Identifying Emerging Industries

RESEARCH TEAM
Dr. Stefan Kesting
Jean Lin
Dr. Judith K. Pringle

Gender and Diversity Research Group
AUT University

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Executive Summary

In this report we identify the emerging global trends of green and knowledge economies and the enduring feminisation of the labour market. These trends can be seen as overarching schemes encompassing the more specific new developments in emerging industries. We ask whether there is the potential for emerging and growing *female* occupations to be found within these industries.

For this report we define *emerging industries* as those that are new, arising from and created by changes in technology, regulations, markets or society. Moreover, emerging industries may also be existing ones; those that are making a reappearance after a period of dormancy or ones that have been adjusted and adapted to fit the budding trends and, as a consequence, are making a surge in employment. In other words, for this study emerging industry means that it is either completely new or is experiencing significant new growth due to a shift in conditions within the industry or environment. In both instances the emerging industry is expected to grow in the near future.

The fields where emerging industries can be found in New Zealand are: biotechnology, food and beverage, creative industries, information and communication technology, specialised manufacturing, wood building and interiors, education and consultancy services, tourism, healthcare and sustainability.

Internationally, these sectors are situated within the mainstream of global trends like bioeconomy, green growth and the knowledge-based economy. Labour market research from Australia and the US shows that in most of these areas, female employment is already high and expected to grow. Statistics for New Zealand confirm these results. Women work predominantly in the service industries and emerging industries provide a large number of service jobs.

We conclude that in principle there is a potential for growing female employment within emerging industries. Based on the evidence in this report we have selected the following industries for potential empirical enquiry: a dynamic niche within the creative industries, a rapidly growing part of biotechnology (with a high service component), an area of information technology in the health sector and a green segment of the tourism industry. The last two sectors (health and tourism) are clearly female dominated, however we wish to focus on particular new emerging areas within them.

Overall, we recognise a lack of gendered analysis in almost all the literature reviewed for this report.

Introduction

Global trends, industries and female employment effects

The focus of this study is to investigate the potential of emerging industries for providing and increasing female employment and thus, reducing gender pay gaps (EEO, 2007) and obstacles (Ball, 2008) for women to successfully pursue a career and earn an income. We ask: What are emerging and growing *female* occupations in emerging industries? In other words, do emerging industries provide a spring board towards greater gender equality in the labour market?

Entrepreneurship

Although we concentrate on nascent industries, there are some unavoidable overlaps with the literature on nascent or emerging entrepreneurship (Johnson, Parker and Wijbenga, 2006; Manolova, Brush and Edelman, 2007; Reynolds and Curtin, 2008). Entrepreneurs are the people founding, building and driving new companies in emerging industries (Hechavarria and Reynolds, 2009). The industries in which women establish their small businesses can provide another source of information on the kinds of occupations that women are choosing to participate in the labour market.

While there has been a great increase in the number of female entrepreneurs, research shows that participation is still low (Rodriguez and Santos, 2007). Female entrepreneurs make up 37.7 percent of all entrepreneurs in New Zealand (International Entrepreneurship, 2010). Female and male entrepreneurs start and run business in different industries, develop different products and have different motivations and goals and while there are similarities in female and male motivation for going into entrepreneurship (Hirsch, 1990); female entrepreneurs also identify flexible work hours as an added motivation (Orhan and Scott, 2001; Sarri and Trihpoulou, 2005; Patterson and Mavin, 2009). There is evidence showing a number of professional women shunning their corporate careers in favour of entrepreneurship (Catalyst, 1998; Bennett and Dann, 2000; Patterson and Mavin, 2009). The ‘Glass Ceiling’, flexibility, independence, control and family are the most commonly cited reasons for why women become entrepreneurs (Orhan and Scott, 2001; Sarri and Trinhpoulou, 2004; Shelton, 2006; Manolova, Brush and Edelman, 2008; Patterson and Mavin, 2009).

In some instances, female founders of companies may even employ exclusively women. The Japanese company Digimom presents an example for this. The motivation for such a practice was to tap into the underutilised female workforce in Japan. As the authors

researching Digimom point out, one of the four most important success factors for the company is the right choice of industry (Futagami and Helms, 2009), which is linked to an exclusively female work force. The advantage is that Digimom's provision of IT services allows for flexible work from home. Such an option is much harder to offer in sectors other than the computer service industry.

Moreover, other international studies in gendered entrepreneurship which concentrate more on environmental (macro-) factors than on individual (micro-) motivation also stress that the chosen sector of activity is important in explaining differences in male and female entrepreneurship. A Canadian longitudinal study for instance finds that 'type of business' is a significant factor explaining gender differences amongst nascent entrepreneurs (Menzies, Diochon, Gasse and Elgie, 2006). Women tend to be less likely to operate in high technology sectors, they are much more predominant in the service sector (Verheul, Van Steel and Thurik, 2006) and female entrepreneurs tend to concentrate on consumer oriented sectors (Allen, Elam and Langowitz, 2008). However, there is apparently also a recent trend for female entrepreneurs to move from traditional female industries into male industries like manufacturing (Bennett and Dann, 2009).

Emerging global trends > emerging industries > emerging occupations

One would expect emerging occupations to be most likely created and growing in newly developed industries. So, not surprisingly Damarin (2003) in a case study situates emerging occupations within the context of an emerging industry (media) and Reitz (2003) discusses them within the context of the emerging knowledge economy. The few studies we found in this area almost exclusively concentrate on the industry level. However, new occupations might as well emerge in more traditional sectors (Pikulinski, 2004). However, government policy tends to target organisations or companies grouped together at an industry level and to a lesser extent specific occupations or the economy as a whole. Therefore, the focus in this report is at the industry level.

Nascent industries can be regarded as an intermediate category between 'emerging occupations' (Damarin, 2003; Reitz, 2003; Pikulinski, 2004) and larger future oriented trends for the economy championed for instance by the OECD, the UN and the EU, for example, 'the knowledge economy' (Brinkley, 2006; Leydesdorff, 2006; Rooney, Hearn and Ninan, 2005 and OECD 2001, 2003, 2005, 2007 and 2009b) or 'Green Growth' (Chapple et al., 2010; Henderson, 2007 and Visser, 2009). If these larger economic trends are taking off as expected, emerging industries should be found within the greening and knowledge based parts of the economy, although probably not exclusively. Since 2000, New Zealand like the

EU has emphasised the knowledge economy as a viable strategic response to the challenges of globalisation (Michalski and Cheyne, 2008). The '100% pure' marketing campaign branding New Zealand as clean and green can be interpreted as signifying a commitment of the country to the global green growth strategy (Bell, 2008).

Another global trend is the feminisation of the labour market. Feminisation does not necessarily mean an improvement for women in terms of quality and status of their labour market participation. It can mean precarious employment (Department of Labour, 2004) or bad jobs (Jütting, Luzi and Morrisson, OECD, 2010).

> With regard to long-term economic growth, evidence indicates women are a smaller percentage of the labor force at moderate levels of development than at either low or high levels (Pampel and Tanaka, 1986; Goldin, 1994; Cagatay and Ozler, 1995). This trend has become to be known as the 'feminization U' in development scholarship and provides evidence that perhaps both the modernization and marginalization arguments have merit regarding economic development and women's participation in the workforce. Proponents of the modernization hypothesis suggest that economic development leads to greater labor force participation for women, while the marginalization hypothesis first proposed by Boserup (1970) counters that economic development, urbanization, and relative growth of the manufacturing sector can cause women to withdraw from the labor force as their traditional roles in agriculture and home production lose importance. The feminization U is consistent with both of these arguments – at low levels of development economic growth decreases women's labor force participation, while at moderate levels of development growth leads to greater participation by women (Ball, 2008: 54).

The top level of the following table shows the three global trends plus the traditional economy which continues in parallel to these new developments. The industry level in the middle of the table has two compartments: 'emerging' and 'mature'. Emerging industries are placed exactly underneath the three new global trends to show that they tend to be part of these. Emerging occupations overlap completely with emerging industries, but also in part with traditional industries to illustrate, that new occupations can also emerge in the traditional sphere.

Table 1: Emerging Industries category by Level

Societal level of Emergence:

Economy wide, global trend	Green Economy	Knowledge Economy	Feminisation of the labour force	Traditional Economy
Industry	Infant and emerging industries			Mature or traditional industries
Occupation	Emerging occupations			Traditional occupations

Source: own

The definition of infant, nascent and emerging industries

The words ‘emerging’, ‘nascent’, ‘infant’ and ‘incubation’ all evoke the image of something in the early and formative stages of its development that needs to be nurtured in order for it to flourish. While definitions are varied, there is at least some general agreement of what an emerging/nascent industry is. According to Avnimelch and Teubal, the classical infant industry theory (Hamilton 1791; List 1904; and Mill, 1909) suggests that: ‘Infant Industry support aims at assisting new firms in less developed countries to acquire production, management, and other expertise that will enable them to compete with firms in industries that already exist in developed countries’ (2008: 154). Caniëls and Romijn stress the novelty of technology and the required learning process when infant industries are introduced into a specific national context for the first time even though they are already well established elsewhere in the world: ‘For this reason, initial production tends to be characterized by all kinds of inefficiencies and problems. It can take considerable time, even decades, for an infant industry to become established and able to compete internationally’ (2008: 259/260).

In economics, there are defenders of free trade and those who argue for the protection of infant industries as necessary for developing countries to catch up and compete internationally on a leveled playing field (Preparata, 1996 and Chang, 2003). This long lasting debate is continuing. Arguments for and against both views are supported by formal modeling (Dellas, Fernandes and Neusser, 2007; Rodríguez-Clare, 2007; Sauré 2007; Xu, 2006; Melizt, 2005; Kaneda, 2003 and Traca, 2002), historical country comparative studies (Messerlin, 2006; Dodzin and Vamvakidis, 2004 and Westphal, 2002) and case studies reviewing concrete industry policies of protection (Kaivanto, 2006, Ohyama,

Braguinsky and Murphy, 2004 and Jarvinen, 2000). A number of recent articles seem to accept the necessity of protection and use formal modeling to demonstrate which kind (quotas, tariffs or subsidies) is delivering optimal results (Dellas et al., 2007, Melizt, 2005 and Kaneda, 2003). However, these contributions to the debate in economics usually assume that infant industries already exist and flourish in some countries and are only newly introduced to others – often less developed ones. There is no discussion of gender in this type literature.

The discussion in economic geography in conjunction with evolutionary economics goes beyond the presupposition that the industry in question already exists somewhere else. Here, the term infant or more often emerging and emergent industry usually means to create something truly original – a global novelty. These scholars discuss the characteristics of an institutional environment that supports the incubation of emerging industries. They stress the co-evolution of innovative firms and their surrounding clusters and networks of supportive institutions (Avnimelch and Teubal 2008; Caniëls and Romijn, 2008; Garnsey and Leong, 2008; Rodríguez-Clare, 2007 and Hansen, Jensen and Madsen, 2003) and how the government can foster or hinder such a development (Avnimelch and Teubal 2008; Caniëls and Romijn, 2008 and Hansen et al. 2003). Boschma and Frenken (2009) point out that a quite similar argument applies when dealing with a product or some other innovation that is new and emerging worldwide.

> There is increasing awareness that institutional change is required to enable the emergence of new industries and the revival of mature industries. We agree with MacKinnon et al. (2009) that the capacity of actors to change institutions through collective action is crucial for regional development, particularly regarding emergent and declining sectors. In this context, Nelson (1995) suggested that institutions should be thought of as coevolving with technology and markets (Boscham and Frenken, 2009: 154).

Such collective action could mean for instance the lobbying of local or central government by entrepreneurs and employees of a particular industry for courses at polytechnics and universities to provide skills and qualifications.

The environment can be a pertinent obstacle for nascent organisations. As firms need to acquire resources, they are generally very dependent on external parties at the time of the founding (Tornikoski, 2009). Achieving legitimacy has also been stated as an obstacle for nascent organisations. Legitimacy is classified as ‘a generalized perception or assumption

that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions' (Suchman, 1995: 574). A lack of legitimacy may prove difficult and complex when forming alliances and gaining access to valuable resources as potential (Aldrich and Fiol, 1994; Suchman, 1995; Déjean Gond and Leca, 2004; Sillince and Brown, 2009). Lack of credibility, familiarity and reputation, access to capital and government protection all play a part for the amount of legitimacy a new organisation has in an emerging industry. This need for legitimacy could create obstacles for women. However, none of the aforementioned articles in economic geography or evolutionary economics touches upon the gender dimension. Only Reimer's review article is an exception. She discusses some contributions in this field concerning intersectionality on labour markets (2009: 680-682). Approaches of intersectionality try to shed light on how practices and discourses construct identities based on categories of gender, race and other dimensions. The entwined relationships which shape workers lives could also play a role in emerging industries. However, the studies reviewed by Reimer focus only on traditional service industries like cleaning and child care (ibid. 681).

Country case studies document new industries emerging in areas of biopower (Altman, Klein and Johnson, 2007), green technology (Caniëls and Romijn, 2008), windmills (Hansen et al. 2003), biopharma (Garnsey and Leong, 2008), nutraceuticals (food products providing health and medical benefits; the word combines 'nutrition' and 'pharmaceutical') and functional foods (Cloutiers and Saives, 2002), aquaculture (Jarvinen, 2000), tourism (Coles, 2003) and video games (Izushi and Aoyama, 2006). Most of these industries fit in with the aforementioned global economic trends of greening and knowledge intensity. Case studies are generally regarded as the appropriate method to study the complexity of emerging industries (Boschma and Frenken, 2009: 156).

Based on the common understanding in the literature and for the purpose of this report we define *emerging industries* as those that are new, arising from and created by changes in technology, regulations, markets or society. Moreover, emerging industries may also be existing ones; those that are making a reappearance after a period of dormancy or ones that have been adjusted and adapted to fit the budding trends and, as a consequence, are making a surge in employment. In other words, for this study emerging industry means that it is either completely new or is experiencing significant new growth due to a shift in conditions within the industry or environment. In both instances the emerging industry is expected to grow in the near future.

Emerging Industries for New Zealand

Within New Zealand, it is the role of New Zealand Trade and Enterprise (NZTE) to identify economic trends at an early stage in order to alert and expose companies to new opportunities and business models. NZTE has listed the growth industries as: biotechnology, creative, information and communication technologies, food and beverage, specialised manufacturing, wood, building and interiors, education, consultancy service and tourism (NZTE, 2010a). These industries also corroborate to some degree with what the Department of Immigration website lists as needed skills: engineering, teaching (education), biotechnology, creative New Zealand, healthcare and information technology (Immigration New Zealand, 2010).

Biotechnology

While the OECD has classified the biotechnology industry as including scientific, industrial, health and agricultural applications (OECD, 2005a), NZBio, which is the peak body representing the bioscience based industries in New Zealand, has further broken them down into New Zealand specific categories, which are: Innovation Foods, Drug Discovery, Large Animals, Plants, Agritechnologies, Bioremedication and Bioprocessing/Biomanufacturing (NZBio, 2010). Even though OECD reports have shown health applications to be dominant in the biotechnology industry (OECD, 2009); it is food technology and agriculture applications that come out top in New Zealand. Research in 2008 and 2009 showed that the bioactives industry (including nutraceuticals, supplements and functional foods) generated annual revenue of $760m while the medical-health technologies industry reported annual revenue of $550m. Further analysis showed that 2.41 jobs are created nationally for every full-time job in New Zealand's wider biotechnology industry (NZTE, 2010b). It was reported in the January 2009 summary from the Medical Technology Association of New Zealand (MTANZ) that there were 2834 full-time employees in the medical-health industry but this figure is expected to increase to 6547 full-time employees in three to five years (MTANZ, 2009).

Statistics New Zealand's Biotechnology Survey in 2007 reported 225 biotechnology-related patents in the two years to 30 June, 2007. This is an increase of 35 patents compared to the previous two years (30 June, 2003- 2005; Statistics New Zealand, 2006 and 2008). However, in 2009, the classification changed to Bioscience rather than Biotechnology, defining it as 'the development and application of knowledge of the way plants, animals and humans function for the development of products and services' (Statistics New Zealand, 2010: 2). There are 267 organisations, which are involved in bioscience with the majority of

the work being done in the categories of Innovative Food and Human Nutrition followed by Human Biomedical Science and Drug Discovery. A reported 156 organisations are also expected to have introduced at least one new or significantly improved bioscience product to the market within the next two years (Statistics New Zealand, 2010). Three companies in this category are on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

A high profile example in biotechnology is Air New Zealand. The company is currently looking into the development of biofuels to make air travel more sustainable. In a world-first, a flight, powered by the sustainable second-generation biofuel jatropha was completed on 30 December, 2008 (Air New Zealand, 2010).

Food and Beverage

NZTE calls the Food and Beverage industry 'the lynchpin of New Zealand's prosperity' as exports in the Food and Beverage industry have increased three-fold in the last 17 years, from NZ$6.96 billion in 1990 to NZ$21.43 billion in 2008 (NZTE, 2010c). It is for this reason that Food Innovation tops the list of funding from the Foundation for Research, Science and Technology (FRST) with an allocated NZ$21 million to a new 'Food Innovation Network New Zealand' initiative (Food Innovation NZ, 2010 and FRST, 2009). Seven companies in this category are on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Due to the increase in worldwide obesity and a greater level of health consciousness and awareness, people worldwide are now changing the way they eat. Demand has shifted to more fresh agricultural products and poultry and less dairy products and red meat. As people's lifestyles change, pre-prepared and ready-to-eat foods and meals are becoming more popular and account for one-quarter of total food expenditure (NZTE, 2010c). The challenge, then, is to find a compromise solution between healthy, nutritious and convenient food (NZTE, 2010c).

The main categories of the Innovation Food industry are:

- **Dairy**: This ranges from high quality basics (milk powders, butter, cheese) to speciality foods (ice creams, artisan cheeses) and highly specialised ingredients (spray-dried milk proteins, protein hydralysates and freeze-dried bio-active proteins). Dairy is New Zealand's biggest export earner, amounting to NZ$9.29 billion in 2008 (22 percent of total exports) (NZTE, 2010c).

- **Meat**: Meat is New Zealand's second largest exports (12 percent) with 2008 exports totalling NZ$5.14 billion, New Zealand is also the world's largest exporter of sheep meat (NZTE, 2010c).

- **Seafood**: New Zealand has the world's fourth largest coastal fishing zone and produces one billion meals annually nationally and internationally (NZTE, 2010c).

- **Fruit and vegetables**: Due to New Zealand's isolated geographic location and strict biosecurity laws and regulations, fruits and vegetables are fortunate to be free of major diseases and pests that strike elsewhere in the world. In the year ending June, 2008, exports amount to more than NZ$1.8 billion and the country supplies just over 20 percent of the world's kiwifruit (NZTE, 2010c).

- **Wine**: New Zealand's wine industry has emerged from small and family-based to technologically advanced, producing a wide variety of wines competing globally. In 2008, wine exports were worth $NZ903 million, an increase from the $NZ60 million a decade earlier (NZTE, 2010c).

- **Specialty food industries**: there are now 2,000 speciality food and beverage manufacturers in New Zealand. Exports earnings were $NZ2.9 billion in 1990 and reached $NZ8.7 billion in 2006 (NZTE, 2010c).

Creative Industries

The past decade has seen the recognition of a bundle of industries and creative activities labelled the cultural industries and within it the 'creative industries'. As well as important centres of employment alone, the creative industries have the potential to drive productivity changes and contribute to growth in other industries, such as, manufacturing and education (NZTE, 2010d). This is a broad sector that includes (but is not limited to) screen production, television, music, design, fashion, publishing, textiles, performing arts, digital content. The success of 'The Lord of the Rings'; and the 'Peter Jackson' effect have contributed to the creative industry becoming one of New Zealand's most well-known emerging industries. While the screen industry is not 'new' in NZ, major changes in the digital technologies and in ways of organising 'creative industries' more broadly, have reframed the area internationally in the context of creative work (Jones and Pringle, 2010). The 4th Labour government modelled their creative industry policies on the UK and combined policies together on the arts, economic development and national identity which contributed to a surge of activity.

The report *Employment in the Cultural Sector* (Ministry for Culture and Heritage, 2009) uses data from the three most recent censuses to report on 'cultural statistics'. It finds that paid employment in the area has increased 21% between 2001 and 2006. The concentration of the cultural industries lies in Auckland and Wellington. Although Wellington (Wellywood) is regarded by some as the screen capital, the Auckland region has greater expenditure and employment in the screen industry (Auckland City Council, 2009). There is a wealth of information in the report, for example, women make up 47% (the same as women's workforce participation) of those employed in the film, video and broadcasting industries but within these groups make up only 38% of the film and video production sector (Savage, 2010). The 2001–2006 period saw an increase in the numbers of both men and women in the industry and in both part-time and full-time work. However, most of the growth was among full-time workers and particularly among males in full-time employment (Savage, 2010). This is a small exemplar of a dynamic emerging industry and gives an indication of the ways in which summary patterns of worker participation can mask a gendered story.

Information and Communication Technology

In mid-2008, the global Information and Communication Technologies (ICT) market had a value of $US3.8 trillion, 70 percent of which was spending by governments and businesses. The US, Japan, China, and the UK were the top five ICT markets by the end of 2008. In New Zealand, the ICT industry includes: wireless infrastructure, health IT, digital content, payments, geospatial, telecommunications and agricultural technology. It has been reported that it contributes an approximate $8 billion each year to the economy and employs around 40,000 people (NZTE, 2010e).

Having built a reputation of innovation and flexibility, ICT is one of New Zealand's fastest-growing export sectors, with an estimated NZ$1.5 billion in 2009 (Immigration New Zealand, 2010b). Notable achievements include the company Rakon supplying over 50 percent of the frequency control devices used by the GPS industry as well as NavMan and TracMap. Other examples of New Zealand-based companies making an international mark include Wellington-based SilverStrip, whose management system was used to build the US Democratic Party's Convention website and Right Hemisphere, a company that produces a key component of Boeing's 3D repair tool (NZTE, 2010e). Both TracMap and SilverStrip are amongst the seventeen companies in this category on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Specialised Manufacturing

New Zealand's manufacturers create and produce goods and services in a number of specialised areas, such as aviation, clean technology, defence, heavy and light engineering, marine, plastics and composites and metals (NZTE, 2010f).

These manufacturers utilise flexible, short-run production processes to deliver to global niches as well as generating value in the areas of design, research and development, production and servicing. Some notable successes include the development of the world-first jet-propelled boats and pioneering the use of fibreglass in marine construction; the creation of refined systems for animal management and security that originated from the invention of electric fences and manufacturing of luxury bathrooms, for example, the water-saving shower (NZTE, 2010f). Five companies in this category are on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Wood, building and interiors

An approximate $NZ4.5 billion in output per year is what places forestry and wood processing amongst New Zealand's largest industries; with exports of sawn timber, logs, chips and pulp totalling $NZ2.89 billion in the year up to 30 June, 2008 – an approximate 5.5 percent of New Zealand's total merchandise exports. Some of New Zealand's international successes and achievements in the wood, building and interiors industry include: Verda New Zealand, which exports outdoor timber products that uses New Zealand developed and patented technology in order to improve durability and appearance. Three New Zealand companies – Jenkin Timer, Pacific Timber and Taranaki Sawmills have joined forces as Bodyguard Wood Products to collaborate and export interior wall cladding to the US (NZTE, 2010g). Three companies in this category are on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Much of the world's demand for timber is met with wood that is harvested unsustainably. With a focus on sustainability and green-growth strategies, New Zealand has the appeal and potential advantage of being one of the few countries in the world with the ability to not only increase but to also sustain its wood production. New Zealand has approximately 1.8 million hectares of intensively managed, renewable and sustainable forest plantations which accounts for 7 percent of total land use (NZTE, 2010g).

Education

New information, technologies and trade agreements have contributed to the growing demand for skills and changed the world market for education and training services. The global corporate training market has a reported worth of $US19 billion each year (NZTE, 2010h).

Training, consultancy and research services are all included in New Zealand's education industry. A number of education providers have gained competitive advantage in overseas markets in several fields of study: agriculture, aviation, education system development, and tourism and hospitality. Some of New Zealand's education industry's international achievements include: the role of PINZ (Polytechnics International New Zealand Limited) in the development of a world-class polytechnic in Bahrain; the e-learning network iNZED has been in collaboration with the Thai and Malaysian governments to assist with integrating ICT into schools to improve teaching and learning (NZTE, 2010h). One company in this category is on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Consultancy Services

New Zealand's consultancy industry exports are worth approximately $NZ600-700 million per year, included in this category is work with the World Bank and Asian Development Bank, both of which generate about an annual $20 million in consulting services (NZTE, 2010i). New Zealand's proficiency in consultancy is due to New Zealand's strong background in research, innovation and reform. Some of the industry's international successes and achievements have been: assisting countries with risk assessment and mitigation; advising governments on environmental management and economic growth; the design of infrastructure for transport and water-related services and helping with policy development and the implementation of education reforms. New Zealand's largest consultancy sector is currently engineering design (NZTE, 2010i). Four companies in this category are on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Tourism

The tourism industry is made up of a small number of major public-listed companies and a large number of small to medium enterprises, providing over 108,000 full-time jobs directly and a calculated 74,500 indirectly (2006). Something that is of growing consumer concern is eco-tourism and how it is incorporated into New Zealand's 100% pure tourism campaigns (NZTE, 2010j).

With 2.4 million visitors to the country each year; the tourism industry is one of New Zealand's biggest export earners. New Zealanders have been pioneers in adventure tourism. This includes AJ Hackett's commercialisation of bungy jumping; the invention of the 'zorb' as well as the luge and gondola products that are now known and exported internationally. Jetboating is another venture that has been successful in New Zealand's tourism industry (NZTE, 2010j). Two companies in this category are on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Healthcare

New Zealand's strengths in the biotechnology, ICT and specialised industries provide a strong background in the country's emerging and growing reputation for healthcare solutions (NZTE, 2010k). Four companies in this category are on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Sustainability

Much of the current focus on sustainability worldwide is driven by concerns about the environment, including climate change, biodiversity and water usage and as a consequence, a growing awareness and demand for more sustainably produced goods and services (NZTE, 2010k). Four companies in this category are on Deloitte's list of 50 Fast Growing Companies of 2009 (Deloitte, 2009).

Emerging Industries in other OECD countries

While each country has particular emerging industries and occupations, the Organisation of Economic Cooperation and Development (OECD) concentrates on identifying overall trends for its member states, namely: the Bioeconomy, the Green Growth Strategy and the Knowledge-based Economy (OECD 2009a).

The Bioeconomy to 2030

The OECD defines biotechnology as 'the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services' (OECD, 2005a), with increasing emphasis over the last decade, on scientific, health and agricultural applications. This OECD project develops a long-term picture on how biotechnology related developments are occurring in health, agriculture and other industries (OECD Publications, 2009).

An example of a health and science application is pharmacogenetics, which explores the relationship between an individual's genetic make-up and the way medicines work for each individual and attempts to create specifically individually targeted pharmaceuticals. Currently, health applications dominate biotechnology research and spending worldwide, followed by agricultural and industrial-environment applications (OECD Publications, 2009).

The Green Growth Strategy

The 2009 OECD annual report draws particular attention to the issue of climate change. Amongst the financial approaches to combat this issue, the OECD highlights: investment in clean technologies, regulatory instruments and standards, which can all given rise to the emerging 'green economy'. The OECD's Green Growth Strategy covers innovation and invention in both traditional and new industries (OECD Annual Report, 2009), such as energy efficient and renewable energy, transport, agriculture, fisheries and tourism (Visser, 2009). An example from the energy industry is the production of biofuel and developing new products and alternatives to traditional sources of energy. Photovoltaic (solar) panels, while around since the 1920s, are a revived innovation that has tapped into a market of conscientious energy consumers (Chapple, et al., 2010).

The Knowledge-based Economy

The OECD defines 'The Knowledge Economy' as 'an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors' (OECD, 2005b: para. 71). The Knowledge-based Economy is also sometimes defined in terms of knowledge intensive industries (Brinkley, 2006). Initially, the focus was on manufacturing, but then expanded into the service industry. Now the OECD defines emerging knowledge intensive services industries as: Finance and Insurance and Telecommunications and Education and Health (Brinkley, 2006).

Based on the images of the knowledge economy used in the OECD, UN and EU, Shire defines the knowledge economy as: 'the information and communications technology sector (ICT), the information sector and the knowledge-intensive services sector (KIS)' (2007: 52). In her comparative study of Britain, Germany, Japan and the US she demonstrates that particularly the second, Information has large female employment whereas the third, KIS is even predominantly female in all four countries (ibid. 66). The Information sector includes industries like: publishing, motion pictures, radio, TV, news and library activities, as well as: telecommunications software publishing and data processing. KIS contains: KI high-tech services (e.g. computer, post and telecommunications), KI market services (e. g. air transport and real estate), KI financial services (e. g. insurance and pension funding) and other KI services (e. g. education, health and social work and recreational, cultural and sporting activities (ibid. 61).

Australia

According to the Australian Government's Department of Employment and Workplace Relations, the industries, which are expected to open up the greatest number of new jobs in the next five years to 2013-2014 are Healthcare and Social Assistance, Education and Training, Retail, Professional, Scientific and Technical Services and Accommodation and Food Services (Department of Employment and Workplace Relations, 2009).

Australian states have their individual emerging industries, but on the national level, it seems that the Government tends to fund research rather than specific industries. Innovation Australia, within the Department of Innovation, Industry, Science and Research currently support research in the areas of: Innovation, Industry, Science and Small Business. When looking at these areas individually, there is the common thread of research being focused on climate change and how to make the Australian car industry more environmentally friendly and green (Department of Innovation, Industry, Science and Research, 2010).

The Australian industries that recently recorded the largest growth of new jobs for women were: Health Care and Social Assistance (156,000), Public Administration and Safety (86,300), Education and Training (63,600), Professional, Scientific and Technical Services (58,900) and Retail Trade (47,300) followed by a range of service industries (Department of Innovation, Industry, Science and Research, 2010).

Table 2: New Jobs for Women by Industry - 5 years to August 2009 in Australia

Industry	Number of new jobs created ('000's)
Health Care and Social Assistance	156.0
Public Administration and Safety	86.3
Education and Training	63.6
Professional, Scientific and Technical Services	58.9
Retail Trade	47.3
Financial and Insurance Services	32.2
Rental, Hiring and Real Estate Services	24.2
Accommodation and Food Services	23.2
Construction	20.8
Other Services	18.6
Transport, Postal and Warehousing	15.3
Mining	13.9
Administrative and Support Services	13.8
Electricity, Gas, Water and Waste Services	10.8
Arts and Recreation Services	9.5
Information Media and Telecommunications	7.9
Wholesale Trade	-7.3
Manufacturing	-8.6
Agriculture, Forestry and Fishing	-13.9

Source: Department of Employment and Workplace Relations, 2009: 36.

United States

The US is the country where at least as much attention is paid to emerging jobs and occupations as to emerging industries. An Occupational Employment Statistics (OES) survey conducted in 2001 revealed that most new and emerging occupations were in firms of less than 100 employees, with no single industry dominating in the creation or growth of the occupations (Pikulinski, 2004). The survey looked at new and emerging jobs in: Construction, Education, Health, Social, Transport, Service and Engineering and Manufacturing.

The Women's Bureau of the US Department of Labor have stated that the 'hot' and fastest growing occupations leading up to 2016 will be related to: health, computer and personal care and service with the *largest* growth being positions related to professional and managerial, service, office and administrative support, food preparation and transport and material moving (Women's Bureau, 2006). Further, they reported that women are underrepresented in the emerging green economy and are encouraging and urging women to consider how the green economy could boost their job opportunities and wages (Women's Bureau, no year).

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Table 3: Females in Industrial Sectors over time 1996-2006 (in percentages)

Industries	1996	2001	2006
Agriculture, Forestry & Fishing	34.4	34.0	34.3
Mining	10.7	11.3	12.4
Manufacturing	30.1	29.4	29.6
Electricity, Gas & Water	21.1	29.4	30.0
Construction	12.2	12.8	13.1
Wholesale Trade	34.4	34.7	35.2
Retail	51.0	52.0	52.8
Accommodation, Café & Restaurant	62.6	62.6	63.6
Transport & Storage	28.3	28.4	29.9
Communication Services	43.2	45.5	46.1
Finance & Insurance	58.1	56.9	55.9
Property & Business Services	47.6	47.6	47.7
Government Administration & Defence	50.6	51.4	54.4
Education	69.7	71.4	72.7
Health & Community Services	82.1	82.7	82.3
Total	45.43	46.57	47.14

Source: Census data for 1996, 2001, 2006; Statistics New Zealand

In the table above, we calculated the proportion of women working in particular industries. This table shows a remarkable consistency over time. From the figures documented in the table we are able to see that women work consistently predominantly in: Health and Community Services; Education; Accommodation, Cafes and Restaurants; Finance and Insurance; Government Administration and Defence; and the Retail Trade. Moreover, women are quite strongly represented in: Communication and Property, and Business Services.

Since the 1970s, there has been a steady influx of women, especially married women, engaging in full time work (Bowen and Hisrich, 1986; Bennett and Dann, 2000). At the end of September 2009 quarter, women's participation in the labour force was at 62.3 percent and 74.1 percent for men (Human Rights Commission, 2010). However, this increase in female labour force participation does not tend to be evenly distributed across industries. Therefore, a certain level of occupational segregation has to be expected (Ball, 2008).

Preliminary results and Implications for future work

The diverse material reviewed in this report indicates where emerging industries in New Zealand are and which of them should have the highest potential to offer employment opportunities for women. To derive those occupational areas and industries most promising for further empirical research to explore the employment potential for women in emerging industries in New Zealand, it is reasonable to start from the global trends identified in the introduction of this report. The industries relevant for the purpose of this research project can most probably be found in the intersection between the emerging green and knowledge economies and the feminization of the labour market. Industries for further research should be placed in the green-purple or the blue-purple intersections in the following diagram.

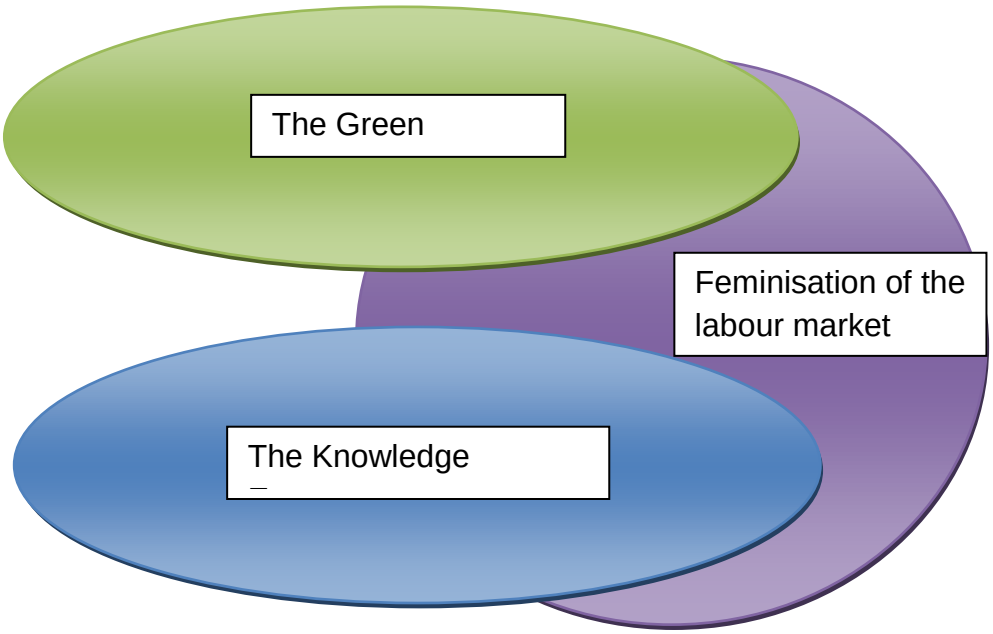

Figure 1: The overlap between the feminisation of the labour market and the two major global trends in emerging industries (green and knowledge economy)

The second important criterion to become part of our survey is a high service component of the emerging industry. The Australian and New Zealand labour statistics by industry show clearly that women are predominantly employed in the service sector. This is further confirmed by research by the Women's Bureau of the US Department of Labor and by

Shire (2007). In the list of emerging industries derived from NZTE the following four industries fulfil the aforementioned criteria and are therefore most promising for further research: a new and dynamic niche within the creative industries, a rapidly growing part of biotechnology (with a high service component), an area of information technology in the health sector and a green segment of the tourism industry. The last two sectors (tourism and health) are clearly already female dominated. However, within these industries we would want to focus on particular new emerging areas.

Thus, these are the potential target areas identified for further enquiry from which to choose the three industries for concrete qualitative research in the second part of this project. This choice will also have to consider the practicalities of access to data and willingness of the people working within the industries to participate in the research.

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