the suggestion of bi-modality resulting from the spike in the 10 per cent region) we have 30 per cent. For R_{ORE}, though, we find a mode in the region of 20 per cent where those for P_{ORE} are around 10 per cent.

(iii) for the group (3) measure, R_{5s}, we find a mode around 15 per cent whereas that for P_{5s} is only 10 per cent.

(iv) for the group (4) measure, R_6, the mode is around five per cent, as it is for P_6.

[5] Of course, it is in the nature of spikes to be large and isolated: we stress the word 'relatively'; the comparison is between different sets of spikes, not of those spikes to their backgrounds.

[6] Comparisons, rather than 'tests'; the figures quoted are estimated from the charts, not computed.

Conclusion

We have considered the form of the distributions across companies of various profit rates, not only for the whole economy but for one-digit sectors and for two-digit industries in the manufacturing sector.

The qualitative evidence presented makes it clear that authors such as Gillman and Glick are indeed justified in paying close attention to the differences which can arise from different definitions of the profit rate – indeed, the issue is still more important than appears in these works.

This is because it turns out that a variety of potential profit rate measures turn out to be skewed, some extravagantly so; further, the general character of each measure is, albeit with some exceptions, carried down from the whole-economy level to at least the two-digit level of disaggregation.

We have also shown that weighting the data by the size of firms' capital – thus producing a distribution of profit rates across capital, rather than firms – does not change the overall nature of several profit measures.

However, we have found unexpected indications that such weighting may be as liable to increase modal values as to decrease them, compared to the distributions across companies.

References

Farjoun, E. and M. Machover (1983). *Laws of chaos*, Verso.

Gibrat, R. (1931). *Les inégalites economiques*. Paris, Sirey.

Gillman, J. M. (1956). *The falling rate of profit: Marx's law and its significance to twentieth-century capitalism*. London, Dennis Dobson.

Glick, M. (1985). *Competition* vs. *monopoly; profit rate dispersion in U.S. manufacturing industries*. New York NY, New School for Social Research.

Härdle, W. (1991). *Smoothing techniques : with implementation in S*. New York, Springer.

Maldonado-Filho, E. (1998). *Competition and equalization of inter-industry profit rates: the evidence for the Brazilian economy, 1973-85*. International Working Group on Value Theory mini-conference at the Eastern Economic Association, New York, N.Y.

Papadimitriou, D. B., Ed. (1992). *Profits, deficits and instability*, Macmillan.

Singh, A. and G. Whittington (1968). *Growth, profitability and valuation*. Cambridge, Cambridge University Press.

Stigler, G. J. (1963). *Capital and rates of return in manufacturing industries*. Princeton, Princeton University Press.

Appendix A

Table 1

Key	Type	Description and notes
P_1	flow	no depreciation Gillman describes this as the 'traditional' Marxist measure
P_2	flow	with depreciation
P_3	stock	fixed capital only
P_4	stock	fixed and circulating constant capital
P_{5s}	stock	fixed capital, diminished *s* (unproductive labour is deducted from profits) Glick also tests this, as his Value Line measure 8 ($Glick_8$)[7]. He describes this as an 'approximation of the "marxist" ratio of total surplus value divided by fixed capital' and notes that this is not a convincing candidate for equalisation
P_{5f}	flow	depreciation, diminished *s* Not actually calculated by Gillman, but mentioned as a possibility, though he claims that it is 'less pertinent' to the practical operation of capitalist enterprise; thus we add *s* and *f* to the subscripts
P_6	flow	augmented c *(and* diminished *s)* Here Gillman tests the effect of considering unproductive expenditure as a form of circulating constant capital. *Note* that although his text suggests (p.98) that he intends to augment *c instead* of diminishing *s*, it is clear from line 8 of his Table I (p.99) that he in fact calculates it as shown in Table 2, this Appendix, which does seem the appropriate method; see also lines 13-17 of Appendix 5, where the full results are reported
P_{7s}	stock	diminished *s* with taxes Gillman describes this as the 'capitalist' measure; he calculates this for three years only, reported in Table K, p.102
P_{7f}	flow	diminished *s* with taxes Not discussed or calculated by Gillman, but included for comparison with P_{5s} and P_{5f})
P_{ORE}	stock	Operating return on equity Financial accounting texts take profit before tax and interest in this and the following measures; when Glick refers to 'profit' he means *after* tax and interest, and adds them back as necessary. Thus $Glick_6$ differs from the present one in excluding tax and interest from the numerator
P_{ROCE}	stock	Return on capital employed $Glick_2$ and $Glick_4$ take capital as being (net plant + inventories + cash); $Glick_4$ is profit after tax and interest, while $Glick_2$ adds back interest and is thus the closest approximation here
$P_{AsstTurn}$	flow	Asset turnover
P_{NPM}	stock	Net profit margin $Glick_7$, qualified as for $Glick_6$

[7] Numbering refers to tests in Glick's main text, not his appendices.

Table 2

Profit measure	Construction using FAME variables	FAME variables
P_1	(TURN + COST)/COST	CASS Current assets (STWI plus cash and short-term debtors and investments)
P_2	(TURN + COST – DEPR)/(COST + DEPR)	COST Cost of sales (direct production costs)
P_3	(TURN + COST – DEPR)/(TASS)	DEPR Depreciation charge
P_4	(TURN + COST – DEPR)/(TASS + STWI)	FASS Fixed assets (tangible assets plus intangibles and investments)
P_{5s}	(TURN + COST – DEPR + OTHE)/(TASS + STWI)	OTHE Other expenses (overheads)
P_{5f}	(TURN + COST – DEPR + OTHE)/(COST + DEPR)	PRAT Profit after tax, or 'net profit'
P_{6*}	(TURN + COST – DEPR + OTHE)/(COST – OTHE)	SHFU Called-up share capital plus reserves
P_{7s}	(TURN + COST – DEPR + OTHE – TAXA)/(TASS + STWI)	STWI Stocks and work in progress
P_{7f}	(TURN + COST – DEPR + OTHE – TAXA)/(COST + DEPR)	TASS Tangible assets (depreciated value of plant and equipment)
P_{ORE}	PRAT/SHFU	TAXA Taxation charge
P_{ROCE}	PRAT/(FASS + CASS)	TURN Turnover (sales)
$P_{AsstTurn}$	TURN/(FASS + CASS)	*Note* that COST and OTHE are given as negative values in FAME, hence the counter-intuitive construction of the items in which they appear
P_{NPM}	PRAT/TURN	

Table 3 One-digit sectors and two-digit manufacturing industries in the 1981UK SIC classification

0	Agriculture, forestry and fishing	
1	Energy and water supply industries	
2	Extraction of minerals and ores other than fuels; manufacture of metals, mineral products and chemicals	
	22	Metal manufacturing
	24	Manufacture of non-metallic mineral products
	25	Chemical industry
	26	Production of man-made fibres
3	Metal goods, engineering and vehicles industries	
	31	Manufacture of metal goods not elsewhere specified
	32	Mechanical engineering
	33	Manufacture of office machinery and data processing equipment
	34	Electrical and electronic engineering
	35	Motor vehicles and parts
	36	Other transport equipment
	37	Instrument engineering
4	Other manufacturing industries	
	41	Food, drink and tobacco (a)
	42	Food, drink and tobacco (b)
	43	Textile industry
	44	Manufacture of leather and leather goods
	45	Footwear and clothing
	46	Timber and wooden furniture
	47	Manufacture of paper and paper products; printing and publishing
	48	Processing of rubber and plastics
	49	Other manufacturing industries
5	Construction	
6	Distribution, hotels and catering; repairs	
7	Transport and communication	
8	Banking, finance, insurance, business services and leasing	
9	Other services	

Appendix B: charts

Whole-economy distributions

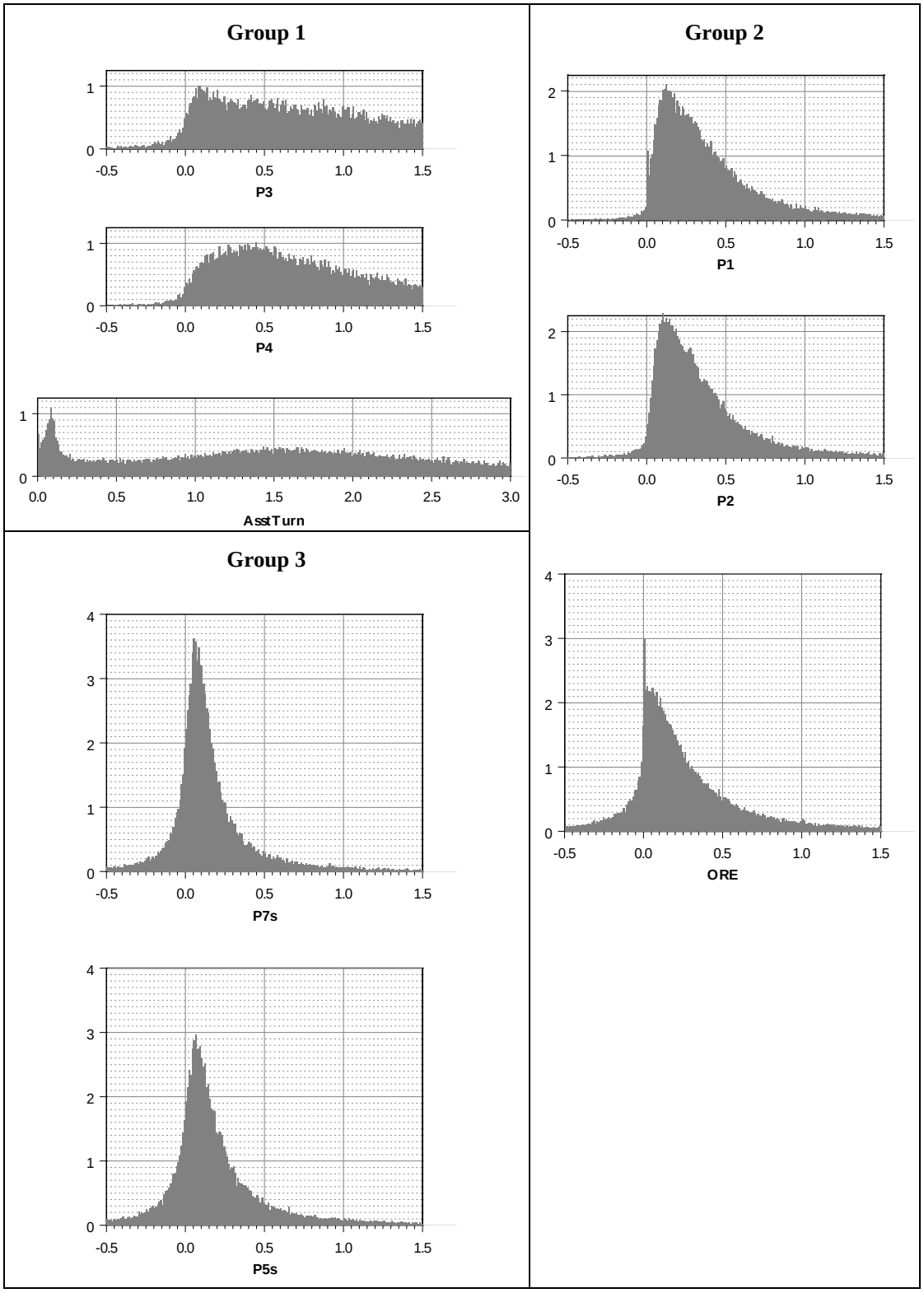


Figure 1

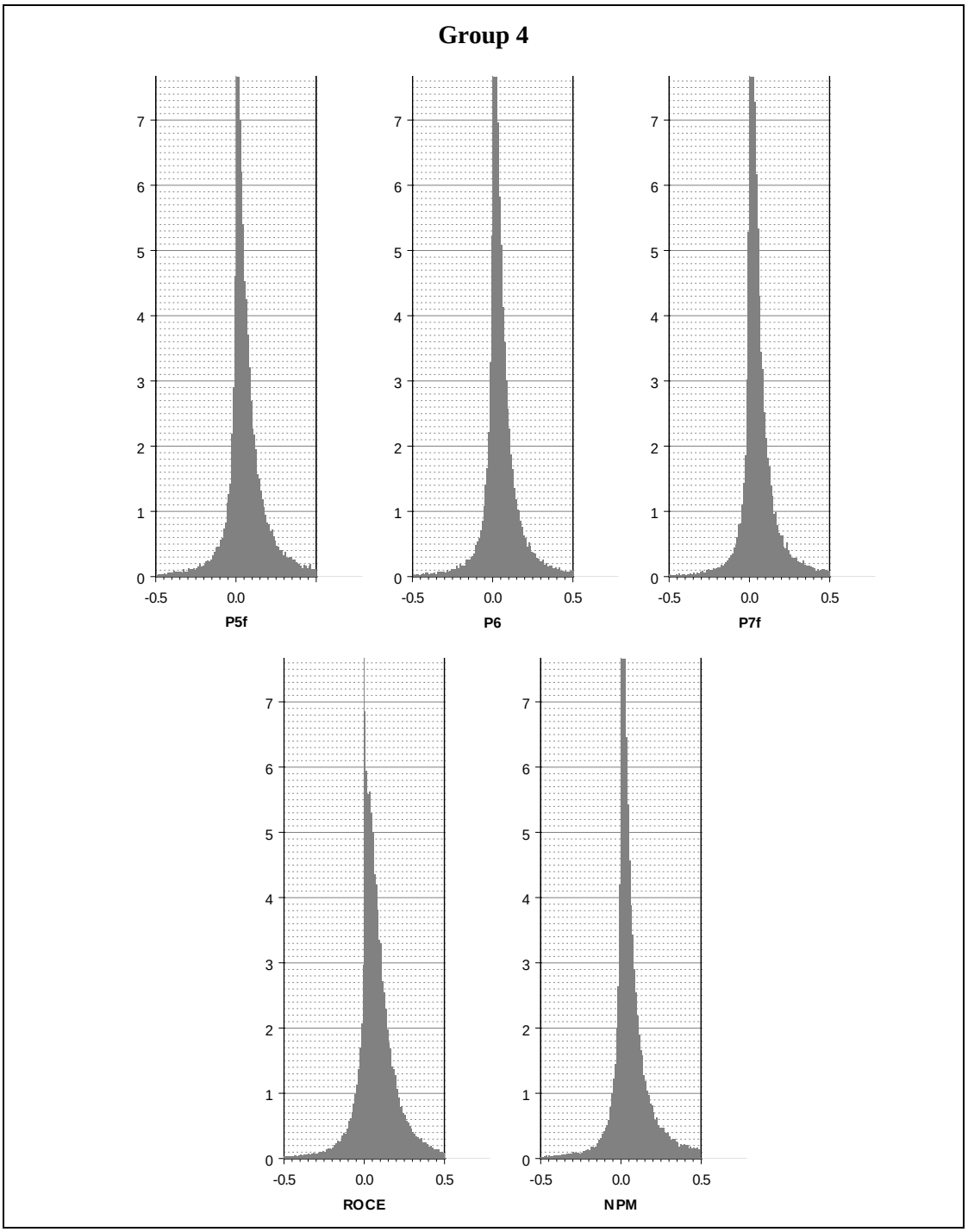


Figure 2

One-digit SIC sector distributions

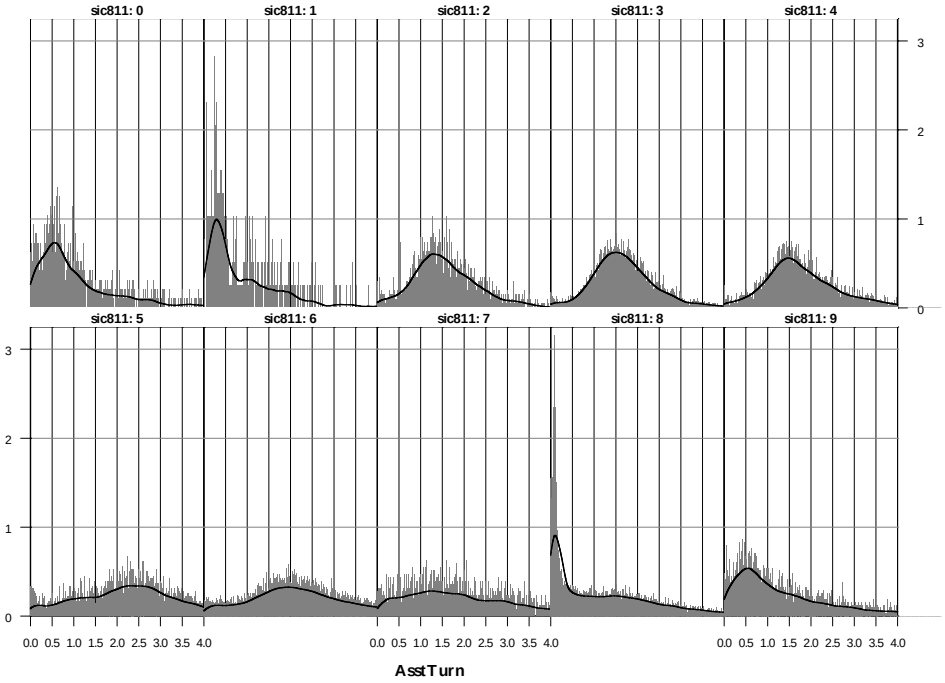


Figure 4

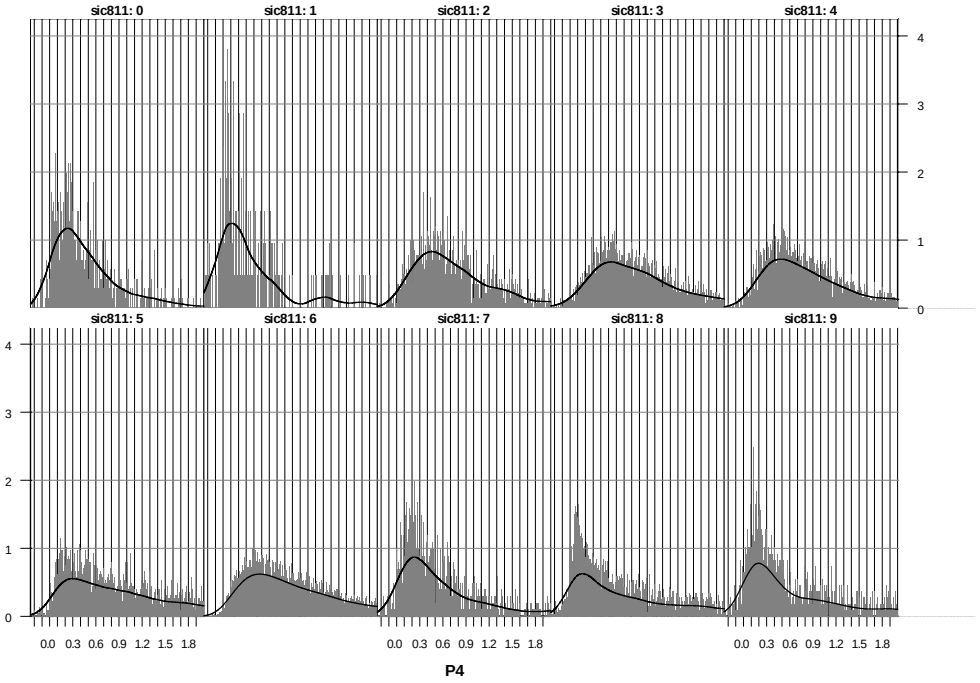


Figure 5

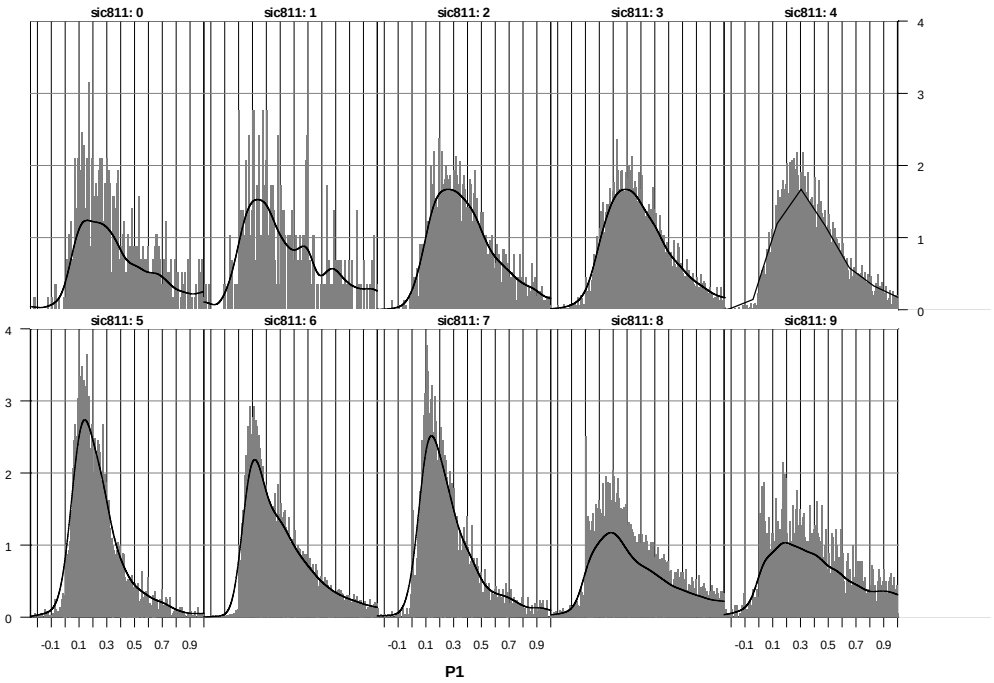


Figure 6

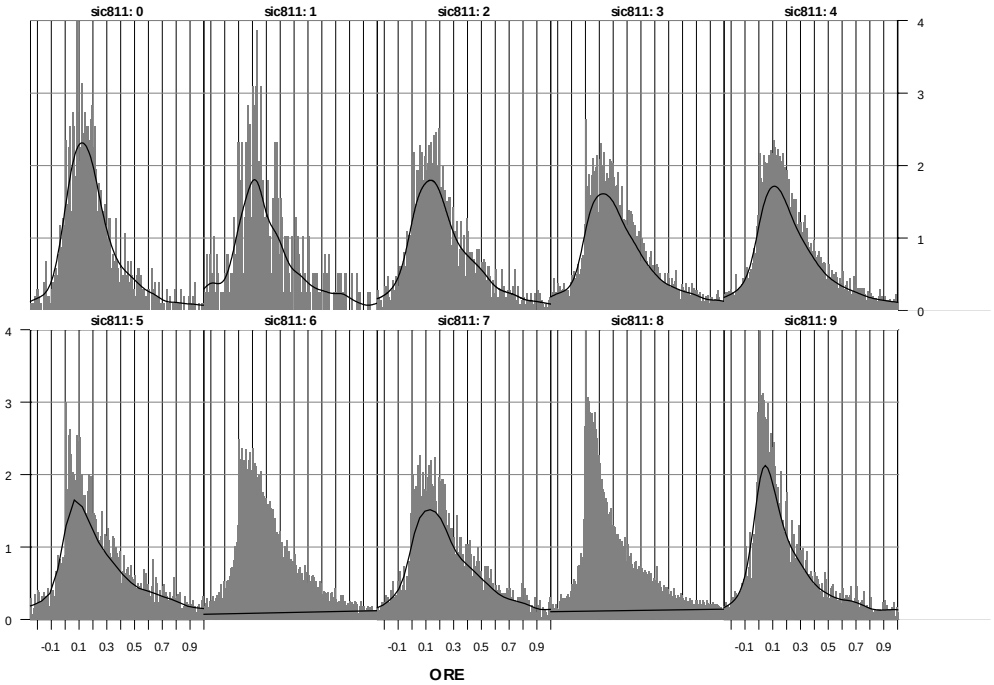


Figure 7

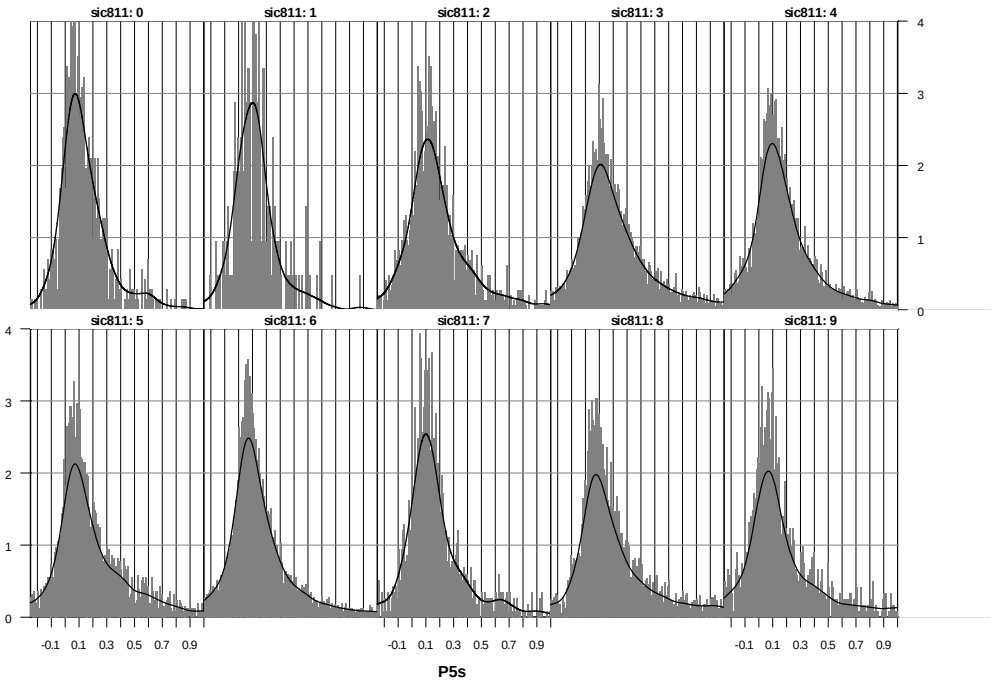


Figure 8

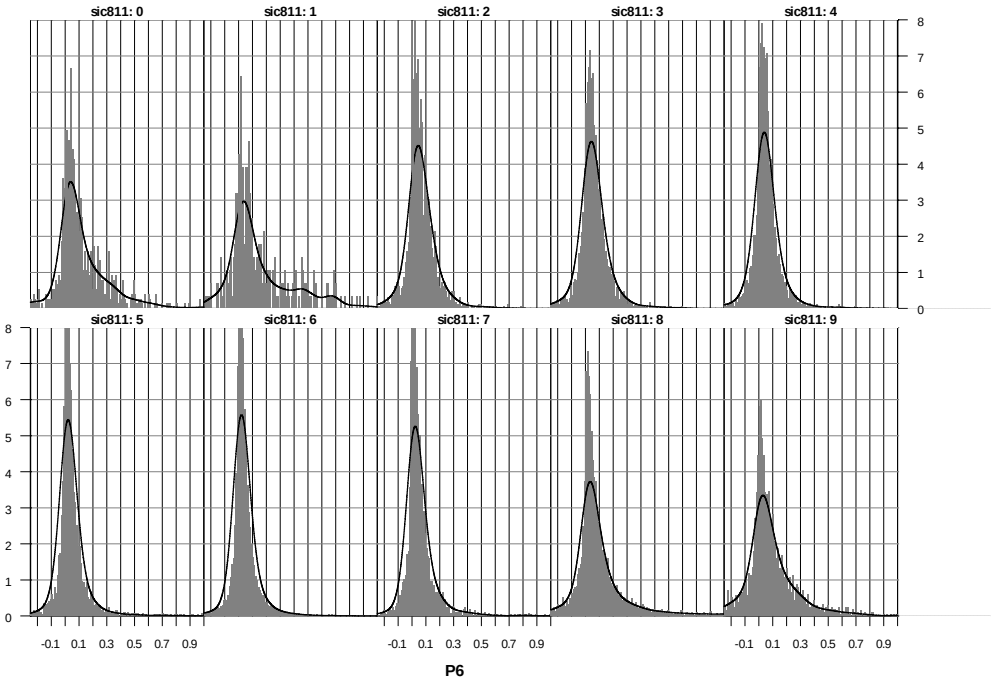


Figure 9

Two-digit SIC industry distributions

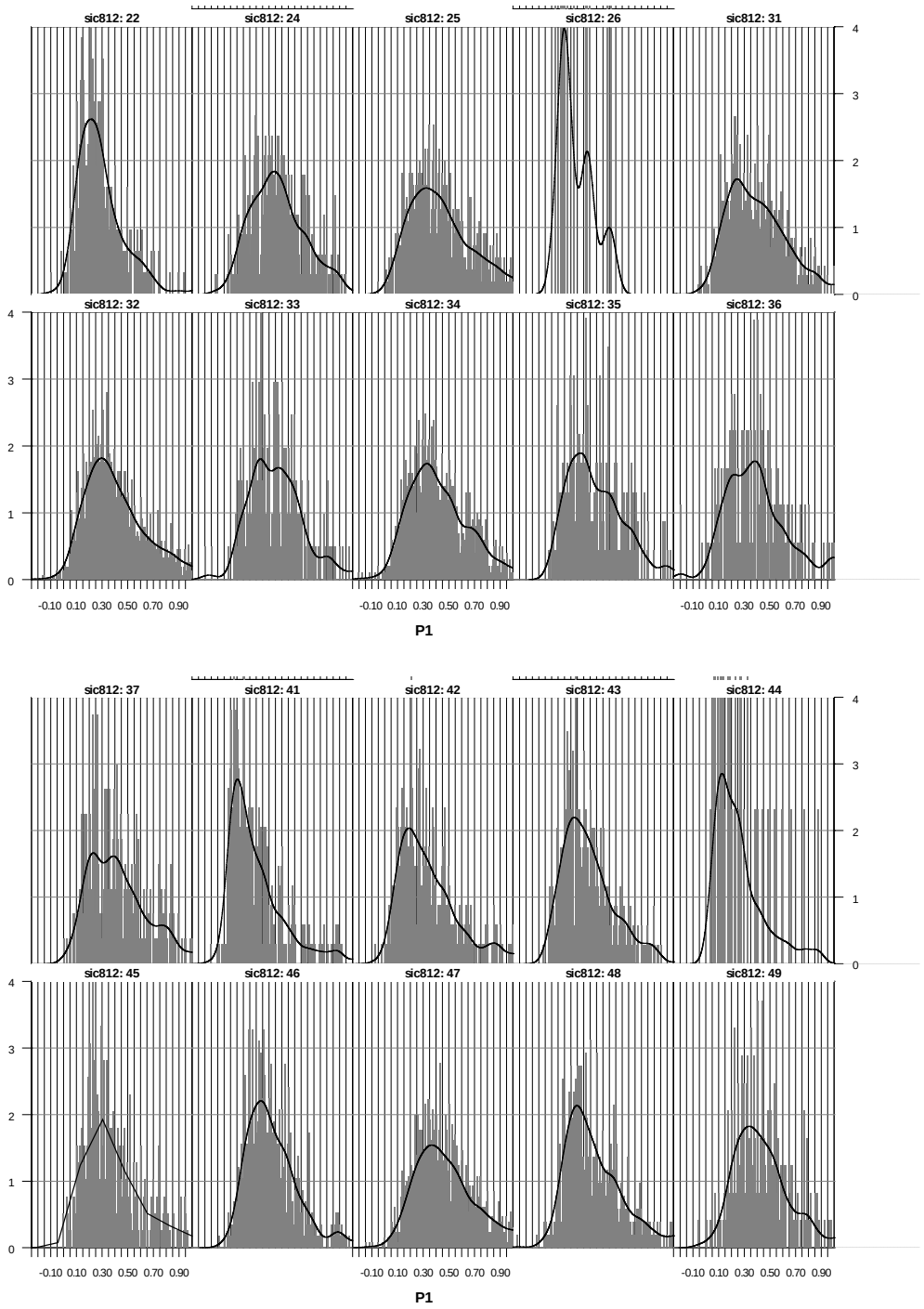
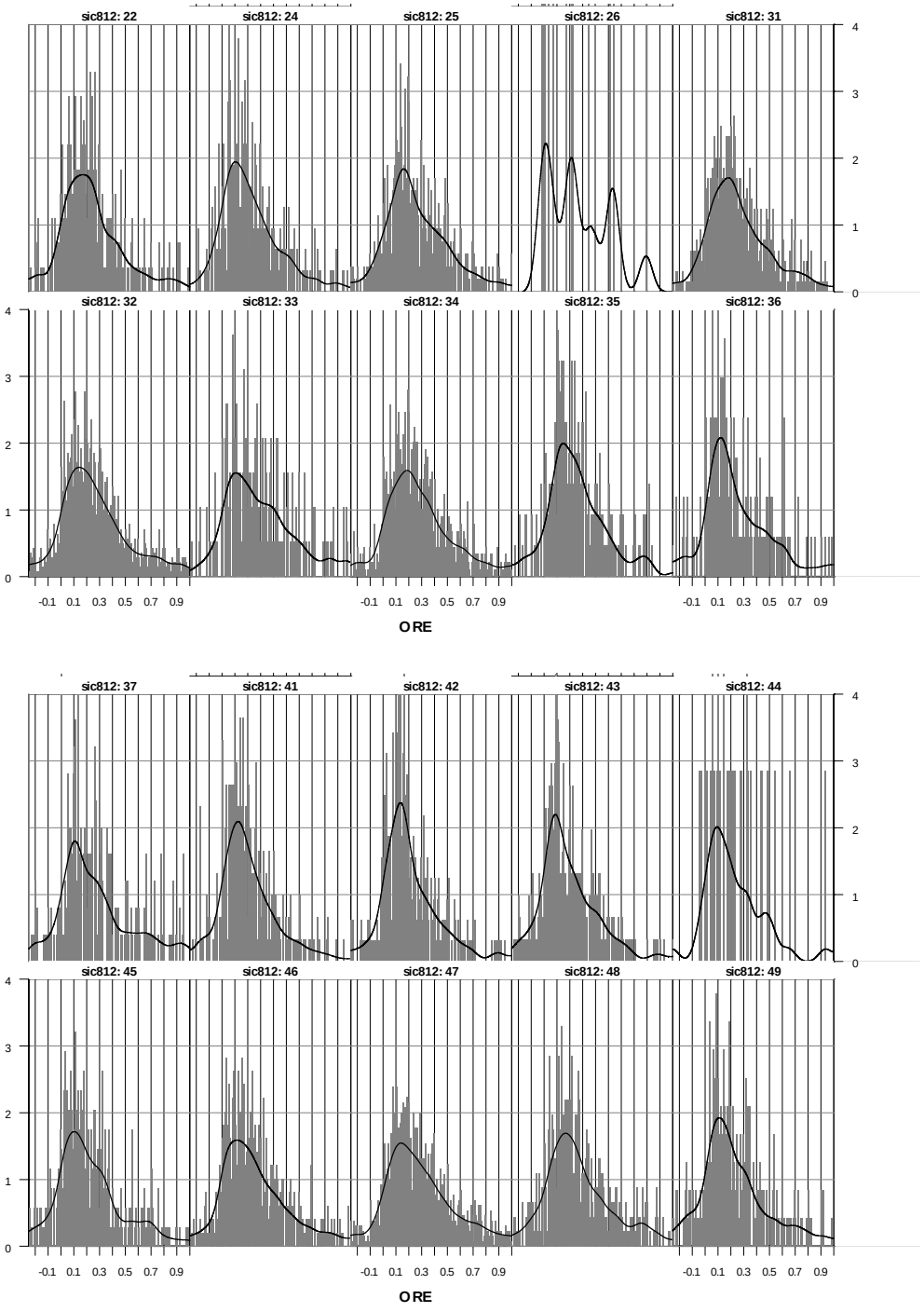


Figure 10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sic812: 41
sic812: 42
sic812: 43
sic812: 44
sic812: 45
sic812: 46
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sic812: 48
sic812: 49
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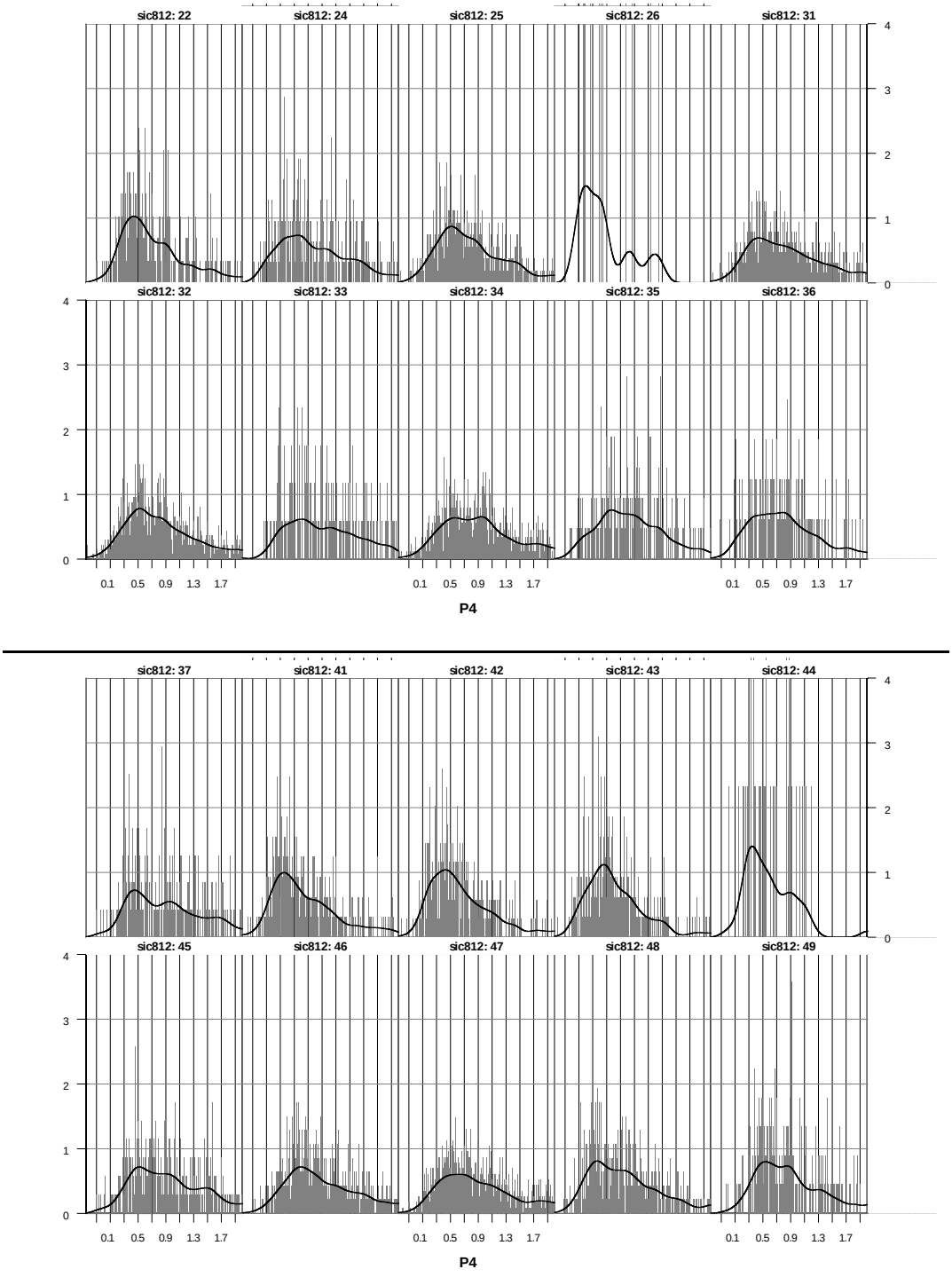
1
2
3
4
-0.1 0.1 0.3 0.5 0.7 0.9
ORE

Figure 11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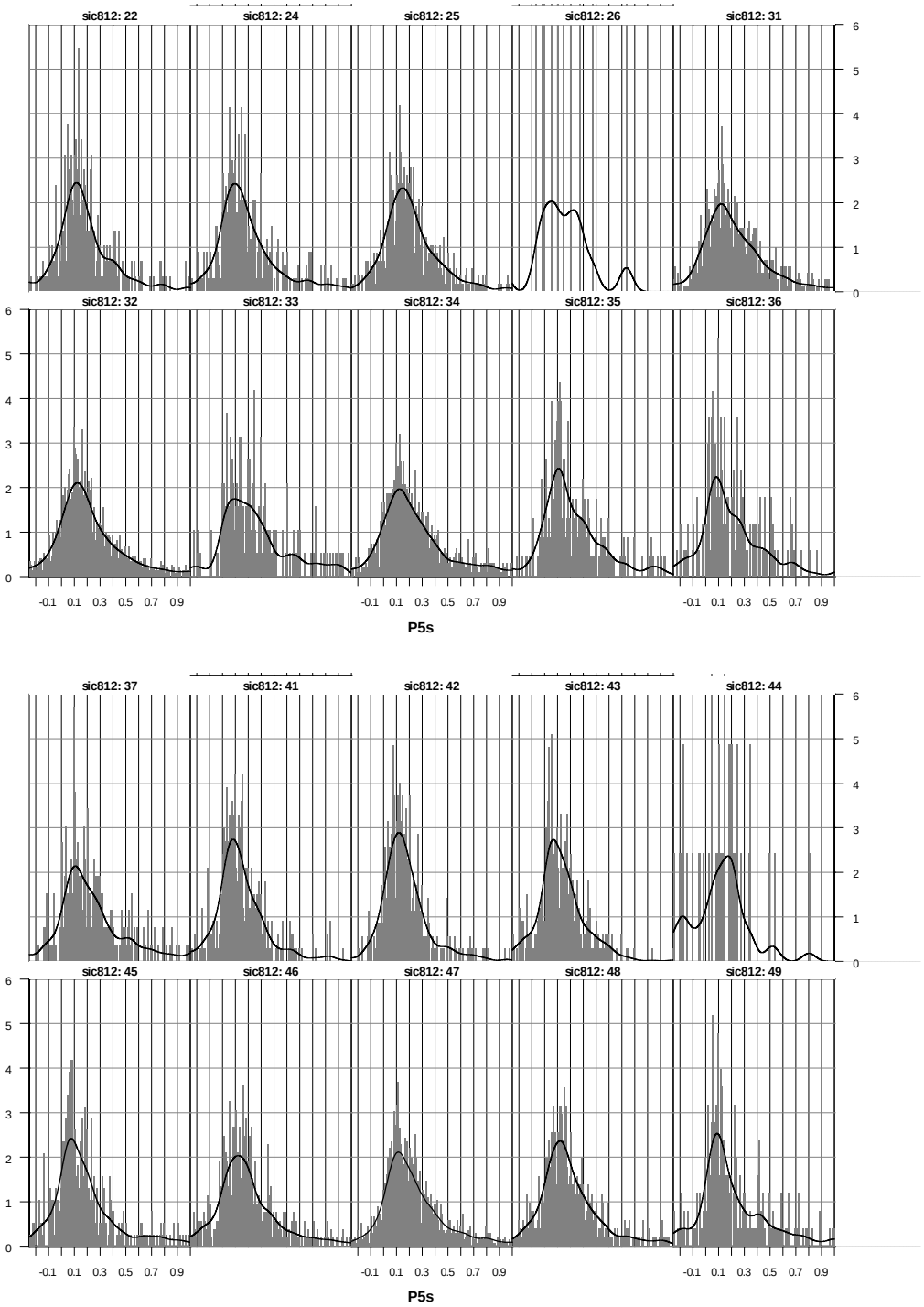
0.1
0.5
0.9
1.3
1.7
P4

Figure 12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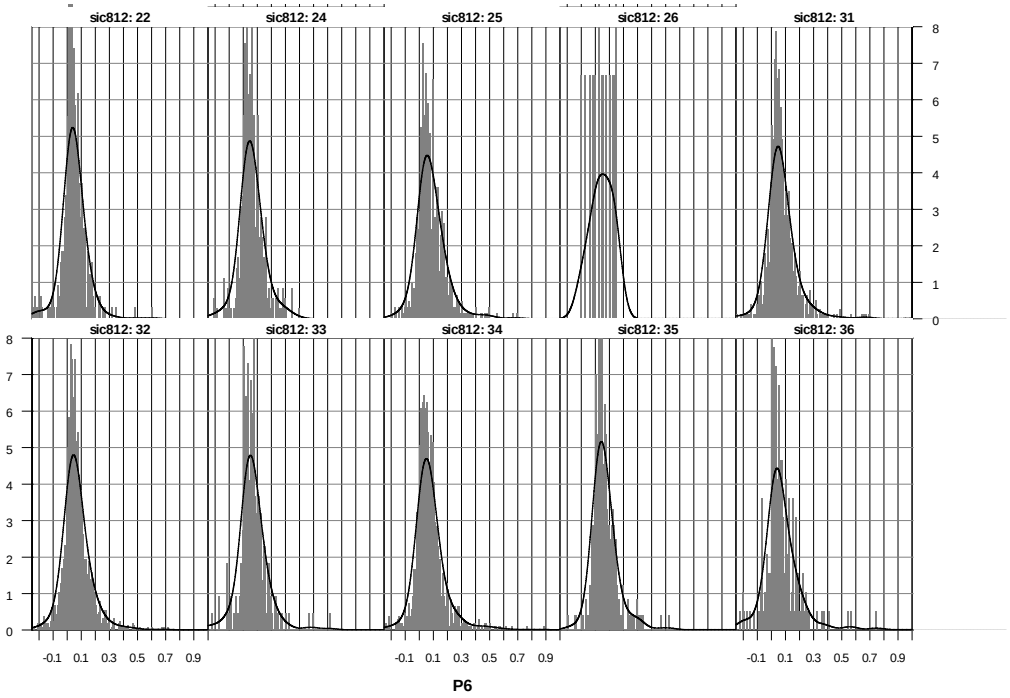
P5s

Figure 13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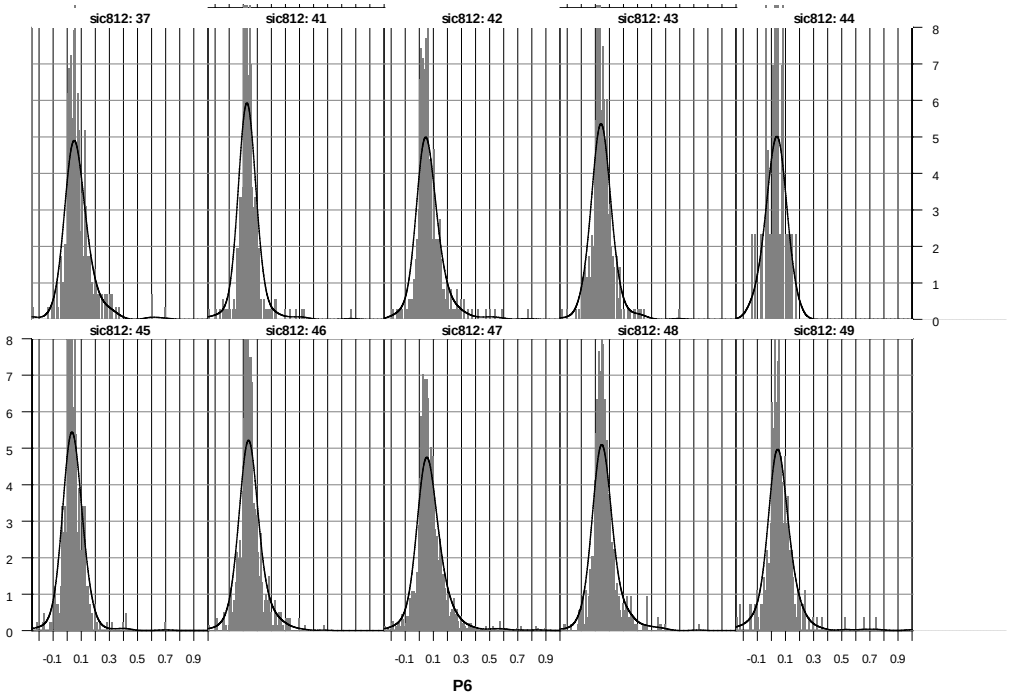
-0.1 0.1 0.3 0.5 0.7 0.9
P6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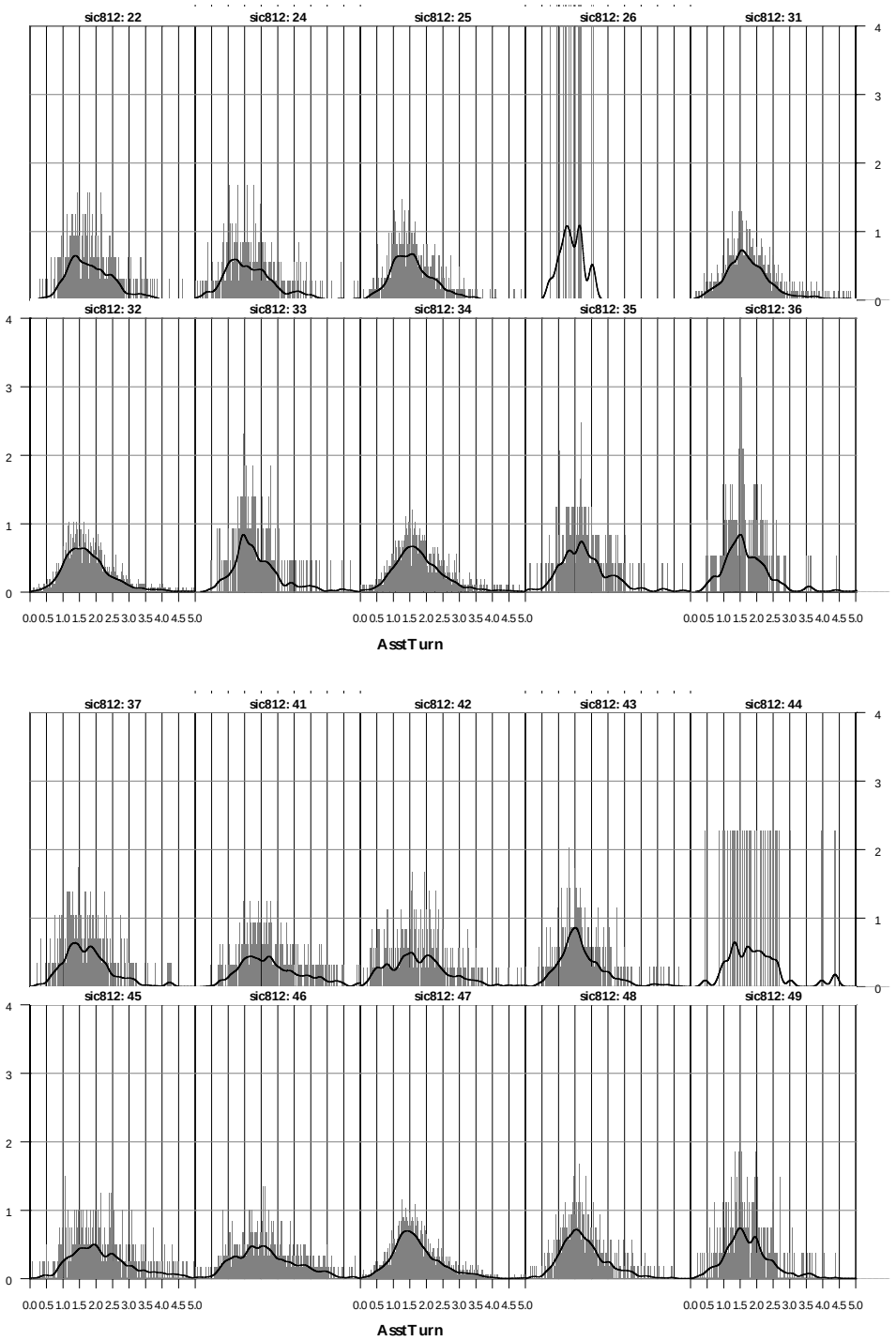
P6

Figure 14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sic812: 41
sic812: 42
sic812: 43
sic812: 44
sic812: 45
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sic812: 48
sic812: 49
AsstTurn
AsstTurn

Figure 15

Capital-weighted profit-rate distributions

Group 1

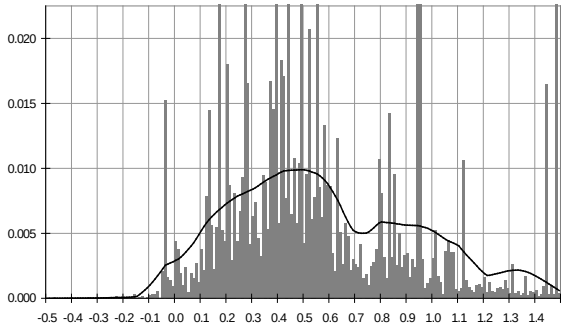

Figure 16: R_4

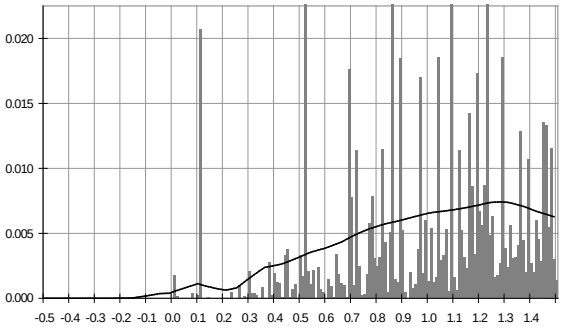

Figure 17: $R_{AsstTurn}$

Group 2

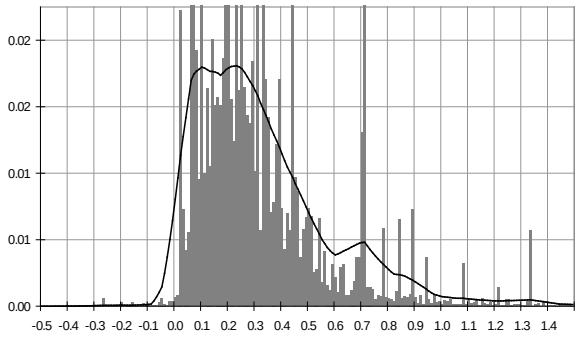

Figure 18: R_1

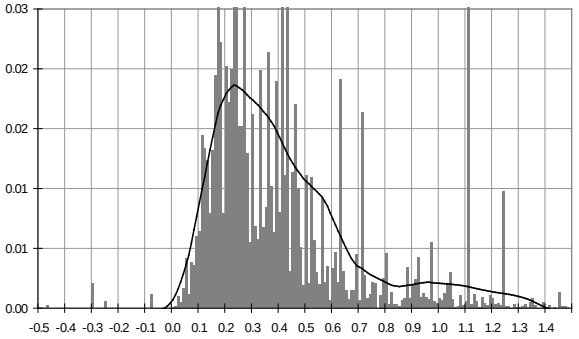

Figure 19: R_{ORE}

Group 3

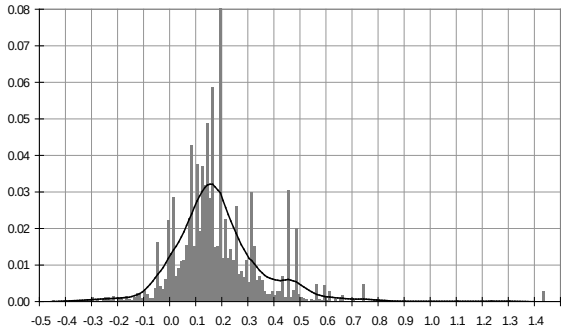

Figure 20: R_{5s}

Group 4

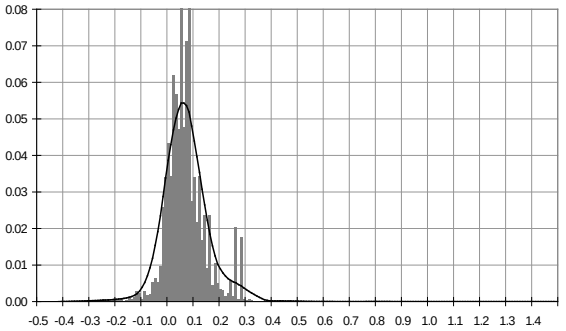

Figure 21: R_6