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Industry Premium: What we Know and What The New Zealand Data Say

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INDUSTRY PREMIUM: WHAT WE KNOW AND WHAT THE NEW ZEALAND DATA SAY

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Abstract

This paper critically reviews conventional explanations of why the individual income reflects an industry premium. It presents four facts about industry premiums in New Zealand to highlight the limitation of those explanations. In particular, it suggests that competitive theories that refer to unobservable characteristics or compensating wage differentials are too broad and non-competitive theories that rely on the efficiency wage hypothesis are too narrow to successfully explain what the New Zealand data reveal. Employees receive industry premium, but so do the self-employed, and do so more than the employees if uneducated; but the premium-difference falls as the education level rises.

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1. Introduction

The notion that some industries may pay more than others for observationally identical workers has been noted for the United States since the 1950s[2]. At different periods of time several econometric studies report similar findings in other countries as well. This paper too supports the finding using the data on the New Zealand industries for several periods between 1986 and 1996 (See, e.g., Tables 1-2, 4-5). It, however, critically reviews what we know about how to explain the industry premium. In addition, the paper reports new regularities in the pattern of the industry premium in New Zealand by comparing the earning profiles of the self-employed with the employees. It argues that what we know provide no satisfactory explanation of what we observe in the New Zealand data.

For example, competitive theories explain industry premium by referring either to returns to individual specific factors that an econometrician cannot easily observe (see, e.g., Murphy, Kevin M. and Topel, 1987); or returns to compensating differentials (Abowd, and Ashenfelter, 1981). Those explanations, however, are too broad to provide a satisfactory explanation of the specific regularities that we identify by comparing the pattern of industry premiums received by the employees and the self-employed in New Zealand. After all, New Zealand industries too, like the US, Canada and Sweden, add a similar pattern of premium to individual income even after we control for a large number of individual characteristics. Another specific regularity in the New Zealand industry data is that one receives relatively larger industry premium as an employee rather than as a self-employed if and only if one's

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[2] Slicther (1980) reports that average hourly earnings of unskilled workers vary across manufacturing industries.

education level is sufficiently high. This feature is robust across all industries. Consequently, they call for a more specific explanation than a generic proposition about the nature of competition that always vacuously holds. Krueger and Summers (1988) argue that the non-competitive theories based on the efficiency wage hypothesis such as Shapiro and Stiglitz (1984) and Akerlof and Yellen (1986) provide more specific and better explanations of industry premium than those generic competitive theories. Those non-competitive theories identify industry premium as the efficiency wage premium that a profit-maximising firm pays to its employees over and above the market clearing wage rate in the economy. Certain features of the New Zealand industry data that the paper presents pose serious problems even with those explanations. Our empirical investigation of the data collected by Statistics New Zealand reveal that even the self-employed receive industry premiums similar to the employees. The self-employed need not pay themselves efficiency wages nor the firms need to pay them an efficiency wage like the other employees! A self-employed in New Zealand is either his/her own employer or works for other employers or firms based on short-term contracts. Firms can observe the productivity of a short-term contract worker relatively more easily than the same of its employees on an individual basis. The difficulty of disentangling individual contribution in the production process organised by a group of employees under the umbrella of a firm is usually not there when it negotiates a contract with a self-employed. In addition, a firm can design a contract a self-employed based on his/her output instead of total hours of work, which is usually the basis of the contract of an employee. Consequently, a firm is not likely to have to pay an efficiency wage to a self-employed. Besides, self-employed individuals clearly would not need to pay themselves efficiency wage! It

seems, therefore, that the efficiency wage based explanation of the industry premium is too narrow to explain what the New Zealand data say.

The paper is organised as follows. Section 2 is a survey of literature to provide a critical review of the conventional explanations of interindustry earning differentials. Section 3 describes the available data and methodology. Section 4 summarises a set of facts regarding the interindustry income differentials in New Zealand. Section 5 includes possible explanations of those facts based on a narrowly defined competitive theory. Tables and charts are included in the Appendix followed by the list of reference.

2. INDUSTRY PREMIUM: WHAT DO WE KNOW

Competitive Theories

A competitive theory explains interindustry wage differentials by referring to returns to unobserved skills or compensating differentials. It implies a self-selection bias in the data such that unobserved differences in characteristics overstate the importance of industry premium in cross-sectional studies. Essentially, the differentials exist because of a failure to correctly control for these factors. If identical individuals do receive unequal compensations then the theory suggest vacuously that there must be negative or positive attributes associated with working in an industry. In the latter case, the theory relies on the idea of compensating differentials. For example, theory explains why the average university graduate earns more as a banker than as a teacher by suggesting that the average university graduate would be happier to work as a teacher than as a banker and, therefore, the banking industry adds a compensating differential. In the following paragraphs we critically review how well the

competitive theories based on the twin hypotheses of *unobserved ability* and *compensating differentials* explain the reported industry premium.

Unobserved Ability

Heckman and Sedlacek (1985) argue that with limited data in cross sectional regressions we typically omit several variables related to individual productivity. Consequently, we do not capture a large amount of heterogeneity. Self-selection bias occurs when workers receive higher wages based upon unobserved characteristics that improve their productivity, and on this basis they choose which industry to work in. They do not receive higher wages because of the industry but because of higher skills and productivity. In the context of interindustry wage differentials this means that if the variables not measured by the econometrician not only increase productivity but are also correlated with the industry classification, then positive returns to skill will be misinterpreted as returns to industry.

Murphy and Topel (1987) attempt to explain the observed industry premium as returns to unobserved ability. They control for unobserved characteristics by using longitudinal data and run regressions of the wages of industry and occupation movers on experience plus the wage change implied from a cross-sectional regression with industry-occupation dummy variables. They find that industry switchers receive only 36.5% of the implied industry occupation differential and 63.5% of industry-occupation wage differentials are attributable to unobserved ability. They conclude that unobserved ability is an important factor that could explain most of the interindustry wage differentials. Murphy and Topel's results have faced several criticisms, however. Blackburn and Neumark (1992) claim that Murphy and Topel's

sample was unrepresentative, since it included only those workers who did not change residence. Katz and Summers (1989) claim that the results regarding the change of industry affiliation are biased, because Murphy and Topel's data rely on the primary industry affiliation for the previous year and the worker's earnings for the current years over all jobs. The annual earnings measure to construct the wage variables for the wage differential regressions are likely to contain estimates for the same job. Consequently, it is likely to have a downward bias on industry affiliation.

Critics point out that the unobserved ability hypothesis cannot, however, explain the puzzle of premiums being paid across occupations such as reported in Groshen (1991) unless higher skills are required in all jobs in some industries. Dickens and Katz (1987) too criticised Murphy and Topel for not separating industry and occupation effects. If individuals are promoted to higher paying occupations they tend to move from relatively high paying job in their old occupation to a relatively low paying job in their new occupation. Their wage would not change by the full difference in the average of the two. Too much of the change may be attributed to occupation. Gibbons and Katz (1990) examine the unobserved difference hypothesis using a sample of exogenous job changes from the 1984 and 1986 CPS displaced worker surveys. They rejected the hypothesis that the majority of interindustry wage differentials can be explained by unobserved ability. Dickens and Katz (1987) identify that the average years of education, capital-labour ratio and profitability in the industry is positively correlated with the industry premium. A competitive theory based on unobserved ability hypothesis can explain the correlation between capital intensity and industry premium only if more capital requires higher skilled workers to

operate the equipment. The theory cannot explain, however, the correlation between profitability and wage structure.

Compensating Differential

Besides the unobserved ability hypothesis, a competitive model based on compensating wage differentials as originally suggested by Adam Smith in 1776 can also explain interindustry wage differentials. Wages differ because of differing non-monetary costs and benefits associated with the job. This theory predicts that high wage industries offer jobs with negative attributes. Abowed and Ashenfelter (1981) conclude that the characteristics of contracts regarding the nature of the risk of unemployment, durability and flexibility can generate interindustry wage differentials. Empirical studies such as Murphy and Topel (1987) and Krueger and Summers (1988), however, argues that a significant part of the industry wage differentials remain unexplained even after controlling for those characteristics of the contracts. Also, Hwang, Reed and Hubbard (1992) report a serious bias due to the inability to observe worker's full market productivity in the conventional estimates of the compensating wage differentials. A further competitive explanation is that the interindustry wage differentials are transitory due to shifts in labour demand across industries. However, studies done on different countries and at different periods of time (see Table 1) report a striking similarity of the pattern of interindustry wage differentials. Consequently, those reports cast doubts over the suggestion that industry premiums reflect transitory shifts in demand.

Mixed support for competitive models of wage determination has led some writers to consider models based on the efficiency wage hypothesis:

Efficiency Wage Theories

Non-competitive theories based on the efficiency wage hypothesis such as Shapiro and Stiglitz (1984) and Akerlof and Yellen (1986) explain the industry premium as an equilibrium phenomenon. In their models firms find it profitable to pay an efficiency wage premium to its workers over and above the market clearing wage rate in the economy. The premium typically depends on the characteristics of the firms, which are similar within an industry and vary significantly across different industries. Workers may attempt to change their wage just by switching across industries but a firm that pays a higher efficiency wage premium does not find it profitable to employ workers from other industry at a lower wage. Consequently, the interindustry wage differentials persist.

Various studies in different countries follow Krueger and Summers (1988) who interpreted the interindustry wage differentials as possibly caused by interindustry variations in the efficiency wage premium. Other researchers such as Leonard (1987), and Groshen and Krueger (1990) report evidence on the efficiency wage premium via case studies. There is, however, no consensus regarding how to rationalise the characteristics of interindustry wage differentials reported in the literature within a single model of efficiency wage.

There are several versions of efficiency wage models: Shirking models are based on the idea that firms have difficulty monitoring their workers. In the competitive model if workers are fired for shirking, they can easily find another job and, therefore, imperfect monitoring implies shirking. To prevent workers from shirking firms pay an efficiency wage premium above the market-clearing wage. The paper by Shapiro

and Stiglitz (1984) is an example of such a model. In their model, even with identical workers, industry heterogeneity leads to a wage distribution. This model explains observed interindustry wage differentials and the positive correlation of industry premium with its capital intensity. In particular, the model suggests that a higher capital intensity implies more use of machinery and hence harder to monitor workers' activities and that in turn leads to a higher industry premium. This model cannot explain, however, why interindustry wage premiums are paid across occupations. If it is difficult to monitor factory workers, it does not mean that it will be difficult to monitor the clerical workers in the same industry. In turnover efficiency wage models such as Salop (1979) firms minimise turnover costs such as cost on the job training by paying a wage above the competitive level. Positive wage premiums in this type of model are paid by industries that face the highest turnover costs. These models can explain the positive correlation between industry premium and capital-labour ratio but fails to explain why the premiums do not vary significantly across occupations. Training costs are likely to be very different across different occupations.

In sociological models of efficiency wage such as Akerlof (1982) and Akerlof and Yellen (1986) workers' effort depend on the perceived fairness in the system. A worker gives a "gift" in the form of increased effort to the firm and the firm gives a "gift" of a higher wage. If the wage is below the "fair wage," then workers supply less effort. If the industry must pay a high wage to some of its workers, either because of high skill or because of their scarce supply, it may lead to all workers receiving higher wages, based on the notion of fairness. Thus this class of models can explain why profitability is related to wage premium or why different occupations in the same industry appear to have the same wage premium. The model cannot explain,

however, why industry premiums are correlated to capital-labour ratio and the average level of education. Also, Moll (1993) points out that fairness is not a likely candidate for explanation under the apartheid regime in South Africa where "near-powerless African workers managed to secure industry wage differentials of approximately the same magnitude in percentage terms as their white overlords."

Theoretically, therefore, a non-competitive theory based on the efficiency wage hypothesis is wanting in providing a satisfactory explanation for the industry premium puzzle. Nevertheless, even if we accept the theory as a reasonable explanation of industry premium for the employees, we would have hard time using any version of it to explain what the paper reports about the New Zealand industry data in the following two sections.

3. DATA AND METHODOLOGY

In this section, we begin by describing the nature of available data and the statistical procedure that we follow to compile those stylised facts. In Section 4 we examine a set of stylised facts compiled from various data sources in New Zealand regarding the industry premium that both the employees and the self-employed share together. We also report any obvious differences of industry premium between these two groups and how they are related to other economic factors.

Data Sources

The paper utilises data mainly from the Census data for the years 1986, 1991 and 1996. The Census data provide information on total income for the broadest range of

individual characteristics. Income in the census data, however, is a category variable that takes values from a finite number of intervals. Also, the Census income data may include non-labour income and transfer payments. Unfortunately, there is no other source that provides a better data on income for sufficiently broad range of individual characteristics necessary for this study. For example, the Household Labour Force Survey collects data on broad range of individual characteristics but provides no earning or income related data. The Household Expenditure Survey, on the other hand, provides data on earnings per hour. Being a small sample, however, it cannot provide necessary data on a broad range of individual characteristics for our study. We, therefore, do our best to extract data on income from the Census conducted in various years. Following Krueger and Summers (1988), we exclude the upper and lower tails. We assign the midpoint of each interval to the corresponding income category. Inclusion of non-market related benefit payments in income is an obvious problem with the data. To address this problem we check the sensitivity of our statistical findings by comparing our inferences regarding the whole population with the subset of individuals who have not received any benefits. Another problem with using the total income data is that we may overlook the variation of hours of work as an important source of the variation of the total income. In the absence of data on earning per hour in the Census, we create data on "productivity" by taking the ratio of total income and total hours and compare them with the HES data on earning per hour for broad categories of individuals to determine the sensitivity of our inferences. We then compare inferences derived from the total income data and that derived from the "productivity" data and report only when they are robust.

Industry Premium as Point Estimates

We pursue two different methods for estimating the industry premium and compare them to examine the robustness of the statistical findings. One involves a point estimation of the mean of a variable while the other involves the ordinary least square estimation of an earning function following Krueger and Summers (1988). First we use 1991 Census data to calculate point estimates of the mean income per hour as a measure of labour productivity for 151 types of individuals based on their highest educational attainment, age, benefit-status and industry affiliation. We then take the difference between the point estimate of the mean income per hour for a specific type of individuals defined by their age, highest educational attainment and benefit-status in a specific industry and the same for that type in the whole economy. We call this difference the productivity differential for an industry or simply the industry premium that a specific type of individuals receives in that industry. We repeat the estimation of industry premium by replacing productivity by income. We do that to examine if the income differentials simply reflect the variation of total hours of work across industries. This procedure is carried out for both the self-employed and the wage and salary earners. We then compare the premiums for each industry across different types of individuals to determine if some industries pay consistently below or above the average for all types of individuals. This approach differs from the conventional method of regression analysis that we also do later on the Census Data for the years 1986, 1991 and 1996. The advantage of the use of full Census data to obtain actual point estimates of the differentials is that it avoids estimation bias due to incorrect model specifications. In particular, assuming the specifications of the earning function do not vary between the employee and the self-employed, we derive by examining the difference of the point estimates of income between the two groups. Those inferences are, therefore, not conditional on any restrictive assumptions on the

functional form and the distribution of residual that typically accompanies any specific method of regression.

Industry Premium as Estimated Coefficients of An Earning Function

Following our analysis of the point estimates of the industry premium we also perform standard regression analysis. Like most other studies on New Zealand data (see e.g. Maani 1997) we rely on an earning function following Mincer (1974). The Mincer's equation models an individual's earning as a function of his life cycle and the level of education. We also control for factors such as gender, ethnicity, occupation that may partially explain the variation of earnings among two individuals who belongs to the same age and education categories. We do that to examine, following the conventional way, if the industry affiliation is a significant determinant of income for both the wage and salary earners and the self-employed. We run regressions of logarithm of income as a function of gender, age, age-square, highest educational attainment, occupation, ethnicity and industry affiliation following the methodology of Kruger and Summers (1988). We do not include total hours as an independent variable since we believe that it is essentially an endogenous variable and is determined by the individual characteristics that we included as exogenous variables. Later we consider a smaller sample that includes only the non-beneficiaries and divide the sample into sixteen sub-samples based on gender, highest educational qualification and employment status. From each of the sub-sample we extract the life-cycle component of the income by running a regression of income on age and age-square and examine the residual. We compare the residuals across the sixteen sub-samples using two-way mixed model procedure and report the results in Table 6.

4. INDUSTRY PREMIUM: WHAT NEW ZEALAND DATA SAY

Fact 1. In New Zealand, the wages and the salary earners receive an industry premium and its pattern is quite similar to what other studies reported for the US (see, Krueger and Summers, 1988), Canada (see, Gera and Grenier, 1994) and Sweden (see, Arai, 1994).

Tables 1-2 illustrate this fact. After analysing the Census data for 1991 Table 1 summarises the high and low wage industries in New Zealand and compare them with what Krueger and Summers (1988) report for the U.S, Arai (1994) report for Sweden and Gera and Grenier (1994) report for Canada. When considering these results it is necessary to remember that the income figures in the Census data include non-wage income that could affect the observations made above. We, therefore, compare the industry premiums calculated from the Census data without controlling for skills with the same calculated by Mitsuhashi (1991) using Quarterly Employment Survey that excludes non-wage income and have no information on skills. Table 2 describes that the industries found to be above or below average by Mitsuhashi are also, with the exception of transport equipment, above or below average from the Census data. The overall correlation between the industry premiums that are calculated from the two data source is high with a correlation coefficient of 0.9532. This suggests that the inclusion of non-wage income is unlikely to have any significant effect on the summary of facts that we stated above.

Fact 2. Individuals classified as the self-employed too earn a similar pattern of industry premium.

Tables 3-6 and Figures 1-2 describe that fact. Using the 1991 census data Table 3 presents industry premium received by 32 different types of individuals categorised by their age group, highest educational attainment and employment status in a few selected industries. We note that the industry premium does not vary significantly between the wage and salary earners and the self-employed irrespective of their other characteristics. Considering fifty two industries at the two digit level from the same data source Figures 1 portrays a picture of significant co-movements of the industry premium between the wage and salary earners and the self-employed for sixteen different types of individuals. We also find following the regression techniques of Krueger and Summers (1988) that industry is a significant determinant of income not only for the wage and salary earners but also for the self-employed. Also, the industry variables usually have the same sign for both groups. These results are robust across three different years of census data: 1986, 1991 and 1996. Table 4 summarises results of regressions using industries at the one digit level and Table 5 does the same but only for the manufacturing industries at the two digit level like Krueger and Summers (1988). Following those regressions we focus on the most recent data from the 1996 Census and subdivide it into sixteen small subsets based on gender, education level and employment status. We then compare the average residual income by industry after extracting the part of the individual income explained by the life-cycle by running an OLS regression of logarithm of income on age, age-square and a constant. We examine the pattern of the average residuals using two-way mixed model procedure and find: (i) in each sub-sample, the mean residuals by industry vary significantly across different industries and (ii) the pattern of the variation does not differ significantly across the sixteen sub-samples. We report a summary of the findings in Figure 2 and in Table 6.

For each type of individual we define the IP-differential between the wage and salary earners (employees) and the self-employed to be the difference of industry premium between the former and the latter for that specific group of individuals. The following two facts characterise how IP-differentials vary among different types of individuals.

Fact 3. Among the individuals with no educational qualification, the IP-differential is negative in all industries; i.e., the self-employed receive a higher level of industry premium than the wage and salary earners.

In other words, the industry premium earned by the self-employed exceeds that earned by the wage and salary earners among the individuals with no educational qualification. The reverse is true for individuals with higher education. Table 7 presents a comparison of the difference of industry premiums or the industry premium differentials (IP-diff) between the wage and salary earners and the self-employed for individuals with different levels of education and for 52 types of industries. We note the differentials are negative for individuals with low level of education. If the industry premium truly reflects the efficiency wage premium that only the wage and salary earners receive then the industry premium (IP) differential should reflect the efficiency wage premium. Why does the IP-differential have a negative sign for the uneducated workers? Don't they receive efficiency wages?

Fact 4: The IP-differential increases in all industries systematically with the highest educational attainment of the individuals.

Table 7 (industries at the 2-digit levels) and Figure 3 (industries at the 1-digit level) motivate the above observation. In other words, the part of the industry premium available only to the wage and salary earners but not to the self-employed increases with their level of education. We note from Table 7 that the industry premium differential increases with the level of the highest educational attainment. We summarise that picture in Figure 3. If we believe that efficiency wage premium increases with skill, the above finding will support that belief. It would, however, conflict with a wide class of conventional efficiency wage theories based on the idea of "fair-wage hypothesis" or "the role of nutrition" or "prevention of shirking". It would also fail to explain why the uneducated individuals couldn't access the efficiency wage premium. Theoretically, it has never been an entitlement of the elite! At the same time we note quite high correlation of IP-differential between types that are "close". Interestingly, we find (see Table 8) that the correlation of IP-differential between two types decreases as the difference between their education levels increases. One may wonder if a positive IP-differential reflects a return to group interaction facilitated by various organisations or firms, among employees with little communication gap or, equivalently, among employees with similar level of education?

5. Possible Explanations of The Facts

We now examine a very narrowly defined competitive story based on a hypothesis of network capital following the idea of Lucas (1988) to provide one explanation of the above four facts. Later we contrast this story with an alternative story based on the efficiency wage hypothesis.

Network Capital Hypothesis

Suppose that to organise production in each industry individuals sort themselves into small groups. We call these groups firms and refer to the members as employees. An employee of each firm interacts or exchanges information with others in the industry under the umbrella of the mother firm. Those interactions generate network capital. The network capital increases with the average human capital of those who interact. Also, homogeneity or clustering of skills or any other factor that removes the barrier to communication augments the volume of network capital in an industry. Part of this knowledge-based capital is non-rival and spills over to boost the average productivity in the economy as in Lucas (1988). We assume, however, that individuals operating in the industry where the network capital originates benefit more than proportionately. Consequently, the total factor productivity of an industry becomes a function of the volume of network capital in that industry[3].

As an employee of a firm that provides the infrastructure for networking in the industry one can appropriate an excludable part of the network capital from an industry. More educated employees can appropriate a higher volume of excludable network capital. Following Neal (1995), we call this excludable part of network capital an industry specific skill. The self-employed individuals who operate without any networking umbrella of a mother firm do not accumulate this skill. They, however, free ride on the non-rival component of the network capital that spills over in the industry. Following the line of Kihlstrom and Laffont (1979) we assume that one must make a discrete occupational choice between self-employment and

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[3] Lucas (1988) teaches us that the total factor productivity depends only on the part of any form of capital that spills over and does not earn its marginal product in the market due to the fact that they are not excludable unlike other inputs such as physical or human capital.

employment in a firm. When choosing an occupation one weighs the loss of utility from organised and often obligatory interactions implied by an employment contract against the benefit of having an access to a network of interaction under the same contract. If the benefit outweighs the utility cost one joins a firm to be an employee. If the cost sufficiently outweighs benefit one may choose self-employment. He does not, however, choose self-employment necessarily. As a self-employed he faces an uncertain income while as an employee he receives a wage commitment. We assume that with more education one tends to be less risk averse because education imparts confidence for undertaking risky projects. One compares the indirect utility from employment at a state when he is indifferent between interacting and not interacting with the expected value of the same from self-employment to choose the appropriate occupation.

Interpreting the Facts

We now review the four facts described earlier to examine how well the network capital and efficiency wage hypotheses explain the NZ data. Either in the case when firms pay industry specific efficiency wage or in the case when individuals interact to generate industry specific non-rival network capital we would expect to observe a stable industry premium as indicated by Fact 1. The efficiency wage hypothesis is, however, neither necessary nor sufficient to explain Fact 2 that suggests a common source of industry premium between the employee and the self-employed. The network capital hypothesis offers one explanation of how that might be possible. The non-rival component determines the common industry premium that both the self-employed and the employees share. Fact 3 questions the merit of identifying the industry premium with the efficiency wage premium, since the uneducated self-employed receive a larger industry premium than the uneducated employees.

According to our story an individual with a lower educational attainment acquires a lower level of excludable network capital. Also, an individual with a lower educational attainment pays a higher risk premium as an employee. It follows, therefore, that the difference of industry premium between the employee and the self-employed turns negative in all industries. Note that both the employee and the self-employed equally share the non-rival component of the network capital. Consequently, it affects the industry premium for both types of occupation but does not affect the industry premium differentials. Thus the property of the model with network capital replicates Fact 3. Finally, the efficiency wage theory of industry premium falls flat facing Fact 4. Contrary to the theory, Fact 4 shows that the difference of industry premium between the two groups varies with individual characteristics. The efficiency wage theory is about discriminating industries; but the Fact 4 implies that all industries reward educated employees their self-employd counterpart. The network capital hypothesis can shed some light here too. As the capital stock of the representative individual of a group increases, his stock of excludable network capital increases, he becomes less risk averse and forgoes a smaller amount of risk premium as an employee. Consequently, the model implies that the gap between the average income of the employees and the self-employed increases in all industries with the highest educational attainment of the representative individual.

An Empirical Test

Lastly, note that according to the efficiency wage theory industry premium represents a barrier to entry to the self-employed. Everything else remaining the same industries that pay large industry premium would also attract a larger fraction of individuals who would remain involuntarily self-employed. On the contrary according to the network

capital hypothesis a large industry premium for the employees signals a large volume of potentially excludable network capital and that encourages a larger fraction of individuals to be employees. Or, equivalently, since the theory does not imply any barrier to entry a smaller fraction of individuals would voluntarily remain self-employment in an industry that pays a larger industry premium to the employees.

The income gap between the employee and the self-employed reflects either the efficiency wage premium or the excludable part of the network premium. It follows, therefore, that in an efficiency wage equilibrium we would find a positive relationship between the income gap and the fraction of labour force who are self-employed and in a network capital equilibrium the relationship would be negative.

Table 9 presents a set of results from an OLS regression to examine the validity of those implications. We divide the population into fourteen groups defined by seven levels of highest educational attainment and two age groups. The ratio $(SE/WS)_i$ denotes the ratio of total number of the self-employed to the wage and salary earners and $(EQ)_i$ denotes the fraction of all wage and salary earners in industry i who belong to a specific group of individuals defined by their level of education and age. For all fourteen types of individuals we get a negative sign against the coefficient of the term SE/WS. We conclude that the data reject the implication of efficiency wage theory of industry premium but cannot reject the implication of the network capital story as an explanation for the industry premium. The variable *EQ*, however, does not seem to be the most appropriate measure for the external effects from interaction among the colleagues. Table 9 reports the estimates of the effect of the externality measured by *EQ* on the income of the wage and salary earners of different types of individuals. Note that, when significant at 90% CI or above, the estimates are generally positive

and large for individuals with higher education and specialised skill such as technicians certificate (TC7). It is also noteworthy that the estimated effect is negative for individuals with no formal qualification. Presumably some formal qualification is necessary for fruitful interaction. On the other hand, for individuals with a specialised skill such as TC7 or a university degree such as BD1 we can attribute about 2-4 percent of industry premium due to the external benefit from the interaction with the peers.

Concluding Remarks

The story of *Network Capital* seems to provide an explanation of the four facts from the NZ data that a story based on the *Efficiency Wage* cannot. Also, the story of *Network Capital* is simpler and more specific than a generic story of *compensating differential* or *unobservable ability*. The latter stories do not produce easily testable restrictions on the data and, therefore, cannot easily be falsified unlike the former. There is, however, not much published literature that offers a comparative study of the interindustry income distribution among the self-employed and the employees for other countries and for different time periods. Hopefully, future research in this area will contribute to a better understanding of the issues raised in this paper.

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Table 1: Coparison of Wage Differetials in Different Countries

INDUSTRY	WAGE DIFFERENTIALS IN DIFFERENT COUNTRIES				
	United States[1]	Sweden(1971)[2]	Sweden(1981)[3]	Canada[4]	NZ[5]
Petroleum	0.37	.....	.....	0.21	0.07
Tobacco	0.34	?	?	0.33	0.07
Mining And Quarrying	0.24	0.02	0.15	0.01	0.15
Storage	.....	.....	.....	0.06	0.13
Transport Equipment	0.19	.....	.....	0.07	0.09
Machinery (excluding electrical)	0.19	?	?	0.01	0.04
Communications	0.17	0.02	0.02	0.11	0.31
Paper	0.14	?	?	0.12	0.01
Instruments	0.14	.....	.....	.....	0.15
Other Transport	0.13	0.04	0.03	0.09	0.03
Construction	0.13	0.03	0.08		0.04
Electrical Machinery	0.11	.....	.....	0.03	0.01
Electricity, Gas and Heating	.....	0.07	0.05	0.14	0.18
Printing	0.09	.....	.....	0.06	0.16
Insurance	0.07	0.06	0.06	?	0.22
Professional Services	0.06			0.17	0.21
Hospitals	0.06				.....
Food	0.06	?	?	-0.04	0.07
Rubber	0.05			0.07	0.07
Lumber	0.00	-0.05	-0.06	0.19	0.07
Business Services	0.00	0.06	0.06		0.16
Furniture	-0.01	.....	.....	-0.14	0.02
Repair Services	-0.06	.....	.....	.....	-0.12
Medical Services	-0.08	.....	.....	.....	0.00
Services Incidental to Construction	.....	.....	.....	-0.02	0.00
Religious Organisations	.....	.....	.....	-0.32	.....
Leather	-0.08	?	?	-0.10	-0.13
Apparel	-0.13	?	?	-0.08	-0.14
Entertainment	-0.14	-0.01	-0.01	-0.11	-0.24
Personal Services	-0.15	-0.30	-0.11	-0.17	-0.02
Other Retail	-0.16	-0.01	-0.03	-0.11	-0.11
Eating and Drinking	-0.19	-0.10	-0.12	-0.20	-0.16
Education Services	-0.19	.....	.....	-0.01	-0.05
Welfare Services	-0.25	.....	.....	-0.03	-0.01
Private Household	-0.37	0.04	-0.02		-0.05
Fishing and Trapping	.....	.....	.....	-0.10	-0.23

Sources:

1. Krueger and Summers (1988) pp.265-266, sorted in descending order of the arithmetic averages of four columns of Table II.
2. Arai, "An Empirical Analysis of Wage Dispersion and Efficiency Wages," Scandinavian Journal of Economics, (1994), pp.35.
3. Arai, "An Empirical Analysis of Wage Dispersion and Efficiency Wages," Scandinavian Journal of Economics, (1994), pp.35.
4. Gera and Grenier, Inter-industry Wage Differentials and Efficiency Wages: some Canadian Evidence, (1994), Canadian Journal of Economics, pp.86.
5. Estimated coefficients of the Industry variables from a regression that uses 1991 Census data and a procedure similar to Krueger and Summers (1988).

Table 2: A Comparison of Mitshuhasi's QES and Census

Correlation betweewn Mitshuhasi"s Inter-industry Wage Differentials from QES and my Inter-industry Differentials Using Census Data.

Industry	QES	Census
Forestry	-2.31	-3.02
Mining	9.40	21.05
Textiles	-29.33	-26.20
Chemicals	0.35	6.86
Machinery excluding electrical	-8.10	-2.72
Transport Equipment	-0.70	2.88
Other Manufacturing Industries	-13.51	-10.24
Electricity, Gas and Water	9.47	18.15
Wholesale Trade	4.55	9.53
Retail Trade	-30.73	-20.86
Restaurants and Hotels	-28.49	-27.14
Sanitary	-26.48	-20.88
Educational Services	8.77	27.79
Medical, Dental and Veterinary Service	8.96	5.48
Recreational and Cultural Services	3.55	9.21
Correlation Coefficient		0.95

Table 3: Comparison of Industry Premium between WS and SE

Age: 15 - 37 Years

	No Qualification		Trade Certificate				Bachelor Degree	
Industry	**NQWS**	**NQSE**	**TC1WS**	**TC1SE**	**TC7WS**	**TC7SE**	**BD1WS**	**BD1SE**
Business Services, Except Machinery and Equipment Rentals and Leasing	1.72	3.07	1.28	2.47	1.99	3.96	1.84	6.93
Financing; Insurance	2.42	7.78	1.72	5.31	1.10	2.57	2.68	3.26
Business and Financial Services	1.71	3.98	1.17	2.58	1.62	3.88	2.02	6.15
Electricity, Gas and Water	1.93	....	1.69	....	2.55	....	3.66	....
Wholesale and Retail Trade and Restaurants and Hotels	-0.48	-1.30	-0.56	-1.65	-2.32	-0.18	-0.83	-3.18
Retail Trade	-1.14	-1.26	-0.87	-1.67	-4.32	-0.51	-2.81	-3.58
Other Road Passenger Transport	-1.28	-1.02	-2.05	-0.53	-1.55	-1.13	-6.09	-5.22
Retail Trade n.e.c.	-1.03	-1.11	-1.58	-0.69	-3.19	-1.08	-3.50	-5.43
Agriculture, Hunting, Forestry and Fishing	-2.50	-1.48	-3.07	-3.13	-6.27	-4.28	-7.55	-7.40
Dairy Farming	-4.15	-1.42	-4.89	-3.64	-8.77	-4.32	-8.07	-7.44
Horticulture; Cropping; Fruit Growing	-2.89	-2.84	-3.29	-3.81	-6.50	-5.42	-8.00	-6.70
Food, Beverages and Tobacco Products	-2.03	-3.55	-1.12	-2.85	-6.69	-3.10	-4.89	-8.00
Restaurants, Cafes and Other Eating and Drinking Places	-1.44	-3.50	-0.47	-3.88	-5.87	-3.81	-6.06	-6.89
Sheep Farming; Beef Farming; Mixed and Other Livestock Farming	-2.59	-3.12	-3.80	-5.62	-6.42	-6.76	-8.71	-8.16
Motels, Hotels, Guest Houses, Hostels, Camps and Other Accommodation	-1.02	-4.28	-1.77	-4.63	-5.88	-7.39	-5.14	-8.03

Age: 15 - 37 Years

	Bachelor Degree		Degree				Total	
Industry	**BD2WS**	**BD2SE**	**PG1WS**	**PG1SE**	**PG2WS**	**PG2SE**	**TotalWS**	**TotalSE**
Business Services, Except Machinery and Equipment Rentals and Leasing	1.89	3.99	2.09	1.99	3.79	3.72	3.37	7.53
Financing; Insurance	2.92	0.27	2.96	1.46	5.10	2.44	2.22	6.86
Business and Financial Services	2.10	3.37	2.25	1.63	4.03	3.38	2.70	6.80
Electricity, Gas and Water	0.53	....	5.11	....	8.38	....	2.23	5.99
Wholesale and Retail Trade and Restaurants and Hotels	-1.05	-7.65	-1.10	-7.40	-0.90	-6.26	-1.43	-1.75
Retail Trade	-2.47	-8.56	-5.30	-7.23	-2.84	-7.67	-2.68	-1.85
Other Road Passenger Transport	....	....	-7.14	....	....	....	-2.94	-1.86
Retail Trade n.e.c.	-0.36	-2.51	-6.30	-5.99	-3.48	-12.71	-2.57	-1.96
Agriculture, Hunting, Forestry and Fishing	-10.04	-11.86	-7.68	-11.68	-4.41	-9.45	-4.81	-3.52
Dairy Farming	-11.43	-16.35	-10.47	-11.20	-7.04	-10.53	-6.27	-3.56
Horticulture; Cropping; Fruit Growing	-10.95	-9.46	-9.43	-14.05	-6.86	-13.23	-5.10	-3.73
Food, Beverages and Tobacco Products	-7.91	-10.78	-6.05	-16.43	-9.64	-13.45	-4.02	-4.62
Restaurants, Cafes and Other Eating and Drinking Places	-9.29	-10.54	-7.22	-12.64	-5.64	-7.40	-3.16	-4.67
Sheep Farming; Beef Farming; Mixed and Other Livestock Farming	-13.20	-12.35	-11.07	-12.17	-8.64	....	-5.32	-4.84
Motels, Hotels, Guest Houses, Hostels, Camps and Other Accommodation	-6.92	....	-6.51	-5.74	-2.50	-5.42	-2.60	-5.28

Age: 37+ Years

	No Qualification		Trade Certificate				Bachelor Degree	
Industry	**NQWS**	**NQSE**	**TC1WS**	**TC1SE**	**TC7WS**	**TC7SE**	**BD1WS**	**BD1SE**
Legal Services	2.41	3.05	1.97	....	....	....	1.48	7.09
Business Services, Except Machinery and Equipment Rentals and Leasing	2.03	4.40	1.18	3.09	2.37	3.88	3.10	5.44
Computer Bureaux and Consultancy, Software Development and Databan	3.68	4.67	2.97	2.70	6.74	7.52	4.89	3.08
Electricity, Gas and Water	1.53	11.72	2.34	....	0.67	....	5.28	....
Business and Financial Services	2.17	5.47	0.91	4.06	1.58	4.31	2.69	4.83
Engineering, Architectural and Technical Services	2.23	2.41	1.02	1.64	2.15	4.23	4.12	3.35
Agricultural Services	-2.11	-0.12	-4.52	-1.52	-4.36	-2.38	-4.40	-4.49
Retail Trade	-1.35	-0.94	-1.96	-2.03	-4.67	-2.44	-4.02	-4.43
Wholesale and Retail Trade and Restaurants and Hotels	-0.67	-1.15	-1.23	-2.05	-2.28	-1.51	-1.05	-4.49
Dairy Farming	-4.23	-0.19	-6.37	-3.63	-7.56	-4.21	-7.78	-8.13
Agriculture, Hunting, Forestry and Fishing	-3.42	-1.44	-4.81	-3.67	-5.79	-4.88	-7.76	-8.82
Other Road Passenger Transport	-3.09	-1.77	-4.67	-2.92	-7.81	-3.65	-11.22	-12.82
Horticulture; Cropping; Fruit Growing	-4.56	-2.33	-4.86	-4.80	-10.27	-5.59	-10.60	-9.05
Sheep Farming; Beef Farming; Mixed and Other Livestock Farming	-3.58	-2.46	-5.16	-5.00	-7.48	-5.70	-10.23	-9.30
Food, Beverages and Tobacco Products	-2.16	-3.09	-2.56	-4.74	-3.30	-4.97	-5.31	-9.98
Motels, Hotels, Guest Houses, Hostels, Camps and Other Accommodation	-3.76	-5.05	-4.75	-5.91	-7.07	-8.44	-7.51	-12.72

Age: 37+ Years

	Bachelor Degree		Degree				Total	
Industry	**BD2WS**	**BD2SE**	**PG1WS**	**PG1SE**	**PG2WS**	**PG2SE**	**TotalWS**	**TotalSE**
Legal Services	0.33	2.32	0.15	5.19	1.64	4.81	2.15	13.02
Business Services, Except Machinery and Equipment Rentals and Leasing	2.91	3.88	1.55	2.20	4.04	4.02	3.79	9.04
Computer Bureaux and Consultancy, Software Development and Databan	2.58	0.09	2.19	1.52	8.10	2.79	7.57	7.88
Electricity, Gas and Water	6.04	....	3.32	....	3.58	....	1.64	7.63
Business and Financial Services	2.93	3.16	1.51	1.89	4.12	3.58	3.41	7.49
Engineering, Architectural and Technical Services	3.46	0.94	3.01	2.10	4.80	6.05	5.68	7.39
Agricultural Services	-2.97	....	-2.30	-6.28	....	-3.15	-4.10	-1.75
Retail Trade	-4.24	-6.71	-6.34	-8.51	-1.65	-7.85	-3.32	-1.93
Wholesale and Retail Trade and Restaurants and Hotels	-0.91	-5.94	-2.28	-7.27	-0.43	-6.85	-1.92	-1.99
Dairy Farming	....	-4.68	-9.62	-7.65	-3.65	-6.08	-6.86	-2.31
Agriculture, Hunting, Forestry and Fishing	-7.95	-11.59	-8.02	-9.21	-7.27	-9.01	-5.89	-3.35
Other Road Passenger Transport	-13.84	-14.77	....	-10.58	....	....	-5.96	-3.84
Horticulture; Cropping; Fruit Growing	-7.49	-13.90	-11.61	-10.61	-8.21	-8.60	-7.13	-4.15
Sheep Farming; Beef Farming; Mixed and Other Livestock Farming	-13.27	-13.28	-11.69	-9.47	-10.22	-10.81	-6.48	-4.18
Food, Beverages and Tobacco Products	-8.44	-14.08	-11.97	-15.17	-6.90	-10.69	-4.73	-4.91
Motels, Hotels, Guest Houses, Hostels, Camps and Other Accommodation	-3.20	-9.16	-5.71	-12.63	-5.47	-12.83	-5.67	-6.89

Dependent Variable: Logarithm of Income of Wage and Salary Earners

TABLE 4

	1986 WS	1986 SE	1991 WS	1991 SE	1996 WS	1996 SE
CONSTANT	8.1788	8.8437	8.6395	9.4072	8.3334	9.3726
	(0.0246)	(0.0611)	(0.0345)	(0.0796)	(0.0398)	(0.0987)
AGE	0.0557	0.0297	0.0516	0.0267	0.0627	0.0297
	(0.0010)	(0.0022)	(0.0013)	(0.0028)	(0.0015)	(0.0034)
AGE2	-0.0009	-0.0005	-0.0008	-0.0005	-0.0010	-0.0005
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
F	0.0491	-0.2246	0.2649	-0.2749	0.6401	-0.5651
	(0.0297)	(0.0977)	(0.0342)	(0.1016)	(0.0384)	(0.1143)
HQ	0.0302	0.2959	-0.1666	0.0288	-0.1657	0.0878
	(0.0372)	(0.0854)	(0.0433)	(0.1007)	(0.0506)	(0.1246)
SQ	0.4136	0.3982	0.0818	0.0047	0.2687	0.3748
	(0.0588)	(0.1099)	(0.0682)	(0.1371)	(0.0925)	(0.1906)
NQ	-0.7176	-0.1645	-0.7982	-0.3318	-0.7211	-0.2616
	(0.0327)	(0.0899)	(0.0425)	(0.1086)	(0.0478)	(0.1285)
AGRIC	-0.1810	-0.1031	-0.1911	-0.1616	-0.0404	-0.0968
	(0.0143)	(0.0177)	(0.0172)	(0.0212)	(0.0083)	(0.0183)
MINING	0.1453	0.2280	0.1577	0.0470	0.2470	0.2107
	(0.0337)	(0.1074)	(0.0406)	(0.1131)	(0.0499)	(0.1315)
MAN	0.1455	0.1666	0.1147	0.0757	0.1192	0.1320
	(0.0105)	(0.0217)	(0.0121)	(0.0257)	(0.0130)	(0.0243)
ELEC	0.0704	0.2682	0.0660	0.8576	0.2093	0.4544
	(0.0270)	(0.3903)	(0.0357)	(0.6940)	(0.0525)	(0.3210)
CON	-0.0024	0.1569	-0.0194	-0.0364	0.0273	0.1323
	(0.0141)	(0.0198)	(0.0176)	(0.0238)	(0.0191)	(0.0216)
WHOLE	0.0110	0.0570	-0.0430	-0.0245	-0.0729	-0.0545
	(0.0012)	(0.0019)	(0.0130)	(0.0123)	(0.0140)	(0.0197)
TRANS	0.1572	0.1972	0.1398	0.0710	0.1943	0.1975
	(0.0131)	(0.0236)	(0.0156)	(0.0266)	(0.0180)	(0.0262)
FINANCE	0.2100	0.4533	0.2351	0.3297	0.2634	0.3175
	(0.0205)	(0.0295)	(0.0183)	(0.0299)	(0.0196)	(0.0324)
R-sqr adj	0.3892	0.1597	0.3882	0.1506	0.3393	0.1154
F-stat	839.63	254.65	704.50	228.46	639.50	178.66

NQ=No Qualification, SQ=School Qualification and/or Trade Certificates,
HQ=University Degree

Dependent Variable: Logarithm of Income of Wage and Salary earners

TABLE 5

	1991 WS	1991 SE	1996 WS	1996 SE
CONSTANT	8.7136	8.7459	8.6392	8.6833
	(0.0805)	(0.2625)	(0.0893)	(0.3255)
AGE	0.0468	0.0464	0.0574	0.0531
	(0.0024)	(0.0090)	(0.0027)	(0.0109)
EXP2	-0.0008	-0.0007	-0.0009	-0.0008
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
F	0.2858	-0.3259	0.4098	0.0580
	(0.1013)	(0.3271)	(0.1121)	(0.3998)
HQ	-0.2563	0.2619	-0.2977	0.2060
	(0.1151)	(0.3226)	(0.1365)	(0.4152)
SQ	0.2230	0.3309	0.2071	1.0268
	(0.0796)	(0.1287)	(0.1307)	(0.6104)
NQ	-0.6563	-0.1726	-0.7130	-0.1900
	(0.1080)	(0.3483)	(0.1154)	(0.4211)
FOOD	0.0842	0.1093	-0.0003	-0.1287
	(0.0575)	(0.0823)	(0.0611)	(0.0949)
TEXT	-0.1375	-0.1899	-0.0954	-0.0815
	(0.0603)	(0.0841)	(0.0242)	(0.0264)
WOOD	-0.0516	-0.0617	-0.1193	-0.1132
	(0.0199)	(0.0280)	(0.0628)	(0.0893)
PAPE	0.2314	0.3227	0.1256	0.3784
	(0.0603)	(0.0901)	(0.0644)	(0.1081)
CHEM	0.1129	0.4541	0.0316	0.4115
	(0.0605)	(0.1146)	(0.0643)	(0.1214)
CONC	0.0887	0.0917	0.0356	-0.1012
	(0.0653)	(0.0957)	(0.0708)	(0.1101)
BMET	0.2177	0.4736	0.1396	0.7218
	(0.0662)	(0.1950)	(0.0709)	(0.2039)
FMET	-0.0191	0.0764	-0.0634	0.1183
	(0.0080)	(0.0764)	(0.0613)	(0.0854)
R-sqr adj	0.3551	0.1076	0.3256	0.0944
F stat	127.22	16.07	118.97	14.08

NQ=No Qualification, SQ=School Qualification or Trade Certificate, HQ=University Qualification.

Table 6 Comparison of Residuals over 16 Groups

Residuals (Frequency)	AGRIC	MININ	MANUF	ELECT	CONST	TRADE	TRANS	FINAN	COMMU
WMNQ	-0.11086 (1025)	0.18208 (105)	0.03577 (3499)	0.15481 (82)	-0.07858 (1005)	-0.02674 (1873)	0.10168 (1020)	0.11165 (412)	-0.04437 (1442)
SEMNQ	0.02618 (5216)	0.12466 (35)	0.03994 (1417)	0.35792 (6)	-0.01717 (2614)	-0.10963 (2879)	0.11562 (1270)	0.30201 (579)	-0.07503 (2144)
WMPQ	-0.17554 (167)	0.19856 (34)	0.05978 (997)	0.13751 (64)	-0.07679 (374)	-0.04952 (594)	0.08209 (228)	0.15289 (166)	-0.05008 (635)
SEMPQ	0.02314 (889)	0.55896 (6)	0.09329 (897)	-0.53368 (3)	-0.01255 (2123)	-0.09244 (1209)	0.08537 (268)	0.21342 (347)	-0.05899 (1094)
WMSQ	-0.15235 (817)	0.33518 (52)	0.06605 (2707)	-0.10228 (84)	-0.10255 (809)	-0.02895 (2919)	0.10194 (1010)	0.04947 (1521)	-0.03289 (2246)
SEMSQ	0.02307 (4396)	0.02022 (23)	0.10645 (1281)	0.08298 (7)	-0.02932 (1908)	-0.09585 (3142)	0.10404 (951)	0.11933 (1502)	-0.08711 (1835)
WMHQ	-0.18018 (553)	0.28712 (77)	0.07333 (3015)	0.05854 (250)	-0.10437 (1126)	-0.07093 (2512)	0.14823 (1007)	0.05120 (2508)	-0.02995 (4679)
SEMHQ	0.01000 (3241)	0.46596 (31)	0.16134 (2121)	0.01251 (15)	-0.02712 (3920)	-0.10868 (3368)	0.08167 (663)	0.04811 (5286)	-0.06270 (3594)
WFNQ	-0.25863 (274)	0.37142 (5)	0.04424 (1517)	-0.13006 (21)	-0.53131 (62)	0.00177 (1603)	0.15574 (239)	0.00981 (661)	-0.00581 (1544)
SEFNQ	0.12422 (1319)	-0.62482 (3)	-0.09765 (489)	0.00000 (0)	0.13232 (161)	-0.09093 (1885)	0.12541 (164)	0.42485 (203)	-0.09572 (741)
WFPQ	-0.05972 (18)	0.90820 (2)	-0.03706 (87)	0.02735 (2)	-0.23805 (5)	-0.01964 (139)	0.19298 (37)	0.01663 (94)	-0.00391 (603)
SEFPQ	0.12666 (174)	0.00000 (0)	0.13129 (63)	0.00000 (0)	-0.04698 (17)	-0.17520 (195)	0.12322 (11)	0.32819 (61)	-0.04607 (363)
WFSQ	-0.28908 (294)	0.54285 12	0.04484 (1429)	-0.08415 (58)	-0.40386 (149)	-0.02079 (2640)	0.19547 (722)	0.01305 (2588)	-0.01507 (2692)
SEFSQ	0.11637 (1651)	0.00000 (0)	-0.00220 (524)	-0.06789 (2)	0.05737 (177)	-0.12137 (2033)	0.12203 (191)	0.28373 (477)	-0.13112 (861)
WFHQ	-0.36253 (207)	0.67028 (10)	0.08731 (679)	-0.14273 (30)	-0.41072 (73)	0.00729 (1417)	0.07648 (466)	0.00215 (1991)	-0.00101 (6879)
SEFHQ	0.12316 (1091)	0.58844 (2)	0.00882 (362)	0.49182 (1)	-0.00469 (95)	-0.15499 (1242)	0.31466 (124)	0.11539 (912)	-0.05179 (1748)

Test of 2 Hypotheses

1. H0 (IND): Residuals do not vary across nine industries;
2. H0 (GRP): Residuals do not vary across the wage and salary earners and the self-employed of different type

	Chi Square Stat	F Stat	Pr > ChiSq	Pr > F
H0 (IND)	71.23	8.90	0.0001	0.0001
H0 (GRP)	9.60	0.64	0.8443	0.8368

Conclusion: Interpreting the residual as "Industry Premium" we conclude that it significantly varies across industries; but does not vary significantly between the wage and salary earners and the self-employed of different types.

Table 7: A Comparison of IP-Differentials among Different Types of Individual

	Age: 15 - 37 Years								Age: 37+ Years							
		Trade Certificate		Bachelor Degree/Diploma		PG Degree				Trade Certificate		Bachelor Degree/Diploma		PG Degree		
Industry	NQ	TC1	TC7	BD1	BD2	PG1	PG2	Total	NQ	TC1	TC7	BD1	BD2	PG1	PG2	Total
Agriculture, Hunting, Forestry and Fishing	-1.02	0.06	-1.99	-0.15	1.82	4.00	5.04	-1.29	-1.99	-1.14	-0.91	1.06	3.64	1.19	1.74	-2.54
Dairy Farming	-2.73	-1.25	-4.45	-0.63	4.92	0.73	3.49	-2.71	-4.04	-2.74	-3.35	0.35	.....	-1.97	2.43	-4.55
Sheep Farming; Beef Farming; Mixed and Other Livestock Farming	0.53	1.82	0.34	-0.54	-0.85	1.11	.....	-0.48	-1.12	-0.16	-1.78	-0.93	0.01	-2.22	0.59	-2.30
Horticulture; Cropping; Fruit Growing	-0.05	0.51	-1.08	-1.30	-1.49	4.62	6.36	-1.37	-2.23	-0.05	-4.68	-1.55	6.41	-0.99	0.39	-2.98
Agricultural Services	-2.30	-0.01	-4.57	-1.15	0.94	2.39	.....	-2.11	-1.99	-3.00	-1.98	0.09	.....	3.98	.....	-2.35
Forestry and Logging	-1.36	1.12	1.77	0.40	.....	20.03	.....	-0.91	-1.96	-2.70	2.51	10.30	-3.53	4.14	.....	-1.53
Fishing	-4.50	-3.37	-3.86	-1.56	.....	.....	.....	-4.13	-4.57	-5.34	1.04	10.42	-2.70	-1.56	-8.33	-3.33
Mining and Quarrying	4.58	-0.40	0.21	-0.06	.....	4.02	7.75	0.00	-1.34	3.03	-2.36	3.85	-17.76	7.94	.....	-1.23
Manufacturing	-0.95	0.34	-2.36	1.61	5.53	2.19	4.16	-0.85	-1.89	-0.78	-1.71	2.50	4.51	3.62	3.22	-2.00
Food, Beverage, Tobacco	1.26	0.72	.....	1.39	15.00	-3.62	-14.99	0.37	-0.90	-0.67	-5.80	2.58	15.22	5.64	4.63	-1.54
Textile, Apparel and Leathergoods	-2.30	-1.42	-4.67	-1.86	7.77	-2.91	.....	-2.45	-2.50	-2.49	-0.23	-2.63	2.29	0.66	8.10	-3.93
Sawmills, Planing and Other Woodmills; Furniture and Fixtures except Primarily of Metal	-1.89	-0.28	-2.07	2.79	3.12	3.35	.....	-1.27	-2.23	-1.12	-1.07	0.45	21.32	-1.97	1.41	-2.30
Printing, Publishing and Allied Industries	-4.87	0.11	-3.53	3.06	-5.23	0.99	.....	-2.52	-4.26	-2.01	5.08	-1.87	2.07	1.30	2.59	-3.18
Manufacture of Chemicals, and of Chemical, Petroleum, Coal, Rubber and Plastic Products; Concrete, Clay, Glass, Plaster, Masonry, Asbestos and Related Mineral Product Manufacture	-2.23	0.83	1.38	5.25	8.71	.....	.....	-0.33	-1.42	-0.98	-4.49	3.32	-1.25	10.37	6.24	-1.20
Manufacture of Fabricated Metal Products, Machinery and Equipment	-1.15	-0.61	-3.00	-0.47	-1.31	5.12	-0.71	-1.41	-2.75	-1.50	-2.15	5.12	3.62	-0.13	0.64	-2.20
Manufacture of Fabricated Metal Products, except Machinery and Equipment	-2.02	-0.05	-5.89	-0.73	.....	-0.06	4.23	-2.57	-3.89	-2.65	-5.18	4.94	-8.10	-6.13	-7.65	-3.53
Machinery Except Electrical	0.18	-0.47	-5.08	-3.09	3.76	8.86	-16.53	-1.28	-1.08	-1.88	-2.61	4.50	-3.62	5.91	6.07	-1.73
Transport Equipment	0.19	0.86	-1.09	4.77	.....	.....	.....	0.52	-1.63	0.92	3.58	7.48	19.70	.....	.....	0.22
Other Manufacturing Industries	-1.51	0.61	1.71	3.54	15.54	.....	.....	-0.93	-2.09	-0.28	2.85	4.62	4.51	8.21	.....	-1.04
Electricity, Gas and Water	.....	.....	.....	.....	.....	.....	.....	-3.76	-10.19	.....	.....	.....	.....	.....	.....	-5.98
Construction	-2.28	-1.59	-3.35	2.48	6.06	5.60	5.03	-2.51	-3.05	-2.71	-3.18	3.64	4.14	4.12	4.71	-2.92
Construction of Buildings	-1.96	-1.59	-2.80	3.35	6.73	8.59	6.10	-2.30	-2.01	-2.23	-1.39	4.69	-1.25	-0.08	4.61	-1.83
Construction other than Buildings	-2.37	-1.13	-4.48	2.36	.....	1.40	.....	-2.44	-3.99	-1.82	-4.83	0.00	1.92	7.36	7.25	-4.05
Ancillary Construction Services	-2.53	-1.65	-3.55	0.94	.....	3.45	2.68	-2.81	-2.69	-2.97	-3.30	2.86	4.61	2.70	1.27	-2.89
Wholesale and Retail Trade and Restaurants and Hotels	0.82	1.09	-2.14	2.35	6.60	6.30	5.36	0.32	0.47	0.82	-0.77	3.44	5.04	4.99	6.43	0.07
Wholesale Trade	-2.71	-1.59	-3.67	-0.07	2.27	4.35	2.49	-2.35	-3.75	-2.50	-5.04	1.08	4.46	1.22	2.45	-3.38
Metals, Machinery and Equipment, Including Transport Equipment	-1.16	0.13	-2.54	1.37	-0.67	5.25	1.52	-1.96	-2.90	-1.66	-4.01	-2.68	5.57	0.01	5.76	-2.66
Wholesale Trade n.e.c.	-3.14	-2.77	-0.36	-1.43	4.73	2.11	.....	-2.60	-2.59	-2.37	-5.69	2.04	5.84	2.68	-4.30	-2.66
Retail Trade	0.11	0.80	-3.81	0.77	6.10	1.93	4.83	-0.83	-0.41	0.07	-2.24	0.40	2.47	2.16	6.20	-1.40
Food, Beverages and Tobacco Products	1.52	1.73	-3.59	3.11	2.87	10.38	3.81	0.59	0.92	2.19	1.67	4.67	5.64	3.20	3.79	0.18
Textiles, Clothing and Footwear	-1.57	-0.07	-5.62	-4.78	.....	4.40	.....	-2.88	-3.01	-3.29	-5.57	-0.02	4.21	5.90	11.05	-3.96
Paint and Wallpaper Shops; Furniture, Soft Furnishings and Floor Coverings; Paper Products	-1.76	-5.25	-7.57	-1.10	1.37	-13.22	1.30	-2.96	-1.71	-0.95	0.20	0.60	-7.45	1.44	3.50	-2.15
Hardware; Household Appliances, Radio and Television Stores, Video and Computer Shops; Sewing Machine Dealer	-1.56	3.11	-4.60	3.49	8.99	0.92	4.33	-0.92	-1.15	-0.02	-1.41	2.06	5.83	-3.55	16.26	-0.74
Transport Vehicles and Fuels	-1.23	0.58	-2.97	1.00	-1.27	-7.54	1.68	-1.21	-1.79	-0.97	-4.18	-0.80	0.05	8.22	5.83	-2.02
Fuel and Transport Vehicle Repair Garages; Specialised Services for the Repair of Motor Vehicles and Motor Cycles	-1.33	-0.07	-3.38	0.89	.....	-8.10	.....	-1.33	-2.41	-1.63	-5.12	0.81	5.14	.....	.....	-2.36
Retail Trade n.e.c.	0.07	-0.90	-2.11	1.93	2.14	-0.31	9.23	-0.61	-0.38	-0.23	0.69	2.26	11.61	2.91	7.52	-1.26
Restaurants, Cafes and Other Eating and Drinking Places	2.06	3.41	-2.05	0.83	1.25	5.42	1.76	1.50	0.81	3.36	-0.33	3.30	1.28	9.24	.....	0.41
Motels, Hotels, Guest Houses, Hostels, Camps and Other Accommodation	3.26	2.86	1.51	2.89	.....	-0.76	2.92	2.68	1.30	1.16	1.37	5.21	5.96	6.92	7.35	1.22
Transport, Storage and Communication	-0.30	-1.79	0.86	3.96	3.83	2.76	4.05	0.62	0.13	1.75	1.43	5.18	8.16	1.75	-1.50	0.90
Other Road Passenger Transport	-0.26	-1.52	-0.43	-0.87	.....	.....	.....	-1.08	-1.33	-1.75	-4.15	1.60	0.93	.....	.....	-2.12
Freight Transport by Road	-1.54	-4.39	-2.85	-3.98	.....	.....	.....	-2.72	-4.06	-4.01	-8.72	-3.49	2.66	.....	.....	-4.87
Business and Financial Services	-2.26	-1.41	-2.27	-4.13	-1.28	0.62	0.65	-4.10	-3.30	-3.15	-2.73	-2.14	-0.23	-0.37	0.54	-4.07
Financing; Insurance	-5.35	-3.59	-1.47	-0.58	2.65	1.50	2.66	-4.64	-5.61	-4.51	-8.31	0.42	5.32	2.19	3.65	-3.06
Real Estate	-1.75	-0.21	-5.59	-0.47	2.50	3.39	2.36	-2.39	-3.88	-3.84	-5.49	-1.04	1.55	0.57	-1.56	-3.40
Business Services, Except Machinery and Equipment Rentals and Leasing	-1.36	-1.19	-1.97	-5.09	-2.11	0.10	0.07	-4.16	-2.37	-1.91	-1.51	-2.34	-0.96	-0.65	0.02	-5.25
Legal Services	.....	.....	.....	-8.46	-8.01	-3.86	-7.69	-11.16	-0.64	.....	.....	-5.61	-2.00	-5.04	-3.17	-10.87
Accounting, Auditing and Bookkeeping Services	0.25	.....	-9.71	-7.53	-2.78	1.37	2.64	-8.57	-1.89	-4.09	-0.05	-5.60	-1.66	-4.57	0.72	-10.67
Computer Bureaux and Consultancy, Software Development and Databank Activities	-5.77	9.53	-2.29	-0.81	4.47	0.29	-1.44	-2.71	-0.99	0.27	-0.78	1.81	2.49	0.67	5.31	-0.31
Engineering, Architectural and Technical Services	-1.22	-0.99	-2.44	-1.36	1.03	2.54	2.73	-1.65	-0.18	-0.62	-2.08	0.77	2.51	0.92	-1.25	-1.71
Community, Social and Personal Services	-0.68	-0.31	-1.21	-5.21	-0.52	-3.47	-1.97	-1.10	-1.09	0.25	-1.20	-4.64	1.80	-2.57	-1.65	-1.15
Sanitary and Cleaning Services; Dry Cleaning and Laundry Services; Domestic Services	-3.07	-2.24	-3.65	-3.32	.....	5.30	-5.29	-3.22	-4.64	-3.09	-1.71	-4.35	1.01	2.62	.....	-4.68
Education Services	-2.03	1.35	-10.93	0.94	2.55	0.75	5.16	0.53	-3.76	3.36	2.43	-0.10	2.01	0.33	1.40	0.72
Medical, Dental, Other Health and Veterinary Services	1.38	.....	-9.78	-9.62	-6.38	-4.30	-5.73	-9.55	-1.97	-4.68	-9.70	-7.56	-1.21	-2.47	-5.18	-10.43
Motion Picture and Other Entertainment Services; Racing and Associated Services; Sporting and Recreation Clubs and Sport People; Amusement and Recreational Services n.e.c.	-1.27	-0.71	4.09	1.56	2.30	3.52	4.22	0.46	0.86	1.20	2.23	4.11	6.21	3.87	4.39	1.67
	-0.32	-0.62	-0.59	-1.26	9.72	1.70	-5.79	-1.04	-1.48	-1.38	-4.24	-0.40	8.14	2.33	3.36	-2.32

Table 8: Correlation of IP-Differentials among Different Education and Age Categories

	NQ15-37	NQ37+	TC115-37	TC137+	TC715-37	TC737+	BD115-37	BD137+	BD215-37	BD237+	PG115-37	PG137+	PG215-37	PG237+	Total15-37	Total37+
NQ15-37	*1.00*															
NQ37+	*0.49*	*1.00*														
TC115-37	*0.18*	*0.36*	*1.00*													
TC137+	*0.54*	*0.51*	*0.49*	*1.00*												
TC715-37	*0.18*	*0.25*	*0.11*	*0.33*	*1.00*											
TC737+	*0.07*	*0.24*	*0.26*	*0.50*	*0.20*	*1.00*										
BD115-37	*-0.02*	*0.15*	*0.20*	*0.43*	*0.37*	*0.35*	*1.00*									
BD137+	*0.04*	*0.20*	*0.11*	*0.23*	*0.37*	*0.37*	*0.64*	*1.00*								
BD215-37	*-0.05*	*0.17*	*0.12*	*0.16*	*0.22*	*0.01*	*0.52*	*0.36*	*1.00*							
BD237+	*-0.06*	*0.16*	*0.12*	*0.12*	*0.22*	*0.08*	*0.38*	*0.08*	*0.30*	*1.00*						
PG115-37	*0.05*	*0.07*	*0.15*	*0.02*	*0.20*	*0.16*	*0.20*	*0.41*	*0.08*	*0.01*	*1.00*					
PG137+	*0.21*	*0.25*	*0.11*	*0.29*	*0.34*	*0.04*	*0.44*	*0.36*	*0.38*	*-0.01*	*0.18*	*1.00*				
PG215-37	*0.00*	*0.04*	*-0.01*	*0.23*	*-0.01*	*0.20*	*0.38*	*0.18*	*-0.05*	*-0.06*	*0.13*	*-0.03*	*1.00*			
PG237+	*0.03*	*0.23*	*0.28*	*0.20*	*0.01*	*0.05*	*0.38*	*0.02*	*0.40*	*0.24*	*0.07*	*0.37*	*0.10*	*1.00*		
Total15-37	*0.26*	*0.38*	*0.26*	*0.60*	*0.39*	*0.29*	*0.75*	*0.57*	*0.47*	*0.30*	*0.24*	*0.52*	*0.26*	*0.33*	*1.00*	
Total37+	*0.09*	*0.43*	*0.29*	*0.60*	*0.39*	*0.36*	*0.76*	*0.65*	*0.48*	*0.28*	*0.22*	*0.48*	*0.28*	*0.32*	*0.93*	*1.00*

TABLE 9:

Dependent Variable:Industry Premium (Logarithmic Difference) Earned by the Wage and Salary Earners							
	LIPSE	**EQ**	**SE/WS**	**Constant**	**R-sqr Adj**	**F**	**N**
NQ15-37	0.34387 (0.0463)	0.01278 * (0.0195)	-2.7644 (0.5607)	0.04446 * (0.1775)	0.6538	25.52	53
TC1_15-37	0.29640 (0.0871)	-0.65538 * (5.481)	-1.5191 (0.5122)	0.38689 * (0.4412)	0.2969	6.48	51
TC7_15-37	0.41639 (0.0773)	74.517 (20.68)	-0.97913 * (0.6308)	-3.0855 (0.5800)	0.5841	29.68	52
BD1_15-37	0.38049 (0.1000)	1.7792 * (8.440)	-3.1705 (0.8230)	0.04392 * (0.5833)	0.5757	25.45	54
BD2_15-37	0.21488 # (0.1020)	37.347 * (29.93)	-5.2602 (1.361)	0.09715 * (0.8621)	0.4965	16.51	41
PG1_15-37	0.20397 * (0.1132)	30.679 * (26.24)	-4.8765 # (2.172)	0.01188 * (1.036)	0.2841	9.31	48
PG2_15-37	0.29732 (0.0715)	-7.5998 * (36.43)	-3.6880 (1.327)	1.5511 * (0.8545)	0.4754	9.80	38
NQ37+	0.35917 (0.0498)	-4.9645 (1.118)	-0.42639 (0.1087)	0.73832 * (0.3841)	0.7547	44.56	55
TC1_37+	0.39039 (0.0657)	0.27458 * (4.411)	-0.97936 (0.1579)	-0.18705 * (0.3515)	0.6927	42.45	53
TC7_37+	0.37152 (0.0948)	72.295 (25.53)	-0.47307 # (0.1789)	-2.7090 (0.6161)	0.5401	26.62	53
BD1_37+	0.41875 (0.1064)	14.134 * (11.05)	-0.67719 (0.1958)	0.05805 * (0.7956)	0.5425	20.99	54
BD2_37+	0.20616 # (0.0785)	94.054 # (35.43)	-1.2394 (0.0419)	-0.04114 * (0.7375)	0.3399	9.48	52
PG1_37+	0.45916 (0.0770)	4.9382 * (18.71)	-1.4652 (0.2992)	1.3713 * (0.7258)	0.6299	32.38	50
PG2_37+	0.43436 (0.0986)	-25.972 * (41.46)	-0.83648 # (0.3857)	2.2692 (0.8197)	0.3682	7.03	44

*Not significant at 95% CI

#Significant at 95% CI but not significant at 99% CI

Figure 1

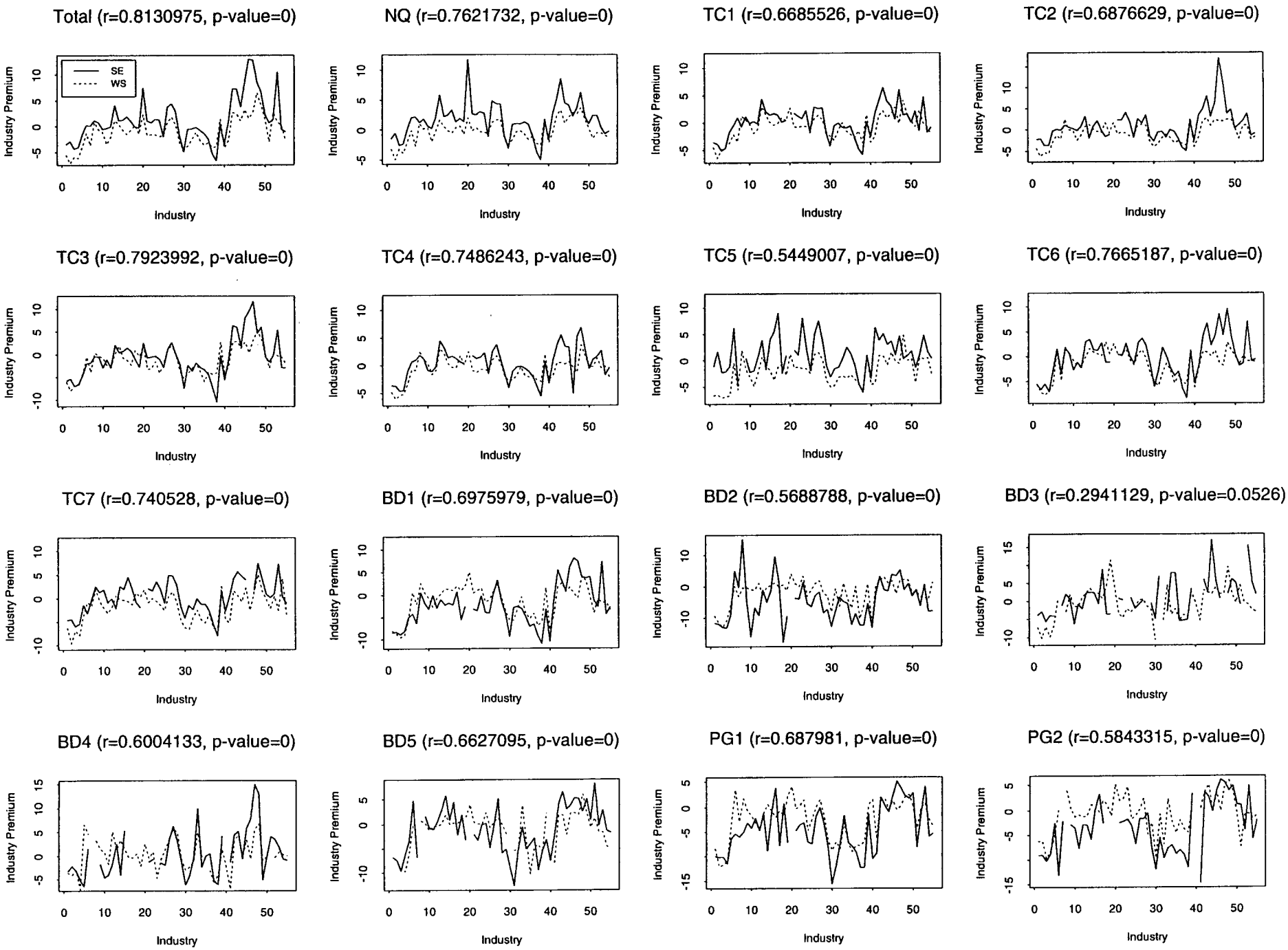

Total (r=0.8130975, p-value=0)
NQ (r=0.7621732, p-value=0)
TC1 (r=0.6685526, p-value=0)
TC2 (r=0.6876629, p-value=0)
TC3 (r=0.7923992, p-value=0)
TC4 (r=0.7486243, p-value=0)
TC5 (r=0.5449007, p-value=0)
TC6 (r=0.7665187, p-value=0)
TC7 (r=0.740528, p-value=0)
BD1 (r=0.6975979, p-value=0)
BD2 (r=0.5688788, p-value=0)
BD3 (r=0.2941129, p-value=0.0526)
BD4 (r=0.6004133, p-value=0)
BD5 (r=0.6627095, p-value=0)
PG1 (r=0.687981, p-value=0)
PG2 (r=0.5843315, p-value=0)
SE
WS
Industry Premium
Industry

Figure 2

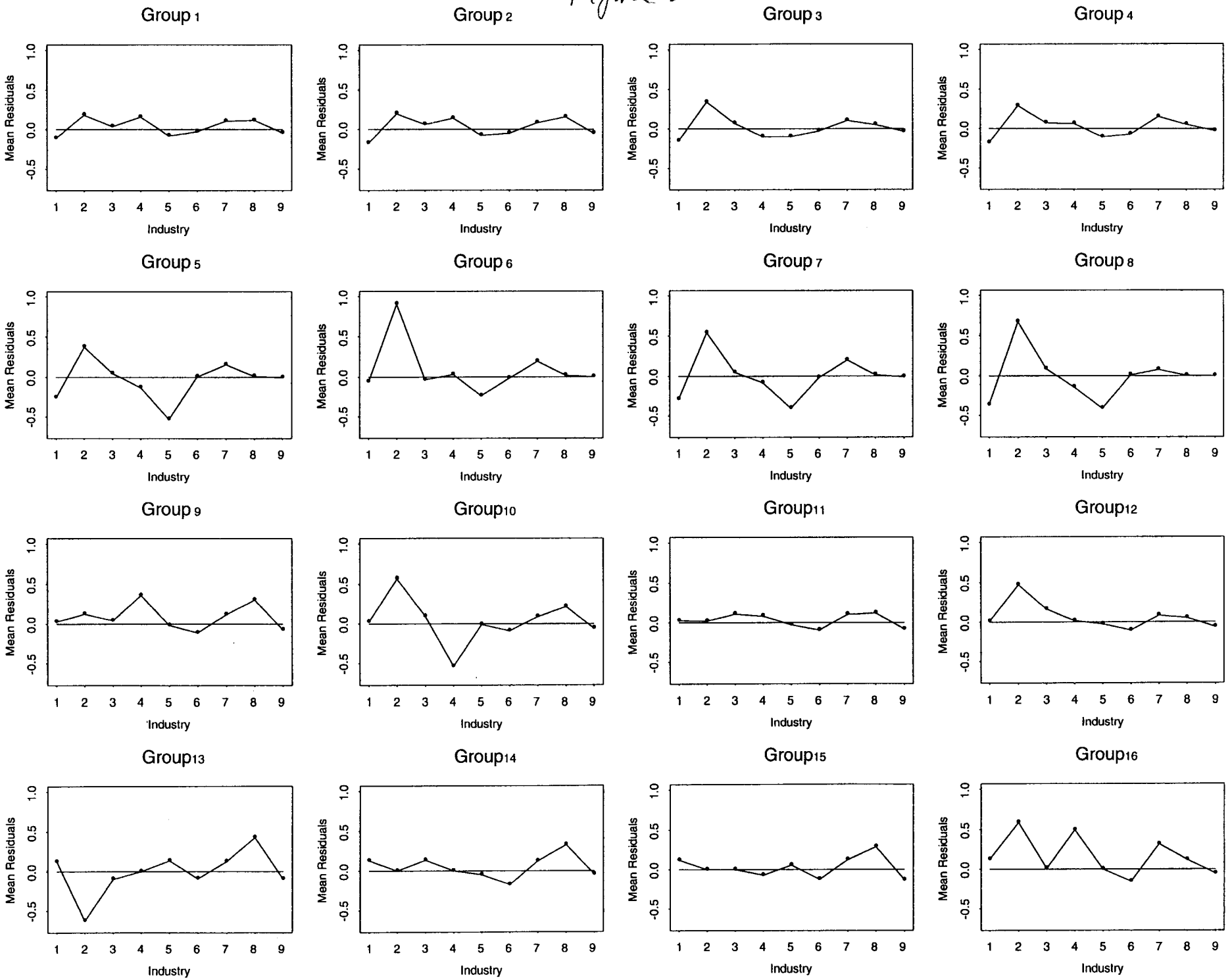
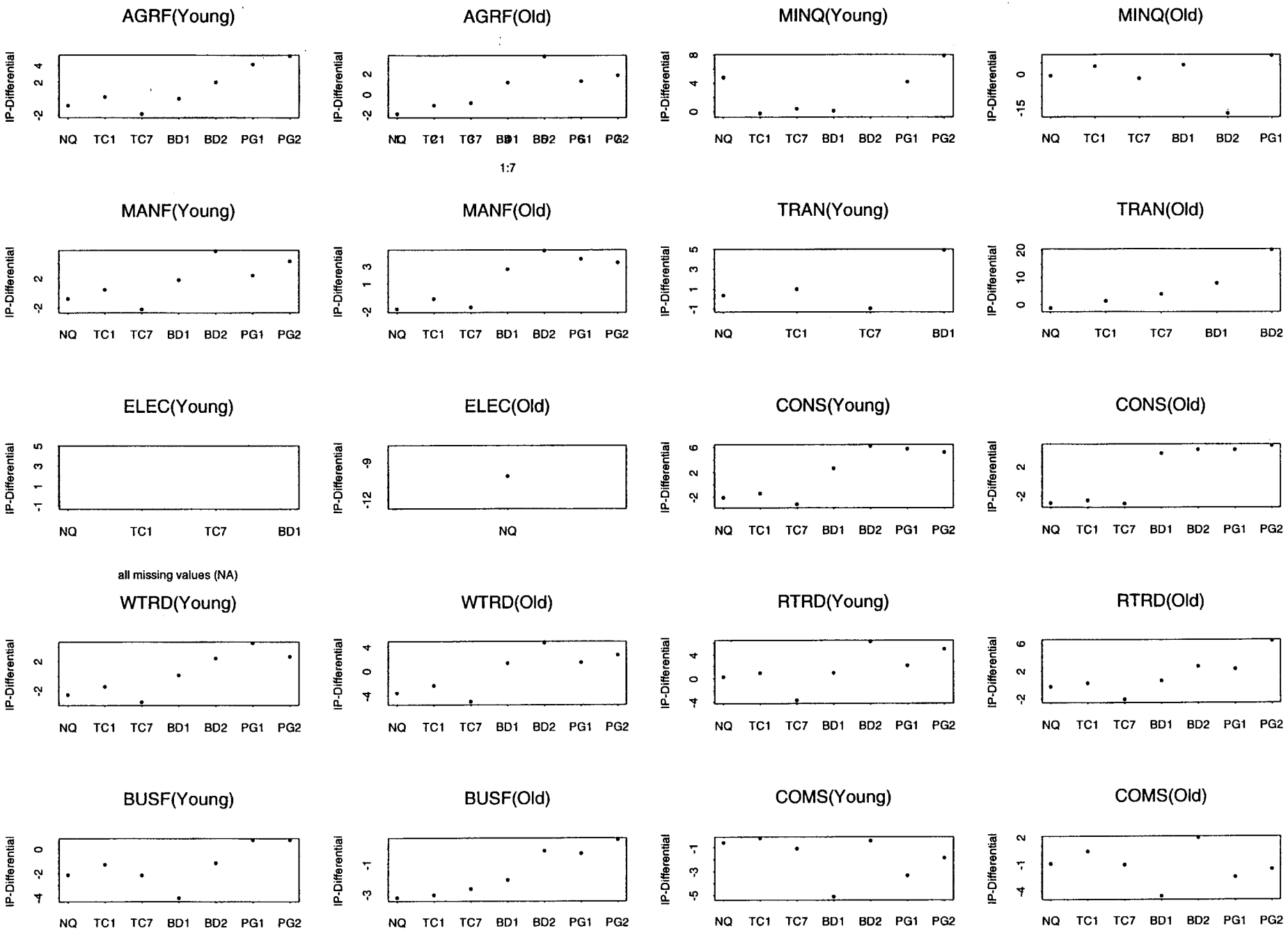

Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group10
Group11
Group12
Group13
Group14
Group15
Group16
Mean Residuals
Industry
-0.5
0.0
0.5
1.0
1 2 3 4 5 6 7 8 9

Figure 3


AGRF(Young)
AGRF(Old)
MINQ(Young)
MINQ(Old)
MANF(Young)
MANF(Old)
TRAN(Young)
TRAN(Old)
ELEC(Young)
ELEC(Old)
CONS(Young)
CONS(Old)
WTRD(Young)
WTRD(Old)
RTRD(Young)
RTRD(Old)
BUSF(Young)
BUSF(Old)
COMS(Young)
COMS(Old)
IP-Differential
NQ TC1 TC7 BD1 BD2 PG1 PG2
1:7
all missing values (NA)