CRANFIELD UNIVERSITY

AHMED J. SAADE

ESSAYS ON CONTEMPORARY ISSUES IN THE SOUTH KOREAN ECONOMY

SCHOOL OF MANAGEMENT
PhD Programme

Doctor of Philosophy
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Supervisor: Professor Constantinos Alexiou
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ABSTRACT

This doctoral thesis sheds light on some issues that are characteristic of the South Korean socioeconomic landscape today. In a series of three papers, I empirically address important questions faced by policy makers of this country, whilst also contributing to major debates currently taking place within the Economics discipline. In the first chapter, I investigate the effects of robotization on Korean workers' labor supply from the lens of dynamic monopsony. I show that an increase in the density of industrial robots is associated with manufacturing workers becoming more responsive to a change in wages in their decision to quit to non-employment, and that the opposite is true for non-manufacturing workers. The second chapter contributes to the discussion on youth unemployment in South Korea, in tandem with the question of the high turnover rate within the nation's Nursing profession. I find that the unemployment rate at time of graduation has scarring effects on Nurses' wages, workhours, and subjective wellbeing. The final chapter of this dissertation tackles the problem of social isolation among Korean elders and contributes to the very small literature on the economic determinants of this phenomenon. I offer the first set of causal evidence linking the social isolation of elders with their adult children's inheritance expectations.

ACKNOWLEDGMENTS

Prior to embarking on this journey, I really did not know what to expect. I think I imagined a PhD to be like a Master's degree but longer, and more difficult. Then, when I and fellow other doctoral students started our PhDs in 2019, we were told that the life of a PhD student could get very lonely, that the routine may get to our heads, and that mental health support was available for those of us who would require it. We were reminded to take a day off every week, and even had a mandatory training regarding the proper way to sit. We had a session on "managing your supervisor" during which the word "conflict" was repeatedly uttered. I also recall someone telling us a statistic on the percentage of Doctoral students who quit in their first year.

I am happy to say that I do not know what all this pessimism was about. The past three years have been the most enjoyable of my life, and for this I have many people to thank.

Firstly, I would like to thank every member of my family, they have supported me in all ways possible and I am forever indebted to them. I am particularly grateful to my mother who herself is an academic and is the person who inspired me to become one. I also remember my father when I told him that I wanted to do a PhD and he replied, "I was thinking the same".

Secondly, a debt of gratitude is owed to my supervisors Costas and Yacine. They truly are outstanding mentors who have gone to great lengths to help me throughout this journey. I would not be where I am today were it not for their guidance, patience, and support.

Last but not least, I would like to thank all the friends who have contributed to improving my life over the past three years. I am particularly thinking of (in alphabetical order) Abdulrahman, Emilija, Fouad, Kanchan, Manish, Mohamad, Nabil, Nora, Navya, Omar, Yun Soo, and Zakarya. I am also grateful to Debbie, the coolest person at Cranfield SOM.

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INTRODUCTION

South Korea has undergone a remarkable transformation over the past few decades, transitioning from an agrarian-based economy to a modern industrial powerhouse (Seth, 2017). As a result of this rapid economic development, the country is now one of the most technologically advanced and innovative economies in the world, and has been serving as a model to nations aspiring for rapid growth. However, today both the Korean economic and social spheres are characterized by a number of fissures which have knocked the country off its pedestal as an undisputed champion of sustainable progress. Indeed, contemporary South Korea is home to record levels of youth unemployment, income inequality, gender inequality, suicide, social isolation, interminable workhours, unaffordable housing, mental health issues, and many other sad achievements. The context is one of political division and corruption, low welfare assistance, and an ageing population with alarmingly low birth rates.

In this doctoral dissertation, I explore some facets that are characteristic of contemporary South Korea, a country which has been largely neglected by Economists in spite of the numerous lessons that can be drawn from the nation's experience with rapid growth. Indeed, the vast majority of empirical papers published in Economics peer-reviewed journals use US, UK or EU data. This is particularly true for the top-ranked journal of the discipline, where far-east countries are very hard to find. Even within this small group of underexplored countries, South Korea lags behind its Chinese and Japanese neighbors, and so in spite of the availability of rich longitudinal data offered to researchers by various Korean governmental and research bodies. In this thesis, I exploit two of such datasets: the Korean Labor and Income Panel Study (KLIPS), and the Korean Longitudinal Study of Ageing (KLoSA).

Through rigorous empirical examination of some of the major issues currently at the center of Korean policy debate, I contribute valuable insights to both South Korean policy makers and researchers, as well as those from other countries which are facing or expected to face similar concerns in the near future. Additionally, I generate a series of empirical findings that are relevant to major debates currently taking place in Economics and Policy, and which will prove valuable to informing theory on those questions.

South Korea is constantly ranked among the countries with the highest robot density in the world, with the latest figures showing Korea as number one on this list. In the first of the three chapters that constitute this thesis, I investigate the effects of this enormous and still growing stock industrial robots in the Korean manufacturing sector on workers' decision to supply their labor. In particular, I offer the first set of evidence linking robotization to labor supply using a monopsony framework. I estimate the effects of robotization on workers' labor supply using Manning's (2003) model of dynamic monopsony, and decomposing the elasticity of labor supply into the elasticity of voluntary quits to employment, to non-employment, as well as the probability of a hire coming from employment.

This chapter joins a growing body of literature seeking to unravel whether and how workers are affected by automation and the adoption of technology in industry. Academic curiosity vis-a-vis the risks of technological change on workers is not new, but this strand of literature has recently witnessed a revival of interest, with the biggest names in Economics (e.g., Acemoglu, Aghion, Autor, among others) joining the debate. This renewal of interest echoes the rapid developments taking place in robotics, machine learning, artificial intelligence, and other such fields, technological advancements which are making some speculate about the inevitability of an upcoming "Great Replacement" of workers. However, so far the vast majority of this literature focused on the implications of technology on labor

demand, with very little empirical work conducted on labor's response to the adoption of technology in industry.

The second chapter of this dissertation tackles the problem of high youth unemployment in South Korea (Lee, 2017). More precisely, I explore the persistent effects of graduating during a period of high unemployment on a set of labor market outcome for female nurses (von Wachter, 2020). This chapter contributes occupation-level evidence to the literature on the scarring effects of unemployment, evidence which is very valuable to informing theory yet remains very scarce. Indeed, I use an instrumental variable approach to show that a higher unemployment rate at time of graduation carries scarring effects on nurses' wages, workhours and perceived condition. This chapter contributes valuable insights to policy makers looking to address the problem of Nurses' shortage which is a prevalent problem in both developed and developing nations. Additionally, the Korean Nursing profession is characterized by having one of the highest turnover levels in the world, thus further increasing this chapter's relevance for policy. Finally, the findings from this chapter provide further support to the need for policies aimed at mitigating the long term risks of joining the labor market during an economic downturn, as well as the necessity to assist fresh labor market entrants who have begun their working lives with a "bad start".

The final chapter addresses an increasingly worrying trend manifesting itself across South Korea, that of the social isolation of elders. This phenomenon has been associated with high levels of depression, suicide and morbidity among this faction of the country's population (Choi et al., 2019; Kim et al., 2016). Additionally, it has been linked with the growing number of "lonely deaths" or *Godoksa* cases among the middle-aged and elderly, individuals who die and whose deaths go unnoticed for weeks. This study is particularly relevant considering the current context of the ageing population in Korea which is quickly becoming a national emergency (Howe et al., 2007). This study is even more relevant

considering that the phenomenon of social isolation is not unique to South Korea, but is also becoming prevalent in many other developed countries. For instance, neighboring Japan is also struggling with *Kodokushi*, the Japanese equivalent of lonely deaths.

In this chapter, I join an extremely small body of literature examining the economic determinants of social isolation. Drawing on Strategic Bequeathing Theory as well as Aspirations Theory, I show that the inheritance expectations of adult children have significant implications on their parents' risks of becoming socially isolated and lonely (Bernheim et al., 1985; Genicot and Ray, 2017). My results are robust to a variety of models and estimation procedures. To the best of my knowledge, this is the only study which examines social isolation from the perspective bequest and aspirations.

For the empirical investigation I utilized panel data analysis across all three chapters of this dissertation. The main data providers for the first and second empirical chapters were the International Federation of Robotics (IFR), and the Korean Labor and Income Panel Study (KLIPS) whilst for the third one I sourced data from the Korean Longitudinal Study of Aging (KLoSA). More details on these datasets are provided in the Data section of each chapter.

The research that has been conducted as part of this PhD has been undertaken with three primary motivating drivers. Firstly, by exploring the hereabove set of issues pertaining to South Korea, one of my main objectives is to inform policy makers of this particular country which is in dire need of more attention from the international economics community. Secondly, the choice of South Korea as a case study was made in order to derive lessons that are relevant for other nations aspiring for a similar developmental path. Last but not least, each of the three chapters that constitute this thesis was designed to contribute novel empirical evidence to emerging bodies of literature and inform theory within each of these

strands (Monopsony theory in Chapter 1, Scarring theory in Chapter 2, and Aspirations theory in Chapter 3).

CHAPTER 1

ROBOTIZATION AND LABOR SUPPLY IN THE CONTEXT OF A DYNAMIC

MONOPSONY

Abstract: Using a framework based on dynamic monopsony, I estimate the effects of robotization in Manufacturing on labor supply in Manufacturing, Services, and the whole of the economy. Following Manning (2003) I decompose the labor supply elasticity into the wage elasticity of quits to employment, to non-employment, and the wage elasticity of the share of recruits coming from employment. In this direction, exponential hazard and a random effects logit methodologies are applied to a dataset for the South Korean economy that spans the period 1999-2019. My findings suggest that a larger operational stock of industrial robots in manufacturing is associated with manufacturing (non-manufacturing) workers becoming more (less) responsive to a change in wages in their decision to quit to non-employment, whilst the ease with which firms can poach workers is found to be unaffected by robotization. Plausible interpretations for these findings and directions for future research are also offered.

1. Introduction

"if each instrument could do its own work, at the word of command or by intelligent anticipation, like the statues of Daedalus or the tripods made by Hephaestus, of which the poet relates that 'Of their own motion they entered the conclave of Gods on Olympus.' A shuttle would then weave of itself, and a plectrum would do its own harp playing. In this situation managers would not need subordinates and masters would not need slaves."

(Aristotle (1957), in Devecka (2013))

Discussion surrounding robots is not new and we seem to have been carrying in our imagination, for millennia, the thought of competition between men and intelligent machines. While this may have once appeared as a wild fantasy, it has very much been brought to reality by contemporary industrial robots which are deployed in numerous manufacturing establishments around the globe.

In the realm of technological innovation, robotization has been the recipient of attention from many social scientists with a wide array of research interests. Such diversity in contemporary academic research relating to robotization is reflected *inter alia* by themes that explore the relationship between robots and the gender pay gap (Aksoy et al., 2019); basic income as a means of protection against technological unemployment (Pulkka, 2017); training as a mitigating factor against the risk of being replaced by robots (Koster and Brunori, 2021); the interaction between demographics and technological change (Jimeno, 2019); employee representation in automating firms (Belloc et al., 2020); robotization and election outcomes (Frey et al. 2018); robotization and workers' bargaining power (Leduc and Liu, 2020) and many other.

Yet, and overwhelmingly so, the primary motivation behind much of the efforts spent on exploring robots and other automated technologies' effects can be summarized with a

simple question: Should workers worry about robots? This simple question, however, remains without a clear and definitive answer, as different works keep on offering divergent and often contradictory findings (Barbieri et al., 2019).

In this paper, I seek to contribute to the strand of literature on industrial robots' effects on workers, taking robotization in South Korean manufacturing as a case study. My choice of South Korea is primarily motivated by a few reasons such as: a) the South Korean economy has undergone radical transformation over the past few decades and today hosts the highest robot density in the world (IFR, 2021; Seth, 2017); b) the movements in its labour share of income remain little understood; and c) there is a lack of diversity in terms of countries explored within the strands of the literature relevant to this research, South Korea being one such neglected country.

Certainly, the determinants and economic significance of robotization have been subject to scholars' scrutiny for a long time (see the early works of Hamidi-Noori and Templer, 1983; Benedetti, 1977), and so even in the case of South Korea (Torii, 1989)[1]. Yet, I believe that my take on the topic brings novel and "different" insights to the table. Indeed, by focusing on two main actors, namely the employers and the workers, I ask: 1) How do robots impact employers' labor market power? 2) How do workers respond to robotization? and 3) How does robotization affect the labor share of income?

In this direction, I adopt a dynamic monopsony framework to explore these questions, an approach I believe to be both adequate and efficient in that by studying the elasticity of labor supply to the firm and making use of its properties, I can generate insightful results about the effects of robotization on a) monopsony power, b) workers' responsiveness to wage

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[1] The literature on robotization in South Korea was limited compared to another East Asian economy which was synonym with rapid technological change: Japan. See Hasegawa (1979), Okubayashi (1986) and Yonemoto (1981) for explorations on determinants and effects of this early robotization.

changes[2], and c) the share of labor income. Indeed, the elasticity of labor supply indicates the extent of wage-setting power held by firms or, in other words, their ability to pay workers less than their marginal product. The elasticity of labor supply is inversely related to Pigou's (1924) rate of exploitation (the gap between marginal product of labor and the wage) and so, by estimating robots' impacts on this elasticity, I am able to comment on robotization's effects on the labor share.

I make a number of contributions to different strands of literature. Firstly, the empirical work on dynamic monopsony, while certainly growing, remains fairly limited. Secondly, the vast majority of researchers investigating the impact of robots on workers concentrate their efforts on labor demand, disregarding potential ramifications on labor supply and workers' response to technological change in the process. This study enriches the extant literature, by providing a novel or alternative way of exploring robotization's effects as categorized by Acemoglu and Restrepo (2019). I pay particular attention to the "composition effect" (the reallocation of economic activity from one sector to another) and observe whether and how robotization in manufacturing affects workers in services. Thirdly, in spite of the large and growing body of work investigating technological change, I am not aware of any study which engages into an in-depth exploration of industrial robots' effects on Korean workers. In fact, there is a lack of diversity in the literature on robotization when it comes to the economies investigated. Barbieri et al. (2019) show that studies on automation in developing economies are extremely limited, in spite of them witnessing rapid technological change. Furthermore, the need to explore different countries in more depth is necessary, as evidenced by Faber (2020), Carbonero et al. (2020) and de Vries et al. (2020) who show that

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[2] Dauth el al. (2017) explore this question from a different angle. They show that workers more exposed to robots have more stable jobs, while we are interested in finding out whether robotization affects workers' responsiveness to wage changes.

workers in countries at different stages of their development do not face the same robot-induced challenges.

The rest of the paper is organized as follows: Section 2 expounds upon the existing literature pertinent to my framework of analysis, whilst section 3 spells out the empirical methodology utilized in this study. Section 4 presents the empirical evidence and section 5 discusses and interprets the results. Finally, section 6 provides some concluding remarks.

2. Relevant literature

At the origin of much of the anxiety when it comes to the risks posed by robots are those studies which attempt to estimate the number or proportion of jobs at risk of disappearing. Autor et al. (2003) develop and test a model where computerization impacts different types of tasks (routine/repetitive, non-routine, cognitive and manual). They posit that computerization negatively impacts routine/repetitive cognitive and manual tasks, and that as computers' capabilities develop, they will cause an increase in productivity for non-routine cognitive workers. Goos and Manning (2007) show that this "routinization" hypothesis offers a valuable (although incomplete) explanation for the job polarization (between high-wage and low-wage occupations) that has been occurring in the UK since 1975. Frey and Osborne (2017) categorize 702 US occupations and conclude that 47% of US jobs are at risk of disappearing at the hand of automation.

Yet, Arntz et al. (2019) suggest that anticipating cataclysmic consequences to robotization may be unfounded, as studies spreading this panic often ignore the heterogeneity of tasks within one same occupation, the actual time it takes to automate, and workers' ability to adjust for automation. A number of studies also point towards this direction, particularly those which assess the risk of automation by conducting their analysis on a task-level such as

Arntz et al. (2016), Arntz et al. (2017) and Nedelkoska and Quintini (2018) for the US, Pouliakas (2018) for the EU and Dengler and Matthes (2018) for Germany. They all report much lower percentages of jobs at risk of automation compared to studies which are conducted on an occupational level such as Frey and Osborne (2017), Bowles (2014), or Pajarinen and Rouvinen (2014). Observing tasks instead of occupations indeed makes sense, as workers in one same occupation often perform different tasks (Autor and Handel, 2013; Spitz-Oener, 2006). Moody (2018) suggests that measuring an occupation's susceptibility to be automated amounts to almost a useless endeavour: commenting on the paradox of a growing American workforce in times of increasing robotization, he discusses how the real risk for workers lies in profitability rates, in the firm's assessment of the return on robotization investment. Cirillo et al. (2021) suggest that digitization could signal more worrying venues for workers than robotization. Just another false alarm, another development in a long history of technical change not worth the panic (Fernández-Macías et al., 2021; Miller and Atkinson 2013)?

A number of studies have looked at the actual effect of robots on aggregate employment levels. In the UK, Kariel (2021) finds a positive effect of robots on employment in services, and a negative one for manufacturing. In the US and using a number of proxies for robotization, Leigh et al. (2020) show that robots have had a positive effect on employment in Manufacturing. Klenert et al. (2020) find that industrial robots have had a positive effect on European employment. In France, Aghion et al. (2020) show that automation technologies have a positive effect on employment at all levels (plant, firm, and industry). Also in France, Acemoglu et al. (2020) find that the labor share and share of production of workers declined in robot-adopting firms, but that overall employment in firms was positively correlated with robotization.

Gregory et al. (2018) and Acemoglu and Restrepo (2019) explore some ways via which robotization and other types of technologies can affect employment. Gregory et al. (2018) find that technological change has created more jobs than it destroyed (1.5 million jobs between 1999 and 2010) and while they do establish that technology did replace a large number of workers, this displacement was offset by technologically induced product demand and spillover effects. The product demand effect represents the additional demand for labor caused by lower capital costs and thus lower prices. The spillover effect stands for the increase in local labor demand following the rise in income induced by the product demand effect. Such offsetting effects are theorized by Acemoglu and Restrepo (2019) in a more general manner. In their framework, robotization can displace workers, but it can also generate a productivity effect that increases labor demand, and even creates completely new tasks where workers have an advantage over technology. Robots can also cause a composition effect, meaning a reallocation of economic activity towards different sectors. Acemoglu and Restrepo (2020) apply this model in their analysis on the impact of industrial robots on jobs and wages in the US economy. They find that the productivity effect was too small to offset the displacement of workers caused by the stocks of robots, results that could be cause of concern considering the projected increase in these stocks over the upcoming years (Ford, 2015). Similarly, Chiacchio et al. (2018) find that the displacement effect has been largely outweighing the productivity effects of industrial robots in the EU. However, Paba et al. (2020) show that this is not true for Italy, where robotization has led to a growth in aggregate employment via an expansion of employment in services.

Undoubtedly, much of the debate revolves around the productivity-enhancing properties of robots, for that is the ground on which humans are supposed to compete against machines. Indeed, the use of industrial robots increases productivity growth and total factor productivity as reported by Graetz and Michaels (2018) from their study of a panel of 17

countries covering the period 1993 to 2007. Fujiwara and Zhu (2020) use a panel of 33 countries and relay a similar positive effect on labor productivity. Graetz and Michaels (2018) show that industrial robot densification is associated with lower output prices. This is in line with the findings of Koch et al. (2019) and Ballestar et al. (2020) from Spain, and Jungmittag and Pesole (2019) from 12 EU countries who all show that robots have had a positive effect on productivity in manufacturing. However, Cette et al. (2021) work with a panel of 30 countries and show that between the introduction of industrial robots and up until 2019, robots' impact on productivity was relatively modest for most countries in their study.

Clearly, our understanding of the ramifications of the rapid deployment of robots in global production plants remains a work in progress. Even the reasons that push firms to automate, and whether they should, remain subject to debate. Of course, there are cases where robots come to fill a clear labor shortage, and not simply to increase profitability. Yet, industrial robots have seen a shockingly rapid deployment in places where one would not expect to see them, such as Eastern Europe, regions that are associated with relatively low labor costs (Lordan, 2018; Cséfalvay, 2020). In China where demographically permitted economies of scale have been key to the country's growth, robotization took place at a later time compared to more developed economies, primarily due to the 2008 crisis which triggered a need to "upgrade" industrial processes (Huang and Sharif, 2017; Giuntella and Wang, 2019).

In light of this wide array of conflicting findings, this study opts for a new perspective on the matter, mainly the adoption of dynamic monopsony to understand robots' effects on workers' labor supply. Major milestones in the development of monopsony theory are Robinson (1933) and, much later, Manning (2003). Fundamentally, the concept of labor market monopsony relays the notion that frictions in the labor market provide employers with a certain degree of wage-setting power. The clear reality that most people think twice before

accepting or quitting a job indicates some degree of imperfection and monopsony power in the market.

A number of studies have adopted dynamic monopsony to investigate a wide array of phenomena[3]. Ransom and Oaxaca (2010) work with such a framework, using separation rates to estimate the elasticity of labor supply in a chain of grocery stores by gender groups. They find that for both genders, elasticities are small but that the labor supply elasticity for females (1.5-2.5) was smaller to that of males (2.4-3). Ransom and Sims (2010) apply this methodology to the market for schoolteachers in Missouri, finding a labor supply elasticity of 3.7, and considerable wage setting power by district. Moreover, dynamic monopsony frameworks have been used for a multitude of purposes, such as studying employer switching costs (Fox, 2010), the timing of buyer-seller and employer-employee contracts (Priest, 2010) among others. This wide array of applications comes as no surprise as imperfections can explain many abnormalities that contradict assumptions of a "perfect world". Manning (2020) surveys this literature and reviews the recent evolutions in monopsony theory and its applications on various economic problems[4].

While I do not come across a paper studying robotization from a dynamic monopsony perspective, I notice some common grounds between these two strands of literature. For instance, Eeckhout et al. (2019) make use of spatial sorting, a topic much touched upon in papers relating to monopsony, to develop and test a model which links location, automation, and job polarization. Also, Bachmann et al. (2019) reconcile the factually increasing labor market polarization in Germany with monopsony theory and, using a dynamic model of monopsony, find that workers performing more routine tasks face less monopsony power

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[3] A 2010 issue of the *Journal of Labor Economics* was dedicated to studies on monopsony. See Ashenfelter et al. (2010) for a summary.
[4] See Bhaskar et al. (2002) for an earlier review of the areas where frameworks based on monopsonistic competition could prove advantageous.

than those who do not, thus depicting a clear relationship between task content and monopsony faced by workers.

The entirety of the above listed literature contributed to the way I framed this study, but the main inspirations for this research and the methodology I adopted are Manning (2003) for the adoption of a monopsony framework, Ransom and Oaxaca (2010), Ransom and Sims (2010) and Hirsch et al. (2018) for the estimation of the wage elasticity of separations, and Acemoglu and Restrepo (2019) and Acemoglu and Restrepo (2020) for the interpretation of robotization's effects on workers.

3. Empirical investigation

In dynamic monopsony, the elasticity of the labor supply curve facing the firm can be decomposed into the wage elasticities of separations to employment ϵ_S^E and to non-employment ϵ_S^N, and the wage elasticity of the share of recruits coming from employment β_w (see Appendix A). In this paper, the object of interest is not to draw an estimate of the elasticity of labor supply, but rather to observe how it is affected by robotization. I thus concentrate my efforts on the interaction between robots and the three elasticities ϵ_S^E, ϵ_S^N and β_w.

To arrive at estimates of the separation rate elasticities to employment and non-employment, I follow the approach of Hirsch et al. (2010) and Hirsch et al. (2018) who, using Manning (2003: 100–104), model the separation rates of job *i* belonging to worker *m(i)* as exponential models:

$$s_i^\rho\left(x_i^\rho, v_{m(i)}^\rho\right) = \exp\left(x_i^\rho(t)\beta^\rho\right)v_{m(i)}^\rho \tag{1}$$

with route ρ =E (quit to employment) and N (quit to non-employment), a vector of independent time-varying covariates $x_i^\rho(t)$, a vector of coefficients β^ρ, and unobserved worker heterogeneity $v_{m(i)}^\rho$ assumed to follow a gamma distribution[5]. Among the covariates are the log (real) wage and an interaction term between the log wage and the operational stock of industrial robots $R_i(t)$, so that the wage elasticity of separations to employment is obtained by

$$\epsilon_S^E = \beta_{\log wage}^E + \beta_{\log wage \times R}^E \times R_i(t), \tag{2}$$

and the wage elasticity of separations to non-employment by

$$\epsilon_S^N = \beta_{\log wage}^N + \beta_{\log wage \times R}^N \times R_i(t). \tag{3}$$

My approach to estimating the effect of robots on wage elasticities of separations is thus in line with Hirsch et al. (2018) who examine the cyclicality of the elasticity of labor supply by using an interaction term between the log wage and the unemployment rate.

For the estimation of ϵ_S^N, I use the whole sample of job spells (whether the job ends with employment or non-employment), while for the estimation of ϵ_S^E my sample includes only the job spells that end with employment, thus following Manning's (2003, p.101) approach. Since I am interested in the effect of wages on workers' separation decisions, I only consider voluntary quits and right-censor involuntary quits and layoffs, a method rendered possible by my dataset which shows the reason why a worker's job spell ended.[6] Moreover, Manning (2003, p.104) explains that the separation elasticity is biased towards

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[5] See Abbring and van den Berg (2007) for the convergence of heterogeneity towards a Gamma distribution in hazard models with proportional heterogeneity.

[6] Hirsch et al. (2018) cannot distinguish voluntary and involuntary separations due to the information provided in their dataset, and thus attempt to partially remedy this issue by disregarding jobs ending in the year the corresponding plant closed and controlling for a number of plant characteristics.

zero, and that shortening the time horizon over which the data is observed reduces this bias. To deal with this unobserved heterogeneity' induced bias, my duration models are estimated with a monthly time period. Note that, following the recommendation of Manning (2003), I do not control for length of tenure as firms may increase wages to keep certain workers and prevent potential quits, which increases tenure.[7]

To obtain the wage elasticity of the share of recruits hired from employment β_w presented in equation (14), I follow Hirsch et al. (2010) and Hirsch et al. (2018) and estimate a random-effects logit model for the probability that a recruit is hired from employment[8]. The use of a random-effect logit model is justified by my modelling of the share of recruits coming from employment $\theta^R(w)$ as a logistic function based on Manning (2003, p.100) and as explained above, with the additional assumption that unobserved heterogeneity follows a normal distribution with mean zero and finite variance. I thus have

$$\Pr = \left[y_i = 1 \middle| x_i, v_{m(i)}\right] = \Lambda\left(x_i'\beta + v_{m(i)}\right), \tag{4}$$

where y_i is a dummy variable taking the value of 1 if a recruit comes from employment and 0 otherwise, Λ shows the cumulative distribution function of the standard logistic distribution, and unobserved worker heterogeneity $v_{m(i)}$ is Gaussian. Similar to the previous estimations, the covariates include the log wage and an interaction term between the wage and robots, hence the wage elasticity of the share of recruits from employment becomes:

$$\beta_w = \beta_{\log wage} + \beta_{\log wage \times R} \times R_i(t). \tag{5}$$

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[7] Manning (2003, p. 102-103) controls for tenure when estimating separation elasticities for four samples and shows that controlling for tenure always reduces the wage elasticity in absolute value.
[8] This shows why β_w hints at firms' ability to poach workers.

For the two wage elasticities of separations, I expect a negative coefficient $\beta_{log\,wage}$ in both estimations, as an increase in offered wages should logically be met with lower voluntary quits, whereas I anticipate a positive coefficient $\beta_{\log wage}$ in the estimation of the wage elasticity of the share of recruits coming from employment, since a firm offering higher wages should find itself able to poach workers with greater ease. Fundamentally, this study revolves around the interaction term in each of these three estimations: if the interaction term is positive (negative) in my estimation of the elasticities of separations, then the stock of operational robots would be lowering (increasing) the wage elasticities of separations in absolute value and thus increasing (decreasing) the degree of monopsonistic competition in the market ceteris paribus. If the interaction term is positive (negative) in the estimation of the wage elasticity of the share of recruits from employment, then the stock of operational robots would be increasing (decreasing) the capability of firms to poach workers, and also increasing (decreasing) the degree of monopsonistic competition ceteris paribus.

3.1 Data, variables, and estimation

In terms of data used and the specification of the variables, I combine three datasets from the Korea Labor and Income Panel Study (KLIPS): The Work History, Individual and Household datasets. KLIPS is South Korea's only labor market panel survey, annually tracking all members of around 7,000 households.

The Work History dataset provides data on all jobs held by an individual since entry in the labor market. The original datasets include both wage earners and non-wage earners but considering the objectives of this study, I concern myself with wage earners only and disregard non-wage earners. Additionally, the questionnaire used to construct the Work History dataset is conducted on a job level, hence a same person could be observed more than once in a particular year. Having disregarded non-wage-earning jobs, I maintain the

possibility of one same individual having two wage-earning jobs at a particular point in time and treat these two jobs as distinct observations. Finally, I concern myself only with jobs surveyed starting the fourth wave of KLIPS due to the frequency of missing values in prior waves. Table 1 provides an overview of the sample I work with.

Table 1 - Sample Description	
Job Spells	34513
Records	95,181
Workers	16,521
Separations to employment	2,883
Separations to non-employment	11,998
Censored job spells	19,632
Notes: The data set used comes from wave 4 to wave 22 of the 22nd version of the Korean Labor and Income Panel Study (KLIPS), restricted to wage earners with job spells starting from 1990 until 2019.	

The Individual dataset uses the respondent as its unit of analysis, whereas the Work History dataset uses jobs as just mentioned. I am able to combine these two datasets using a key identifying variable for each individual, and I maintain job spells as the unit of observation throughout my study. The Individual dataset provides a rich source of information on respondents, such as gender, age, education, location, health status, marital status, job satisfaction, wage satisfaction, leisure satisfaction and state of economic activity.

A key value-point of the KLIPS survey and consequently of this paper is that I am able to control for relevant factors which, to the best of my knowledge, have been omitted in other studies using estimations of the wage elasticity of labor supply (e.g. Health condition, family financial status). The Household dataset uses households as a unit of analysis, but I am able to link each individual, and thus job spell, to the relevant household using a key

household identifying variable. Some of the information contained in this dataset includes one's household size, whether the household owns the place of residence or rents, living expenses, ownership of real estate, financial support given or received by the household, average total earnings of the household, other sources of income, number of social benefits recipients in the household, existence and value of savings, burdensome expenses, debt and current financial condition among others.

For my measure of the operational stock of industrial robots in a labor market, I use data from the International Federation of Robotics (IFR). The IFR follows ISO 8373:2012 and defines industrial robots as being "automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications" (IFR, 2020; pp.23). For its estimations of the industrial robots' operational stocks and installations in South Korea, the IFR has been obtaining data from the Korean Association of Robot Industry (KAR) since 2015, and the Korean Machine Tool Manufacturers Association (KOMMA) before that.

I collect data on the annual operational stocks of industrial robots in each industry from the IFR, covering the period of 2004 to 2019. The industries covered are food and beverages; textiles; wood and furniture; paper; plastic and chemicals; glass and ceramics; basic metals; metal products; metal machinery; electronics; automotive; other vehicles; other manufacturing industries (e.g. recycling); construction; and electricity, gas and water. I omit agriculture as well as mining and quarrying.

To estimate the impact of industrial robots on the wage elasticity, I must first establish a measure for the degree of penetration of robots in the economy. I model the Korean economy as a two-sector economy (Manufacturing vs. Services) and define a local labor market as a single sector geographical unit. I use provinces as the geographical unit in order

to avoid problems associated with overly small labor markets, such as fluidity due to commuting workers (Tolbert and Sizer, 1996; Pischke and Velling, 1997).

Having defined local labor markets, I now move on to determining the number of robots in each local labor market, after which I will be able to estimate the effect of robot penetration on the three wage elasticities. I use the Local Area Labour Force Survey to obtain data on employment per local labor market, and the Mining and Manufacturing Survey to extract the value of machinery in manufacturing in each province and distribute the stock of robots proportionally, so that my variable for robot penetration in a local labor market becomes "*robots in manufacturing per thousand workers in manufacturing*".

For robustness, I use three proxies for robot penetration, constructed the following way: 1) I extract the number of manufacturing establishments with more than 10 employees in each province from the Mining and Manufacturing Survey and construct a "*robots in manufacturing per manufacturing establishment*" variable, 2) I extract the total number of workers in all industries in a province from the Economically Active Population Survey and define a "*robots in manufacturing industry per thousand workers in all industries*", and 3) I use data from the Mining and Manufacturing Survey and the Economically Active Population Survey to construct a "*value of machinery in manufacturing (in million wons) per thousand workers in all industries*". Note that for the last proxy, my estimations cover the period from 1999 to 2019 since I am not limited by the IFR data which begins in 2004.

4. Results

In this section, I present the results for my estimation of the wage elasticity of quits to non-employment, the wage elasticity of quits to employment, and the wage elasticity of the share of recruits coming from employment. My primary interest is in observing the coefficients of

the interaction terms for the wage and robots, which would indicate whether robotization in manufacturing has any significant effect on the degree of monopsony in the labor market in question and, if so, the nature of that effect. In addition to the control variables discussed in the previous section and which are reported under each table, all my estimations include macro controls, year dummies, province dummies, industry dummies and provincial unemployment rate.

4.1 The wage elasticity of quits to non-employment

I begin by estimating the wage elasticity of quits to non-employment for manufacturing, services and all industries, the results of which are reported in table 2. Model 1 measures robot penetration in terms of number of robots per manufacturing establishment, while model 2 measures it as number of robots per thousand manufacturing workers. Both models exhibit the same results, all of which are statistically significant at the 1% level. As expected, the coefficients of log wage are negative for all estimations. Any different result would have been surprising since it would imply that higher wages are associated with more voluntary separations.

The rows reporting the estimated coefficients for the log wage and its interaction with robots (*log real wage x log robots*) report some interesting findings. For manufacturing, I see that a larger operational stock of industrial robots increases the wage elasticity of quits to non-employment in absolute value, with both models showing negative coefficients for the interaction term. The story is different for services, as a greater use of industrial robots in manufacturing appears to lower the wage elasticity of quits to non-employment as evidenced by the positive coefficients for the interaction term for wages and robots in both models. The effect of robots in manufacturing on the elasticity for all industries is similar to that in

services, with positive coefficients for the interaction terms in both models, suggesting a depressing effect of robots on the elasticity of quits in the Korean labor market.

Table 2 - Estimation results: wage elasticity of quits to non-employment						
	Manufacturing		Services		All Industries	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Model 1: robots=Robots per manufacturing establishment (2004-2019)						
log real wage	-0.555***	(0.067)	-0.469***	(0.025)	-0.467***	(0.023)
log real wage x log robots	-0.119***	(0.032)	0.043***	(0.01)	0.032***	(0.009)
Model 2: robots=Robots per thousand manufacturing workers (2004-2019)						
log real wage	-0.322***	(0.109)	-0.628***	(0.042)	-0.592***	(0.037)
log real wage x log robots	-0.063**	(0.031)	0.05***	(0.01)	0.039***	(0.01)

Notes: All estimations include the following controls; year dummies, province dummies, industry dummies, 3 Age dummies, Gender, Health condition, household financial condition, marital status, 3 education dummies, currently studying dummy, overtime work dummy, existence of union dummy, 4 type of employer dummies, 3 dummies for firm size, 8 dummies for firm-provided benefits, the unemployment rate (province level), and log number of manufacturing establishments in city. For estimations pertinent to manufacturing only, I also control for the log number of industrial robots per manufacturing establishment. For the other estimations, I control for the log total number of industrial robots in the economy per thousand workers in all sectors, and the country ICT index (2015=100). ***; ** denote statistical significance at the 1% and 5% levels respectively.

To further test the robustness of this inter-sectoral effect of manufacturing robotization, I estimate two other models using different proxies for robotization the results of which are reported in table 3[9]. In my first round of estimations, I define the robots' variable as "*number of robots in manufacturing industry per thousand workers in all industries*". The results are in accordance with those reported in table 2, mainly that a greater

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[9] The correlation matrix of all three proxies for robotization used in the study suggests that these are highly correlated with the correlation coefficients raging from 0.73 to 0.98.

operational stock of industrial robots in manufacturing lowers the wage elasticity of quits to

non-employment in absolute value in both services and the economy. In my second round of

estimations, I substitute industrial robots for the value of machinery in the manufacturing

sector, and my estimations encompass a longer time period (1999-2019). The positive

coefficients for the interaction term between the wage and machinery support the findings of

the previous three models, suggesting that a greater deployment in machinery in

manufacturing depresses the elasticity of quits to non-employment in other sectors.

Table 3 - Estimation results: wage elasticity of quits to non-employment (proxies)				
	Services		All Industries	
	Coefficient	SE	Coefficient	SE
Proxy1: Robots in manufacturing industry per thousand workers in all industries (2004-2019)				
log real wage	-0.498***	(0.025)	-0.489***	(0.023)
log real wage x log proxy1	0.033***	(0.009)	0.024***	(0.009)
Proxy2: Machinery (mill. KRW) in manufacturing industry per thousand workers in all industries (1999-2019)				
log real wage	-0.752***	(0.083)	-0.706***	(0.075)
log real wage x log proxy2	0.033***	(0.01)	0.028***	(0.009)

Notes: Both estimations include the following controls; year dummies, province dummies, industry dummies, 3 Age dummies, Gender, Health condition, household financial condition, marital status, 3 education dummies, currently studying dummy, overtime work dummy, existence of union dummy, 4 type of employer dummies, 3 dummies for firm size, 8 dummies for firm-provided benefits, the unemployment rate (province level), log number of manufacturing establishments in city, and the country ICT index (2015=100). For the 2004-2019 estimation, I further control for the log total number of industrial robots in the economy per thousand workers of all sectors. ***; ** denote statistical significance at the 1% and 5% levels respectively.

Intuitively, these results suggest that greater robotization in manufacturing lowers the degree of monopsonistic competition in the manufacturing sector and increases it in services and other parts of the economy. In other words, higher robotization in manufacturing lowers Pigouvian exploitation in manufacturing while it increases it in other sectors, or also manufacturing robotization is associated with workers becoming more responsive to a change in wages in manufacturing and less responsive in other sectors. Of course, the net effect of robotization on the labor supply elasticity depends also on the two other elasticities to be investigated: the wage elasticity of quits to employment and the wage elasticity of the share of recruits coming from employment.

4.2 The wage elasticity of quits to employment

I move on to the estimations of the elasticities of quits to employment, the results of which are reported in table 4.

As expected, coefficients for the log wage are all negative and statistically significant at the 1% level, hence higher wages are associated with lower quits towards other jobs. Turning my attention towards the effects of robotization on these elasticities, I observe that the interaction term for wages and robots is insignificant in all estimations, implying that robotization in manufacturing has no effect on a worker's decision to quit for another job. These findings come as no surprise considering that a separation to employment reflects the manifestation of an alternative option for the worker; given that my estimations use only voluntary quits as the dependent binary variable, one would have no reason to expect any impact of robotization on the nature of the worker's decision, i.e. to opt for the best of available career options depending on the worker's idiosyncrasies. By and large, these results suggest that there is no additional, discernible effect for robotization on the degree of monopsony in either sector.

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Table 4 - Estimation results: wage elasticity of quits to employment		
	Coefficient	SE
Manufacturing		
log real wage	-0.752***	(0.246)
log real wage x log robots	-0.004	(0.07)
Services		
log real wage	-0.77***	(0.095)
log real wage x log robots	0.046	(0.027)
All Industries		
log real wage	-0.776***	(0.085)
log real wage x log robots	0.038	(0.024)

Note: Data covers the period 2004-2019. "robots" is defined as the number of industrial robots per thousand manufacturing workers. Insignificant coefficients for the interaction term are also obtained when defining "robots" as number of industrial robots per manufacturing establishment. All estimations include the following controls; year dummies, province dummies, industry dummies, 3 Age dummies, Gender, Health condition, household financial condition, marital status, 3 education dummies, currently studying dummy, overtime work dummy, existence of union dummy, 4 type of employer dummies, 3 dummies for firm size, 8 dummies for firm-provided benefits, the unemployment rate (province level), log number of manufacturing establishments in city, log total number of industrial robots in the economy per thousand workers of all sectors, and the country ICT index (2015=100). ***; ** denote statistical significance at the 1% and 5% levels respectively.

4.3 The wage elasticity of the share of recruits coming from employment

The third and final group of elasticities I need to estimate is the wage elasticity of the share of recruits coming from employment. This elasticity represents the ease with which firms can attract workers from competitors, hence a positive coefficient of the interaction term for the wage and robots would imply that firms can poach workers with more ease. Since intuition dictates that firms paying higher wages should be able to poach workers, I expect positive coefficients for the log wage, and such is the case for all estimations as shown in table 5. However, the effect of robots proves to be statistically insignificant, suggesting that

robotization in manufacturing has little to no effect on the ease with which firms can poach workers, be it in manufacturing or other sectors of the economy.

Table 5 - Estimation results: random effects logit model for probability hire comes from employment		
	Coefficient	SE
Manufacturing		
log real wage	0.719***	(0.24)
log real wage x log robots	-0.144	(0.147)
Services		
log real wage	0.863***	(0.096)
log real wage x log robots	0.001	(0.051)
All Industries		
log real wage	0.82***	(0.082)
log real wage x log robots	-0.002	(0.045)
Note: Data covers the period 2004-2019. "robots" is defined as the number of industrial robots per manufacturing establishment. Insignificant coefficients for the interaction term are also obtained when defining "robots" as number of industrial robots per thousand manufacturing workers. All estimations include the following controls; year dummies, province dummies, industry dummies, 3 Age dummies, Gender, Health condition, household financial condition, marital status, 3 education dummies, currently studying dummy, existence of union dummy, 4 type of employer dummies, 3 dummies for firm size, 8 dummies for firm-provided benefits, the unemployment rate (province level), log number of manufacturing establishments in city, log number of industrial robots per manufacturing establishment, log total number of industrial robots in the economy per thousand workers of all sectors, and the country ICT index (2015=100). ***; ** denote statistical significance at the 1% and 5% levels respectively.		

The results of my combined estimations for the three wage elasticities show that robotization in the manufacturing sector increases the labor supply elasticity in manufacturing and lowers it in services with a net depressing effect on the labor supply elasticity for the whole economy. These effects on the degree of monopsonistic competition in different parts of the market are manifested through one channel: a robotization-induced'

modification in workers' responsiveness to changes in wages in their decision to quit to non-employment. My findings show this with the significant coefficients in front of the interaction terms for wages and robots in the estimations of the wage elasticities of quits to non-employment, and the insignificant results when estimating the other components of the labor supply elasticity. Simply, I see that more robots in manufacturing make manufacturing workers more prone to separate for wage-related reasons, while the opposite can be observed for non-manufacturing workers.

5. Discussion

In the context of South Korea, there is no consensus as to whether the labor share of income has decreased or not. Indeed, Karabarbounis and Neiman (2014) find that Korea is among the few countries to experience an increase in labor share in the corporate sector, while Song (2021) finds a declining labor share in the country. This comes as no surprise considering the complexity of measuring the labor share, with different methodologies often generating different results (Lee, 2015).

My findings report a significant and negative (positive) effect of robotization on the degree of monopsonistic competition in the manufacturing (services) sector, suggesting a lower (higher) Pigouvian rate of exploitation and thus a positive (negative) impact on the labor share of income in this sector. My results also show that a larger operational stock of industrial robots in manufacturing increases the degree of monopsonistic competition in the Korean economy, indicating a negative effect on the labor share of income on an aggregate level.

One way to interpret the greater degree of monopsony in services due to robotization in manufacturing is with a composition effect going from manufacturing to services as

described in Acemoglu and Restrepo (2019): a reallocation of value added towards services where productivity is growing faster than wages, hence the increasing Pigouvian exploitation associated with robotization. This interpretation finds support in Rieu and Park (2020) who observe sectoral rates of surplus value to study recent macro-trends and structural changes in the Korean economy.

Figure 1 (a, b)

The share of unproductive sectors in South Korea

(a) Value added   (b) Employment and compensation
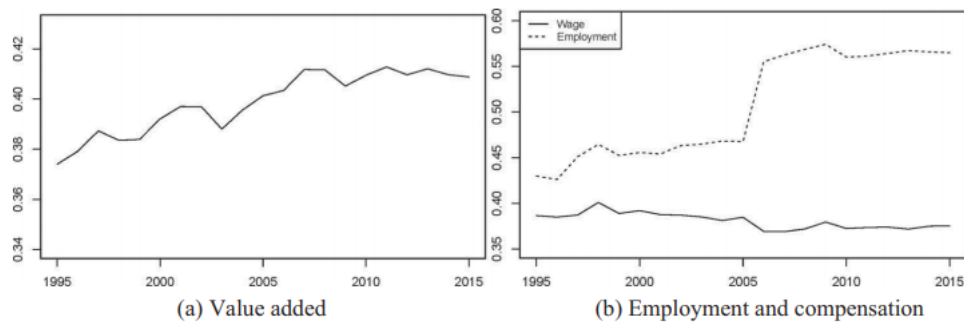
Source: Rieu and Park (2020)

Looking at figures (1a) and (1b) jointly, we can see that the labor share of value added in "unproductive sectors" has experienced an almost steady decline between 1995 and 2015, and Rieu and Park (2020) further support this observation by showing how the Marxian rate of exploitation continuously intensified over that same period. We can relate this observation on stagnating wages to Lee (2016) who shows that Korea experienced an increase in corporate savings that is superior to that in the majority of developed economies, and that this increase is associated with a lower labor share of income and higher inequality. The National Assembly Budget Office (2014) also reports an increase in retained earnings simultaneously accompanied by a deceleration in the rate of investments between 1995-2011, which suggest

negative effects on the labor share (Chen et al., 2017; Karabarbounis and Neiman, 2014). Kim (2015) further supports this and finds that in the case of the top 50 Korean firms, only a small portion of retained earnings are directed towards investment.

In this context, my study joins the body of work investigating whether the fall in labor share in an economy is due to a fall on an intra-industry level, or because of a sectoral recomposition whereby activity is reallocated to industries where the labor share is naturally lower. Rodriguez and Jayadev (2013) and Karabarbounis and Neiman (2014) suggest that the former is true, mainly that the decline in labor share is due to intra-industry movements and not a sectoral reallocation of activity. Song (2021) finds that the falling labor share in Korea can mostly be attributed to a decline within capital-intensive industries, thus refuting the hypothesis which posits that a growth in services is to blame for the falling labor share.

However, my findings cast doubt on this hypothesis when it comes to the effect of robotization in manufacturing on the degree of monopsony in services and the aggregate economy, as my study signals an inter-sectoral effect to manufacturing robot density.

Furthermore, I qualify the following potential channels via which, individually or jointly, robotization is lowering the degree of exploitation in manufacturing, thus increasing the labor share. Firstly, robot adoption may be generating a productivity effect that outweighs robots' displacement effect in the manufacturing sector (Acemoglu and Restrepo, 2019; Autor and Salomons, 2018): because of enhanced productivity, that same sector witnesses greater demand for labor in non-robotized tasks, a demand for workers that is larger than the number of those displaced by robots, hence a net positive change in labor demand. This would be in contrast to the findings of Kariel (2021) for the UK, and more in line with Leigh et al. (2020) and Barth et al. (2020). Moreover, this positive effect on employment is accompanied by a larger labor-share of value added thanks to high union density in large

manufacturing firms (Kim and Kim, 2020; Blanchard and Giavazzi, 2003). One may also postulate that robotization is creating completely new tasks and thus new jobs in the manufacturing sector, a "reinstatement effect" whereby the task content of production has tilted in favour of workers thus increasing the workers' share of value added (Acemoglu and Restrepo, 2019).

The statistically insignificant effect of robots on the ease with which firms can poach workers is intriguing, since considerable literature shows how robot' adopting firms largely dominate their competitors in share of employment (Acemoglu et al., 2020). Autor et al. (2020) show that firms with high productivity, high markups and low labor share of value added (what they refer to as "superstar firms") reap the benefits of technological change and increase their dominance over product markets. In Korea, Kim (2016) and Kim and Kim (2020) show that higher markups and market concentration have caused a decline in labor share. Autor and Salomons (2018) find that technological progress lowers the share of labor from value-added, even though it may have a positive aggregate effect on employment, which could be a reflection of the expansion of the "superstar firms" described in Autor et al. (2020). Barkai (2020) finds that, should capital have a role to play in the fall of labor share, then it is likely to be by increasing profitability and lowering the degree of competition. Clearly, whether and how lower competition in product markets affects the wage elasticity of labor supply is an interesting avenue for future research.

6. Concluding remarks

In this chapter, I have examined a new channel via which robotization impacts workers. Using a dynamic monopsony framework, I estimated the effect of an increase in the operational stock of industrial robots in Korean manufacturing on the labor supply elasticity

of manufacturing and non-manufacturing workers. Using Manning (2003), I ran duration models to estimate the effects of robotization on the wage elasticity of quits to non-employment and employment, and a random effects logit model for the estimation of the wage elasticity of the share of recruits coming from employment, effects which I observe using an interaction term for the wage and robot adoption. My results show that robotization in manufacturing has no statistically significant effect on the elasticity of quits to employment nor the elasticity of the share of recruits coming from employment for either sector. However, I observe statistically significant (1%) effects on the wage elasticity of quits to non-employment, increasing it in absolute value for manufacturing while depressing it for services and the whole economy. I interpret these findings as evidence for a displacement effect in manufacturing that has been outweighed by productivity effects, and a composition effect whereby value added is being transferred towards services where the labor share of income is in decline. I also interpret my findings in terms of Pigouvian exploitation and the labor share of income, and postulate that the considerable union density in large manufacturing establishments has secured workers' share of value added, while higher retained earnings and lower investment in services has diminished the share of workers.

These findings should prove interesting for policy makers, particularly in the current Korean context. Indeed, the Moon Jae-In government has opted for an income-led growth strategy since 2017, a direction criticized in Jeong and Jeong (2020). This policy framework affects the reservation position among the Korean labor force, which directly relates to workers' wage responsiveness. Furthermore, a greater reservation position for workers could very well impact the rate at which robots are deployed in manufacturing, with profitability taking centre stage in the firm's decision whether to invest or save (Moody, 2018). Finally, a particular concern for Korean policy makers should be the direction taken by services where workers are losing both in terms of wage responsiveness and share of value added (Pyo and

Rhee, 2018; Rieu and Park, 2020). This trend is worrying considering that the Korean economy is experiencing further transformation towards a service-led growth.

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The Elasticity of labor supply under dynamic monopsony

In a simple model of dynamic monopsony, the firm faces an upward sloping labor supply (L_t) curve in discrete time given by

$$L_t = [1 - S(w)]L_{t-1} + R(w), \qquad (6)$$

where $S(w)$ represents the rate of separations of workers from the firm and $R(w)$ being the flow of recruits, depending negatively and positively on the paid wage respectively, thus $S' < 0$ and $R' > 0$.[10]

In a steady state, separations and recruits balance and $L_t = L_{t-1}$ thus

$$L(w) = \frac{R(w)}{S(w)}, \qquad (7)$$

and taking logs and differentiating with respect to w, we obtain

$$\epsilon_{LW} = \epsilon_{RW} - \epsilon_{SW} \qquad (8)$$

where ϵ_{LW} is the long-run wage elasticity of labor supply faced by the firm, ϵ_{RW} is the wage elasticity of recruitment, and ϵ_{SW} is the wage elasticity of separations. ϵ_{LW} hints at the distribution of bargaining power between workers and the monopsonist as well as the labor share of income, as it relates to the proportional gap between marginal revenue product of labor and the real wage in the following way as shown by Manning (2003, p.30):

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[10] See Card and Krueger (1995, pp. 374)

$$\frac{MRP_L - w}{w} = \frac{1}{\epsilon_{LW}}. \tag{9}$$

Under perfect competition, $\epsilon_{LW} = \infty$ and $MRP_L = w$. The difference between MRP_L and w is the Pigouvian rate of exploitation (Pigou, 1924), revisited in Robinson (1933) and explored in depth by Persky and Tsang (1973)[11].

Equation (8) can further be decomposed in the following way:

$$\epsilon_{LW} = \theta^R \epsilon_R^E + (1 - \theta^R)\epsilon_R^N - \theta^S \epsilon_S^E - (1 - \theta^S)\epsilon_S^N, \tag{10}$$

which shows that the long-run elasticity of labor supply to the firm is the difference in weighted average of the elasticity of recruitment broken down into the elasticity of recruitment from employment (ϵ_R^E) and elasticity of recruitment from nonemployment (ϵ_R^N), and the elasticity of separation broken down into the elasticity of separation to employment (ϵ_S^E) and the elasticity of separation to nonemployment (ϵ_S^N). The weights θ^R and θ^S represent the share of recruits from employment and the share of separations to employment, respectively, and in a steady state we have $\theta^R = \theta^S$.

I am able to estimate the wage elasticities of separations using the job-flow data at my disposal, but estimating the wage elasticities of recruitment is a more complex task that would require data on all job offers received by workers to observe their reactions, information which I do not have for my sample of workers. Manning (2003) proposes a way to circumvent this problem, enabling me to estimate elasticities of recruitment with the data at my disposal.

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[11] Flatau (2001) compares Pigou (1924) and Robinson's (1933) notions of exploitation to show that, contrary to general belief, they are not identical. This fallacious consensus can, to a certain extent, be attributed to Robinson's adoption of Pigou's definition of exploitation and her later acknowledgement of Pigou as being the main influencer for her 1933 book *The Economics of Imperfect Competition* (Robinson,1978,pp:ix)

Building on Burdett and Mortensen (1998), Manning (2003, p.97) shows that the wage elasticity of recruitment from employment can be expressed as:

$$\epsilon_R^E = \frac{-\theta^S \epsilon_S^E}{\theta^R}, \tag{11}$$

and thus, in a steady state (or when $\theta^R = \theta^S$) we have

$$\epsilon_R^E = -\epsilon_S^E. \tag{12}$$

Since estimating the elasticity of separations ϵ_S^E can be accomplished using our job-flow data, equation (12) shows that in doing so, we would be estimating ϵ_R^E indirectly, thus remedying the initial complication faced.

For the elasticity of recruitment from nonemployment, Manning (2003, p.100) shows that it can be written as:

$$\epsilon_R^N = \epsilon_R^E - \frac{w\theta'^R(w)}{\theta^R(w)[1 - \theta^R(w)]}. \tag{13}$$

The second term on the righthand side shows the wage responsiveness of the share of recruits from employment, thus informing us on the ability with which firms can poach workers. Manning (2003) further shows us that we can model $\theta^R(w)$ as a logistic function $\frac{e^{\beta x}}{(1+e^{\beta x})}$ and, taking x as the log wage, we get:

$$\frac{w\theta'^R(w)}{\theta^R(w)[1 - \theta^R(w)]} = \beta_w, \tag{14}$$

with β_w being the coefficient on the log wage. The wage elasticity of the share of recruits can thus easily be obtained.

Descriptive statistics

	Manufacturing				Services			
	Mean	SD	Min.	Max	Mean	SD	Min.	Max.
Real monthly pay (10,000 KRW)	192.867	116.443	5.572	3786.648	162,619	112	1.743	3787.383
Single	0.226	0.418	0	1	0.281	0.450	0	1
Married	0.693	0.461	0	1	0.608	0.488	0	1
Age	43.234	12.019	17	80	42.158	14.091	15	80
Gender (1=male)	0.728	0.445	0	1	0.443	0.497	0	1
Government job dummy	0.003	0.053	0	1	0.092	0.289	0	1
Private company job dummy	0.9	0.301	0	1	0.755	0.43	0	1
Foreign company job dummy	0.008	0.087	0	1	0.005	0.07	0	1
Existence of union	0.103	0.305	0	1	0.106	0.308	0	1
Work overtime dummy	0.049	0.216	0	1	0.019	0.138	0	1
Poor household financial condition dummy	0.455	0.498	0	1	0.43	0.495	0	0
Household size (number of family members)	3.302	1.259	1	10	3.216	1.279	1	10

Note: Data used comes from wave 4 to wave 22 of the 22nd version of the Korean Labor and Income Panel Study (KLIPS), restricted to wage earners with job spells starting from 1990 till 2019. In KLIPS, I use the Work History dataset, the Individual dataset and the Household dataset.

CHAPTER 2

THE SCARRING EFFECTS OF INITIAL LABOR MARKET CONDITIONS AMONG

KOREAN NURSES

Abstract: I explore the persistent relation between unemployment at the time of graduation and labor market outcomes, in the context of the South Korean nursing profession. To this objective a 2SLS methodology is applied to a panel data set spanning the period 2000 to 2020. The yielding evidence suggests that the unemployment rate at time of graduation has negative effects on nurses' wages that remain highly significant up to 6 years after joining the labor market. My estimations also yield a positive effect on weekly work hours, suggesting that nurses who graduate under higher unemployment work longer hours and for a lesser wage. This effect decreases in magnitude with years of experience, but remains highly significant up to 10 years after graduating. Finally, I estimate a series of happiness equations to further get informed on nurses' experiences over the first ten years after joining the labor market. I find that a higher unemployment rate at time of graduation is associated with respondents reporting worse financial conditions, less happy lives, and lower income satisfaction. Finally, I make policy recommendations for an occupation characterized by significant labor shortages and a high turnover rate.

1. Introduction

Labour economic theory suggests that the early stage of a career is a particularly important phase in a worker's life. It is a period typically characterized by high productivity, during which an average worker goes through faster wage growth than they will ever experience. It is also a period where workers learn many of the critical skills that will shape their long-term working life, compiling a stock of human capital that will be used throughout their careers. Human capital can take different forms, and may be acquired in many different ways such as through performing particular tasks, interacting with certain types of colleagues, or via training and working under particular organizational settings. A bad career start might have adverse effects on the wage progression of certain individuals which are bound to last for a long period of time, while a good one could lead to a long-lasting wage premium (Guo, 2022; Schmillen and Umkehrer, 2018). Intuitively, this makes a lot of sense as individuals who are exposed from the early stages of their careers to experienced and knowledgeable colleagues, or who acquired a distinctive set of skills via training and quality experiences, stand more chances of being more productive hence achieving a better wage progression than those who have had limited such opportunities. In this context, the nature of the macroeconomic environment should also be taken into account as it directly affects one's chances of getting a job, let alone a "good job". It is therefore envisaged that graduating at a time where an economy is contracting may have negative effects on employment and wages that persist for a long time after joining the labor market (Kawaguchi and Murao, 2014; Raaum and Roed, 2006). This notion, known as scarring and also sometimes referred to as hysteresis, has been the subject of many theoretical interpretations which I will explore later in this paper.

Empirically, studies have shown that macroeconomic conditions at labor market entry have scarring effects on income, employment, consumption, health, wellbeing, and a number of other outcomes. The empirical findings on scarring are reviewed by Borland (2020), while

the theoretical arguments underpinning this literature are discussed extensively by von Wachter (2020). Naturally, such studies have clear implications for policy, but also for theory as labor market frictions enter a wide array of micro and macroeconomic models (Card, 2019; Oreopoulos et al., 2012, von Wachter, 2020). It is thus essential to advance our understanding of the long-term effects of an unlucky start to working life, and the channels via which such effects persist.

Perhaps unsurprisingly, one labor outcome that has drawn special interest from scholars interested in persistence is income. In amidst the studies that evaluate the impact of initial labor market conditions on the subsequent income, Kahn (2010) and Kawaguchi and Kondo (2020) using the National Longitudinal Survey of 1979 (NLSY79) find that graduating during a recession has a persistent negative effect on wages. A similar conclusion is reached by Genda et al. (2010) when using the Current Population Survey. In the US, graduating during a large recession is found to have a small but persistent impact on future wages (Altonji et al., 2016). Barsbai et al. (2022) look at labor market entry from a migration perspective instead of graduation, and find that a one percentage point increase in the unemployment rate at arrival decreases annual wage income for migrants by four percent and two percent in the short and long run respectively. In Australia, Brunner and Kuhn (2014) show that an increase in the initial local unemployment rate by one percentage point decreases starting wages by 0.9% and causes a lifetime loss in wages of 1.3%. In Belgium, Cockx and Ghirelli (2016) find that initial labor market conditions have different effects for different education groups. The wages of the highly educated exhibit persistent losses, while those of the low educated remain unaffected primarily due to minimum wage legislation. This notion that different groups are differently affected by adverse labor market entry conditions is also reflected in Lupi and Ordine (2002) for geographical groups, Hershbein (2012) for gender groups,

Arellano-Bover (2021) for educational groups, or also Arellano-Bover (2022) for groups based on parents' education levels.

However, within this strand of literature only a few studies have focused on a specific occupation, even though such an analytical scope would be highly informative regarding the mechanisms driving the persistent effects of initial labor market conditions (von Wachter, 2020). In this existing sparse empirical literature, Oyer (2006) studies PhD Economists in the US and shows that those who join the academic job market during a macroeconomic downturn are less likely to hold a top research job in the future, and suffer a persistent negative effect on their research productivity. In another study, Oyer (2008) shows that stock market conditions at time of graduation have long term effects on the earnings and careers of MBA graduates. Borgschulte and Martorell (2018) examine labor market conditions after military service, and find that US service-members are willing to sacrifice 1.5-2% in earnings in exchange for avoiding a one percentage point increase in the home-state unemployment rate.

In view of the above, this paper makes a distinct contribution to the literature on persistence by examining the short- and long-term effects of initial labor market conditions on three different outcomes; wages, workhours, and perceived condition. As such, my work focuses on South Korean nurses who graduated between 2000 and 2010, a period when macroeconomic conditions and the unemployment rate varied considerably[12]. I choose South Korean nurses for my empirical work for a number of reasons. Firstly, nurses are critical to the smooth operation of any national healthcare system, yet the nursing profession is globally characterized by a major shortage of workers and a worryingly high turnover rate (Bartel et al.,2014; Shields, 2004; Lee, 2019). This is particularly true in the South Korean case (Lee et al., 2012; Hong and Cho, 2017). Indeed, Kim and Kim (2021B) find that newly hired nurses

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[12] See Business Cycle Clock at https://kosis.kr/visual/bcc/

in South Korea have a turnover rate of 26.4% in their first year of work, with almost a fifth of nurses resigning in their first six months of tenure. This motivates me to join the literature exploring the root-causes of this phenomenon to inform policy, scarring being one potential culprit. Secondly, nurses tend to have similar levels of education (which is the case in my sample), and they typically join the labor market to accomplish relatively similar tasks. This limits potential bias stemming from heterogeneity in initial skills, which helps me in the interpretation of my findings. Moreover, the choice of South Korean nurses in particular is made because the practice of nursing in South Korea requires the passing of an official examination, the Korean Nursing Licensing Examination (KNLE)[13] which further helps ensuring a certain level of skill and human capital homogeneity within my sample (Haaland, 2018; Park et al., 2016). Additionally, in an effort to increase the homogeneous nature of my dataset, I work with a sample consisting only of Female nurses who were born and raised in South Korea. This means I can proceed with my analysis without worrying about any potential effect stemming from gender differences, or the possibility of having been exposed to beneficial or harmful experiences in another country which might have affected the respondents' human capital (Gregg, 2001; Kalist, 2005; Spetz, 2016; Walani, 2013; Xu et al., 2010). The data I utilize comes from the Korean Labor an Income Panel Survey (KLIPS), which is run on a yearly basis since 1998. KLIPS is divided into three categories: the Household survey, the Individual survey, and the Work History survey, all of which I use in my research. More details on KLIPS are presented in the Data section.

   In line with the literature, initial labor market conditions are proxied by the unemployment rate, which I specify at both the national and local level. My findings provide evidence that a higher unemployment rate at time of joining the labor market has significant and persistent effects on wages, workhours, and perceived condition whilst a higher

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[13] https://www.kuksiwon.or.kr/

unemployment rate when joining the labor market is found to depress wages and negatively impact life happiness, financial condition, and income satisfaction, and so for a number of years after graduating. My results also show that a higher initial unemployment rate increases weekly workhours, which contradicts previous empirical works such as Speer (2016) and Schwandt and von Wachter (2019). All of these effects dissipate with each additional year of potential experience.

This chapter makes a number of contributions to different strands of literature. Firstly, it offers novel insights to the body of work on scarring which needs more occupation-specific studies as previously mentioned. Secondly, this study provides insights that helps further our understanding of the potential long-term costs of business cycles and market shocks and thirdly, by limiting individual heterogeneity, my findings are important for the literature on youth unemployment and state dependence[14]. This is particularly relevant to South Korea where youth unemployment constitutes an important challenge (Lee, 2017). Finally, my results can inform healthcare policy aimed at improving nurses' conditions in the South Korean context, and provide recommendations which could be potentially generalized for other countries as well.

The rest of the paper is organized as follows: Section 2 presents the theoretical arguments underpinning this field of research whilst section 3 presents the data used in the empirical investigation. Section 4 lays out the econometric methodology utilized in the estimation. Section 5, reports and discusses the estimation results, whilst section 6 offers concluding remarks, implications, and directions for future research.

2. Theoretical considerations

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[14] See Hoffman (2010) for a discussion on homogeneous samples and limiting issues pertaining to unobserved initial conditions.

It is now well established in the empirical literature that young new workers pay a high price for adverse macroeconomic conditions (Abel et al., 2014; Elsby et al., 2016). They have less work opportunities, face more competition for one same vacancy, and are more pressured to accept the first jobs offered to them, jobs that are often unsuitable for them (Abel and Deitz, 2016). This kind of pressure poses a number of issues. It lowers the match quality between the worker's skills and those demanded by firms (Liu et al., 2016; De Fontenay et al., 2020; Bae and Kim, 2022). It can also push young adults towards smaller, lower quality, lower paying employers, or pressure them to accept irregular forms of employment (e.g., fixed-term contracts, unpaid internships, etc.), which has punitive effects on their human capital and earnings (Borland and Coelli, 2021; Fogg and Harrington, 2011; Ignacio García-Pérez et al., 2019; Leonard et al., 2016; Oreopoulos et al., 2012). Matters are often worse for the less advantaged groups in the labor market who have been shown to face even higher and longer unemployment (Hoynes et al., 2012; Fernández-Kranz and Rodríguez-Planas, 2018; Schwandt and van Wachter, 2019). With various groups affected differently, this contributes to increasing inequality and polarization in our societies (Hines et al., 2002; Burgess et al., 2003; Altonji et al., 2016; Ralston et al., 2016).

2.1 Search and Matching

Several theories can help us understand how a thin initial labor market precipitates scarring effects on earnings that may last for many years. The first of those is search theory, which tells us that job shopping is key to improving wages (Topel and Ward, 1992; Neal, 1999). In a context of high mobility when finding a job and moving to better firms is easy and frequent, the adverse effects of graduating during an economic downturn are easily correctable (Mortensen, 1986). Unemployment spells would be shorter, and mismatches between firms and workers would be less persistent. However, the story is different once labor market frictions are taken into consideration. Indeed, consider an economic downturn which has led

graduates to join low-quality low-paying firms. Due to search frictions, limited mobility, or imperfect information, correcting for this bad start becomes difficult and workers end up being stuck at a bad workplace. A key aspect of this explanation lies in the assumption that some firms are better than others (Arellano-Bover, 2022; Piore, 1975; Krause and Lubik, 2006; von Wachter and Bender, 2006). Good employers pay, train, and promote better, and they look well on a resume which further increases one's ability to be mobile if ever needed. Also, as shown by Stewart (2007), an early career low-wage job has long-term adverse consequences for one's employment prospects, which is not the case for those with a good job. For example, Kondo (2007) finds that Japanese graduates who were not able to enter employment after graduation were less likely to have a regular and full time job later in their career. Under such an explanatory arc, the catch-up process that occurs after the initial loss takes place over a period of time. Individuals would be changing jobs and moving to higher quality employers, and wage increases would primarily take place at job transitions rather than within the same job (Burdett, 1978; Topel and Ward, 1992; Neumark, 2002).

2.2 Human capital

Another way to look at scarring is from the lens of human capital. Firstly, in the case of someone who experienced a spell of joblessness (i.e., was actually unemployed and not only witnessed a period of high unemployment), unemployment can lead to skill atrophy and to the loss of knowledge due to having less experience (Mincer, 1974; Mincer and Ofek, 1982; Albrecht et al., 1999). When this unemployment spell is experienced at a young age, many skills that the worker would have obtained on the job are never acquired (Ben-Porath, 1967; Ellwood et al., 1982). Indeed, on-the-job skill accumulation is an important determinant of future wage levels. If this fundamental process experiences an adverse shock, it could result in workers being placed on a suboptimal trajectory for human-capital accumulation, leading to long-lasting consequences (Luijkx and Wolbers, 2009). In a rapidly changing world of

work, the destruction of skills and loss of human capital implies lower productivity which contributes to a stagnation of lifetime earnings (de Grip and van Loo, 2002). A number of models showcase the impact of unemployment on human capital (e.g., Phelps, 1972; Blanchard and Summers, 1986; Pissarides, 1992; Acemoglu, 1995). Empirically, Edin and Gustavsson (2008) find that each year spent unemployed is equivalent to a five-percentile average drop in the skill distribution. Similarly, being out-of-job has been suggested to trigger a loss in social capital by distancing individuals from their surroundings, further lowering the likelihood of getting re-employed (Granovetter, 1974; Gallie and Paugam, 2000). However, these explanations alone are not enough, as they do not prove useful when looking at short spells of unemployment which are typical of young adults. Indeed, Böheim and Taylor (2002) and Doiron and Georgens (2008) show the major culprit for the subsequent effects of being out of work is the incidence of an unemployment spell and not its duration.

An alternative explanation which also builds on human capital, is that graduates during economic downturns are more likely to end up in a mismatch, developing the wrong type of human capital at the wrong firm which makes them less productive in the long term. Indeed, employees recruited when the market is thin are seen to be allocated less important tasks in lower-level jobs, and their skills are often under-utilized (Gibbons and Waldman, 2004; Gregg and Wadsworth, 2000; Huckfeldt, 2022). Such misutilization of skills is brought up in Allen and Van Der Velden (2001), McGuinness and Wooden (2009), Mavromaras et al. (2012), Baert et al. (2013), and Mavromaras et al. (2015). Additionally, the lack of correct training at an early stage, which is commonly manifested in cases of mismatch, also carries punitive effects on future remuneration (Gardecki and Neumark, 1998). Nevertheless for this study, the possibility of mismatch is limited considering the nature of my sample, and it is difficult to see how nurses may spend time investing in the wrong human capital.

Models of job assignment with task specific skills can also provide an explanation for the persistent effects of graduating during a downturn (for example, see Prendergast (1993), Hayes et al. (2006) and Lazear (2009)). Such models would suggest that initial labor market conditions affect the future earnings of nurses depending on who they begin working with and the tasks they accomplish as part of their everyday duties. For instance, under favorable circumstances, nurses hired by reputable hospitals may be allocated to shifts with more important tasks, or asked to work with more skillful doctors, which helps them develop "task-specific human capital" (Gibbons and Waldman, 2004; Gibbons and Waldman, 2006). Bartel et al. (2014) have shown this in the context of nurses, and found that such capital is important for the wellbeing of patients. In a more general context, Gathmann and Schönberg (2010) find that task-specific human capital is responsible for more than half of lifetime wage growth.[15] Moreover, an early "good exposure" could also help in developing the right social skills which are becoming increasingly valuable in the modern labor market, and are certainly part of a nurse's job description (Deming, 2017).

2.3 Other plausible explanations

A further hypothesis is that initial job placement is subsequently used as an indicator for skills by recruiters, such as in Vishwanath (1989), Lockwood (1991), Gibbons and Katz (1991) and Kroft et al. (2013). As recruiters are unable to assess applicants' productivity, they may use previous employment records to screen applicants, which may provoke stigma towards those with previous unemployment spells (Bratberg and Nilsen, 2000). For instance, a nurse who started her career at a famous (unknown) hospital during a boom (downturn) may be mistaken for having been hired there for her greater (lower) abilities, and not due to chance (misfortune). This would limit the possibility of transitioning to a more suitable and better paying employer in the future, because of the failure to account for the effects of initial

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[15] Between 22% and 52%, depending on the level of skills.

market conditions (Gibbons and Katz, 1991). There is some empirical work in support of this hypothesis. For example, the role of stigma attached to joblessness is explored in Lupi and Ordine (2002) in the case of Northern and Southern Italy. Their findings attribute an important role to stigma for post-unemployment labor market outcomes. Manning (2000) shows that unemployed jobseekers are less likely to be invited for interviews compared to employed applicants. This is further shown in Atkinson et al. (1996) who use employer survey data and find that recruiters allocate importance to spells of unemployment when assessing job applications. Some implications of this are suggested by Gregg and Wadsworth (2000) who find that out-of-work job applicants are those who mostly take on "bad jobs". Furthermore, Stigma has been shown to have scarring effects on labor market outcomes by means of lowering people's confidence levels. As they receive negative signals and have their job applications rejected one after the other, they can lose hope in finding a decent job, or even lose trust in their abilities to perform (Mortensen, 1977; Sprengers, 1992; Gonzalez and Shi, 2010).

Another plausible explanation is that the initial job placement affects the worker's tastes (Rayo and Becker, 2007). A nurse who began her career working for a small clinic limited to minor medical matters might become content with her environment, and not aspire to work for a larger hospital where nurses are exposed to and help in treating more varied critical cases. In such a case, initial job market conditions trigger a long-term impact on human capital, productivity, and earnings by acting on nurses' job preferences, or their aspiration window, thus their future career decisions (Cotofan et al., 2021; Genicot and Ray, 2020). Oyer (2006) uses a similar analogy in his study of PhD economists.

2.4 Hypotheses development

In view of the above theoretical arguments, it can be clearly established that there are different channels though which scarring effects of adverse economic conditions can be transmitted. When it comes however to accurately assessing the persistence of such effects, there are obvious limitations. Most importantly there appears to be a gap in the extant empirical literature where scarring effects in specific occupations have not been adequately assessed.

The key theoretical arguments in the area suggest that different interpretations and radically different conclusions can be drawn. In particular, an interpretation based on human capital would mean that macroeconomic fluctuations alter the quality of inputs in the economy (workers being an input in the economy, and human capital being their quality) whilst interpreting events using frictions would entail that macroeconomic fluctuations alter the efficiency with which inputs are combined in the economy (the matching of workers with firms and jobs).

The direct implications of the above arguments could mean that a) joining the labor market when the economy is experiencing a high unemployment rate can lead to a greater likelihood of obtaining a lower quality job i.e. to a task mismatch; and b) joining the labor market during an economic downturn might increase the likelihood of working for a lower quality employer. These two potential outcomes are not mutually exclusive and could very well jointly take place.

The first possibility suggests that a higher initial level of unemployment can push nurses towards lower quality jobs, such as in Huckfeldt (2022). Human capital theory offers some possible explanations as to why a persistent negative effect on nurses' wages may manifest itself. Firstly, beginning a career performing less important tasks and being less exposed to quality learning experiences may cause a nurse's skills to stagnate, or to develop

at a suboptimal pace (Arellano-Bover, 2022). This can slow the promotion process hence wage progression within the same hospital, thus lead to a persistent anchoring of wages. Similarly, should the nurse opt to take matters into her own hands and move to a better employer, her earlier bad start is likely to hinder her climbing the wage ladder on an industry level, since her skills are lower than what may be required in exchange for a higher salary. In fact, Modestino et al. (2016) and Modestino et al. (2020) suggest that skill requirement is positively correlated with the level of unemployment. Thus, both within the organization or on an industry level, starting a career performing lower tasks may scar nurses' wages.

According to the second possibility nurses graduating when unemployment is increasing may be pushed to work for a hospital with less favorable working conditions, such as relatively lower wages and longer working hours. Should it be easy to change employers and move to a hospital with better working conditions, then I would expect to find little persistence in my estimation results. It is known that throughout South Korea, nurses tend to complain about low pay and long workhours (Min et al., 2022). Nevertheless, it is reasonable to assume that different hospitals offer more/less favorable working conditions to their nursing staff. If this difference in working conditions is not reflected by different wages and working hours between establishments, then we may find it by looking at nurses' own perceived condition. Additionally, it is possible that starting a career at a "bad hospital" can carry persistent effects by downgrading a nurse's prior record of high quality work experience. Thus, in the hypothetical case whereby graduating at a time of higher unemployment can push nurses towards lower quality employers, we can expect to find persistence across one or all of wages, working hours, and perceived condition.

Having laid out the various theoretical strands underpinning the literature on scarring, I am now able to empirically explore and address my hypothesis on whether initial economic

conditions may have persistent effects on labor market outcomes in the context of the nursing profession.

3. Data

I exploit data from South Korea's only labor market panel survey, the Korean Labor and Income Panel Survey (KLIPS) which has been tracking the activities of urban households and their members on an annual basis since 1998. The KLIPS survey consists of three major datasets, all of which I use in my analysis: The Work History dataset, the Individual dataset, and the Household dataset. This survey is ideal as I am able to access individuals' age, education, year and location of graduation, location of early schooling, relationship with other members of the household, household characteristics, current and historical work information (including wage, working hours, occupation, company size, and others), and much other information useful to study scarring as explained in von Wachter (2020).

From this survey, I use data spanning the years 2000 to 2020, i.e. from wave 3 to wave 21 of KLIPS. My subjects of interest are nurses who have finished their university education between 2000 and 2010 (Table 1). I observe the first ten years of potential experience of these nurses, potential experience meaning years since graduation. All of my subjects are females who were born, raised, and completed all levels of schooling in South Korea. The rationale behind my choice of working with a one gender sample is as follows. Firstly, the vast majority of nurses surveyed in KLIPS are women. Secondly, ensuring maximum homogeneity within my sample helps to elevate the quality of my analysis and makes my findings more informative. Thirdly, South Korea is notorious for its military service which is mandatory for men and voluntarily open to women. Since timing of graduation is an integral part of my empirical work, including men who semi-randomly join and leave military service

at different stages of their youth would add an unnecessary layer of complication to this study.

Although the KLIPS survey includes nurses who have graduated before 2000 and after 2010, I limit myself to the period between these 10 years for three main reasons. Firstly, a number of questions were not asked to survey participants prior to 2000, thus including nurses surveyed before 2000 would lead to a high proportion of missing observations in our data, which would pose a number of methodological challenges. Secondly, since I would like to observe the first ten years of nurses' potential experience, and considering that the last round of the survey was conducted in 2020, I must truncate to the 2010 cohort if I am not to face an issue of decreasing sample size. Thirdly, the Korean Nursing Licensing Examination (KNLE) has remained mostly unchanged during this period, which helps in limiting skill' bias at career start (Haaland, 2018). Table 2 offers some descriptive statistics of my sample.

The key explanatory variables in my analysis are the unemployment rate at time of graduation (GUR), and its interaction with the number of years since graduation (GUR*POTEXP). The coefficient in front of the prior informs me on the initial effect of the graduation unemployment rate, while the coefficient in front of the interaction gauges the persistence of this effect as years since graduation accumulate. KLIPS provides us with the timing and location of graduation. I obtain the unemployment rate (national and local) from the statistical database of the Korean Statistical Information Service (KOSIS)[16], and estimate models at both the national and local levels. Note that, for the local estimations, my unit of analysis is provinces, or Major Cities. I work with the following 16 local units: Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi-do, Gangwon-do, Chungcheongbuk-do, Chungcheongnam-do, Jeollabuk-do, Jeollanam-do, Gyengsangbuk-do, Gyengsangnam-

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[16] https://kosis.kr/

do, and Jeju-do. All additional data necessitated for my identification strategy, which is explained in more details in the next section, are also taken from KLIPS and KOSIS.

Table 1 - Sample Description	
	N
Observations	842
Nurses	203
who graduated in_	
2000	27
2001	10
2002	26
2003	21
2004	24
2005	22
2006	20
2007	12
2008	14
2009	17
2010	10

Notes: All nurses in the sample are females, born and schooled in South Korea. The data is sourced from KLIPS, waves 3 to 21.

Table 2 - Descriptive Statistics				
	Mean	S.D.	Min.	Max.
Potential Experience	6.92	5.284	0	20
Work Hours, weekly	43.773	5.81	24	69
Log Wage, monthly	5.125	0.487	3.638	6.31
GUR_province (%)	4.325	1.169	1.8	7.9
GUR_country (%)	4.366	0.74	3.3	5.7
GUR_female (%)	3.862	0.614	2.8	4.8

Notes: Potential Experience is the number of years since graduation. In KLIPS, the wage is the monthly aftertax wage in 10,000 Korean Wons. GUR_province is the quarterly province-level unemployment rate at time of graduation. GUR_country is the monthly country-level unemployment rate at time of graduation. GUR_female is the monthly national female unemployment rate at time of graduation. Data is sourced from KLIPS and KOSIS.

4. Empirical specification

In the extant empirical literature, the persistent effects of initial labor market conditions on subsequent wages or other outcomes are usually estimated by interacting the unemployment rate at time of graduation with the number of years since graduating, also referred to as potential experience (in contrast with "actual experience" which does not consider time spent out of employment). Kahn (2010) and Kawaguchi and Kondo (2020) are good examples of such papers. Indeed, such a specification offers insights into both the initial and persistent

effects of the graduation unemployment rate on the outcome of interest. As such, I estimate

the effects of initial labor market conditions, approximated by the unemployment rate, on a

set of labor market outcomes (wages, workhours, and perceived condition) and observe their

persistence up over ten years of potential experience. Across the different versions of my

estimation (i.e., different unemployment rate, labor market outcomes, etc.), the following

augmented Mincer earnings function is adopted:

$$y_{it} = \beta_0 + \beta_1 GUR_i + \beta_2 GUR_i * POTEXP_{it} + \beta_3 POTEXP_{it} + \beta_4 POTEXP_{it}^2 \quad (1)$$
$$+ \beta_5 UR_t + \beta_6 \gamma_t + + \beta_7 \omega_{yit} + u_{it}$$

y_{it} is the dependent variable and denotes the labor market outcome of interest, i.e.,

wages, workhours, or the perceived condition measure. GUR is the unemployment rate at

time of graduation, which can be at the local or national level depending on the estimation.

Similar to Kahn (2010), POTEXP refers to potential years of experience, or years since

finishing education. In order to isolate the effects of the initial unemployment rate GUR, I

control for the unemployment rate when the observation was recorded, UR. γ captures both

year and city fixed effects. ω is a vector of control variables that vary given the specification

of the respective models. More specifically, for the log wage estimations, the additional

controls included are the age, a dummy variable for type of workplace (private versus public

hospital), a dummy variable for whether nurse works overtime, and the number of years of

actual experience; in the case of weekly workhours estimations, I control for age, the type of

workplace and the years of actual experience.; for perceived condition, the financial condition

estimation contains as additional controls the log after-tax wage and the household size; the

life happiness specification controls for age, marital status, the log after-tax wage, weekly

work hours and household size; finally, the income satisfaction model includes controls for

age, the log weekly work hours and the log on household average monthly expenses. The

coefficients of interest in equation (1) are β_1 and β_2. β_1 informs me of the initial effect of the graduation unemployment rate whilst the coefficient in front of the interaction term between the graduation unemployment rate and potential experience, β_2, shows me how persistent this effect is as years since graduation increase.

4.1 Identification strategy

A concern with the estimation of such models is that we should consider potential endogeneity which may affect the robustness of my results. Referring to the literature, I find that my study is subject to the same omitted variable endogeneity issues faced by Kahn (2010), Kawaguchi and Kondo (2020) and other papers which use similar specifications. Hence, I employ an identification strategy similar to the one used in these papers.

Firstly, a high unemployment rate at time of studying could incite students to delay graduation or migrate to another location with more favorable economic conditions. As I do not have sufficient information to address this issue, I follow convention and instrument for the Graduation Unemployment Rate (GUR) with the unemployment rate at age 22 in the state of residence at age 14. Indeed, 22 is the mean age of graduation in my sample, and it is unlikely that someone has a say in where they reside at age 14 (Kahn, 2010). This instrument is thereafter referred to as GUR_{proxy}. [17]

Secondly, I must also address endogeneity stemming from potential experience, or the number of years since graduation. Indeed, if graduation could be delayed as explained above, then the number of years of potential experience is also affected. Thus, similar to Kahn (2010), I use a quadratic on age as an instrument for the quadratic on potential experience.

Finally, since both the graduation unemployment rate (GUR) and potential experience (POTEXP) may suffer from endogeneity issues as just explained, then a similar concern

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[17] In the case of National estimations, the national unemployment rate when aged 22 is used.

applies to the interaction term between these two variables (GUR*POTEXP). Thus, to instrument for this interaction term (GUR*POTEXP), I interact the unemployment rate proxy GUR_{proxy} (i.e. unemployment rate at age 22 in state of residence at age 14) with a novel instrument, the ratio of age to potential experience which I refer to as EXP_{proxy}. Indeed, although age is conventionally used as an instrument for potential experience, I find that this proxy performs better when instrumenting for the interaction term. In any case, as mentioned above, age and its square are still part of the first stages of my estimations.

4.2 Estimation procedure

My models are estimated using a two-stage least squares (2SLS) technique which is appropriate for the estimation of identified equations. In the first stage, the instrumental variables are regressed against the perceived endogenous/causal variables. This first stage regression generates estimated values, which are then used in the second stage, regressed against the dependent variable of interest in place of the values of the endogenous predictors. This procedure ensures that endogeneity stemming from the original model specification is appropriately dealt with (Angrist et al., 1996).

I must first make sure that the instruments used as part of my identification strategy are valid. I can determine whether my instruments are appropriate by looking at the results of the first stage estimations, which are shown in Table 3. Looking at the coefficients for all estimations, I can see that my chosen instruments are significant predictors of the respective endogenous variables. Additionally, the lowest F-statistic I obtain is of the size of 13.52, thus higher than 10, which enables me to set aside any concern of having weak instruments (Stock et al., 2002; Stock and Yogo, 2005). Thus, I am now able to proceed to observing and interpreting the results of the second stage regressions which inform me on the nature and

persistence of the effects of initial labor market conditions, should such effects exist. These

are shown in the findings section of the paper.

	COUNTRY				PROVINCE			
	GUR	GUR*POTEXP	POTEXP	POTEXP2	GUR	GUR*POTEXP	POTEXP	POTEXP2
GUR_PROXY	0.425				0.256			
	[0.067]***				[0.036]***			
GUR_PROXY *EXP_PROXY		-0.373				-0.465		
		[0.123]***				[0.087]***		
EXP_PROXY			-0.125				-0.16	
			[0.063]**				(0.04)***	
AGE			-0.372				-0.384	
			[0.148]**				[0.143]***	
AGE2				0.718				0.706
				[0.052]***				[0.049]***
F statistic	13.52	63.91	187.37	124.4	40.99	59.58	189.49	127.05
R squared	0.522	0.838	0.938	0.902	0.77	0.83	0.939	0.912

Table 3 - First stage of IV regressions

Notes: *** and ** indicate statistical significance at the 1% and 5% level respectively. Standard errors are given in square brackets; Regressions include year and city fixed effects and the unemployment rate at the time of observation. GUR_PROXY is the unemployment rate (quarterly) at age 22 in the state of residence at age 14 for the city-level models, and the national unemployment rate (monthly) at age 22 for the country-level models. EXP_PROXY is the ratio of Age to Years since Graduation.

In spite of the envisaged endogeneity issues, I still present the OLS estimates for

comparison purposes. In fact, each coefficient is presented in a set of three: the OLS estimate,

the 2SLS estimate with no control variables except years and location fixed effects, and the

2SLS estimate with all additional controls which I coin as the "augmented" model. The

coefficients obtained from the augmented model are treated as the preferred ones. For the

perceived condition equations where the dependent variable is a dummy variable, I only

present the coefficients obtained from the augmented model.

5. Findings

5.1 The impact on wages

Table 4 shows the results of the estimations where the log monthly wage is the labor market outcome under consideration. Two models are estimated: the first one, shown in columns (1), (2) and (3), is on a country level, where the key predictor (GUR) is the monthly national unemployment rate at time of graduation. The second model, presented in columns (4), (5) and (6), is at province level, with GUR defined as the quarterly unemployment rate at the time of graduation and at the province where education was undertaken. In panel A, we can see the coefficients for the unemployment rate (GUR) and its interaction with the number of years since graduation (potential experience, POTEXP). I estimate the model using both OLS and the two-stage least squares methods, to check whether the coefficients are robust to dealing with endogeneity. The coefficients of the 2SLS with controls shown in columns (3) and (6) are my preferred ones, considering that the technique deals with potential endogeneity. This method is also the most prevalent one in this literature.

All the coefficients in Panel A are significant at the 1% level. Across all specifications, the graduation unemployment rate is shown to have a negative initial effect on wages which dissipates as years after graduation accumulate. Looking first at the OLS results, we can see in column (1) that a one percent increase in the initial national unemployment rate triggers a wage loss of 0.153 percentage points. The coefficient in front of the interaction term (GUR*POTEXP) shows that this initial wage loss is followed by a yearly catch up of 0.011 percentage points. The OLS estimates for the provincial specification tell a similar story: In column (4), we can see that a one percent increase in the local unemployment rate as associated with an initial wage loss of 0.096 percentage points, which dissipates yearly by 0.007 percentage points.

Table 4 - The impact on wages						
	COUNTRY			PROVINCE			ROBUSTNESS
	OLS	2SLS	2SLS	OLS	2SLS	2SLS	2SLS
			(augmented)			(augmented)	(augmented)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A: Regression Results							
GUR	-0.153	-1.757	-1.05	-0.096	-0.715	-0.756	-1.325
	[0.03]***	[0.432]***	[0.389]***	[0.026]***	[0.169]***	[0.175]***	[0.407]***
GUR*POTEXP	0.011	0.159	0.099	0.007	0.034	0.038	0.103
	[0.002]***	[0.043]***	[0.037]***	[0.001]***	[0.11]***	0.011]***	[0.041]**
B: Effects for selected experience years							
Years 0-3	-0.096	-0.238	-0.618	-0.061	-0.236	-0.712	-0.556
	[0.029]***	[0.075]***	[0.146]***	[0.024]**	[0.071]***	[0.189]***	[.179]***
Years 4-6	-0.068	-0.124	-0.36	-0.038	-0.14	-0.404	-0.536
	[0.028]**	[0.045]***	[0.083]***	[0.023]**	[0.046]***	[0.115]***	[0.162]***
Years 7-9	-0.047	-0.086	-0.324	-0.017	-0.089	-0.402	-0.444
	[0.029]	[0.054]	[0.098]***	[0.023]	[0.049]*	[0.144]***	[0.17]***
Observations	737	536	536	736	530	530	536
R-squared	0.541	-	-	0.52	-	-	-

Notes: ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively. Standard errors are given in square brackets. Estimations control for current local unemployment rate, year fixed effects and location fixed effects. The augmented model, shown in columns (3) and (6), contains the following additional controls: the age, a dummy variable for type of workplace, a dummy variable for whether nurse works overtime, and the number of years of actual experience.

Looking now at the 2SLS coefficients, we can see that both with and without controls the story is consistent with the one told by the OLS estimates. Indeed, for the national specification, a one percent increase in the graduation unemployment rate is followed by a wage loss of 1.757 and 1.05, without and with controls respectively. In the model without controls, the yearly catchup is of the magnitude of 0.159 percentage points, whereas it is of 0.099 percentage points in the augmented model. In the provincial case, a one percent

increase in the local unemployment rate triggers a 0.715 percentage points wage loss in the model without controls, and a 0.756 percentage points wage loss in the augmented model. The respective yearly catchup is 0.034 percentage points and 0.038 percentage points.

We notice that the effect of initial unemployment conditions on the log wage is always larger in the national model compared to the province-level one. Indeed, all the left-side Panel A coefficients are larger in magnitude compared to their respective right-side ones. This is in line with the literature on educated workers being less sensitive to local labor markets compared to the whole economy, as they are able to mitigate the effects of shocks with their ability to migrate (Wozniak, 2006). This observation is robust for all OLS, 2SLS, and augmented 2SLS specifications. Moreover, we can also see that the OLS coefficients are always smaller than the 2SLS ones. I was expecting this, as this is in line with previous works explaining that OLS results are biased towards zero.

In Panel B, I present my findings on the degree of persistence for the wage effects of the initial unemployment rate. Similar to Panel A, I estimated the effects of both the national and local graduation unemployment rates. Beginning with the national model, and the OLS results shown in column (1), we can see that the effect of the national unemployment rate decreases with years of experience, and becomes small (-0.047) and insignificant after 7 years of potential experience. The 2SLS estimations tell a similar story as to diminishing magnitude as potential experience years accumulate. However, my augmented model (column (3)) suggests that the effects remain highly significant even in the 6 to 9 years of potential experience interval. Moving to the provincial specification, I can see that the coefficients tell a similar story. For all OLS, 2SLS, and augmented 2SLS, the effect of the initial local unemployment rate decreases with years of potential experience. The OLS (column (4)) suggests that this effect becomes insignificant after 6 years of potential

experience. This is contradicted by the augmented 2SLS result which shows that the effect remains relatively large (-0.402) and highly significant at the end of the period studied.

5.2 The impact on working hours

One labor outcome that has been relatively neglected by the literature on scarring is the number of working hours. I have attempted to fill this gap, and Table 5 presents the estimated coefficients when the log of weekly work hours is plugged in as the dependent variable in equation (1). Panel A shows that for both country-level and province-level models, the graduation unemployment rate has a positive initial effect on working hours, which dissipates as experience accumulates. In the national case, the OLS estimation (column 1) suggests that the graduation unemployment rate initially increases weekly workhours by 0.05 percentage points, followed by a yearly catch up of 0.002 percentage points. In the province-level model, the OLS (column 3) tells us that the graduation unemployment rate is associated with a 0.033 percentage points initial increase in weekly workhours, followed by a yearly dissipation of 0.002 percentage points. For both the national and provincial specifications, the 2SLS and the augmented 2SLS tell a similar story to that of the OLS, although the OLS coefficients are smaller.

Panel B in Table 5 shows the long-term nature of these effects over a selection of intervals of potential years of experience. The coefficients show that for all estimations and for up to ten years after graduation, the effect of the graduation unemployment rate is positive, persistent and significant, although decreasing in magnitude. These results suggest that initial labor market conditions play an important role in determining nurses' working hours over the first 10 years of their career, particularly in the earlier years after graduation. In the following section, I discuss the implications of these results when contrasted with the findings on wages presented earlier in Table 4, and relate them to theory.

Table 5 - The impact on working hours						
COUNTRY			PROVINCE			ROBUSTNESS
OLS	2SLS	2SLS (augmented)	OLS	2SLS	2SLS (augmented)	2SLS (augmented)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A: Regression Results						
GUR	0.05	0.294	0.296	0.033	0.234	0.213	0.266
	[0.01]***	[0.107]***	[0.108]***	[0.01]***	[0.06]***	[0.063]***	[0.123]**
GUR*PO	-0.002	-0.022	-0.019	-0.002	-0.01	-0.01	-0.041
TEXP	[0.0007]***	[0.011]**	[0.009]**	[0.0006]***	[0.004]***	[0.004]**	[0.026]
B: Effects for selected experience years						
Years 1-3	0.043	0.153	0.149	0.027	0.183	0.198	0.265
	[0.01]***	[0.041]***	[0.036]***	[0.01]***	[0.05]***	[0.047]***	[0.107]**
Years 4-6	0.037	0.141	0.127	0.022	0.174	0.176	0.22
	[0.01]***	[0.037]***	[0.033]***	[0.01]**	[0.046]***	[0.044]***	[0.095]**
Years 7-9	0.031	0.123	0.098	0.018	0.156	0.171	0.175
	[0.01]***	[0.036]***	[0.024]***	[0.01]**	[0.044]***	[0.042]***	[0.071]**
Observations	780	534	534	779	534	534	534
R-squared	0.349	-	-	0.294	-	-	-

Notes: ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively. Standard errors are given in square brackets. Estimations control for current local unemployment rate, year fixed effects and location fixed effects. The augmented model, shown in columns (3) and (6), contains the following additional controls: a dummy variable for type of workplace, and the number of years of actual experience.

5.3 Robustness

Although the results for my estimations on the impact of the initial unemployment rate on subsequent wages and weekly working hours are consistent across all the specifications and indicate the existence of persistent effects of initial conditions, I further test how robust my findings are to a third indicator for the unemployment rate: the national female unemployment rate. Indeed, this is valid considering that my sample consists of females only,

but also interesting considering that historically, the national female unemployment rate in South Korea has been consistently lower than the country rate.

Columns (7) in both tables 4 and 5 include the results from my robustness estimations. The monthly female national unemployment rate is used in a 2SLS with the relevant controls as discussed in section 3.1.b. Beginning with the log wage, I can see in column (7) panel A that a one percent increase in the national female rate at time of graduation has a highly significant negative initial effect on wages, the size of 1.325 percentage points. As years since graduation accumulate, a catch-up process occurs and we have a yearly dissipation of 0.103 log point, significant at the 5% level. In panel B, we can see that throughout the first ten years of potential experience, the effect of the initial female unemployment rate maintains a highly significant and negative effect on the log wage. Thus, in the case of the log wage, my robustness estimations relay the story presented by my models. It is not surprising to find that the magnitude of the coefficients obtained from the robustness estimations are closer in magnitude to the national models compared to the provincial one, as the female rate I use is the country-level one.

Column (7) of table 5 shows the coefficients for the robustness estimation when the log of weekly working hours is the dependent variable. From panel A, we can see that the initial effect of a one percent increase in the national female unemployment rate at time of graduation is a 0.266 percentage points increase in weekly working hours, significant at the 5% level. The coefficient in front of the interaction term is relatively similar in magnitude to the ones found in the models, and has the same negative sign, but emerges as insignificant. In Panel B, we can see the persistent effects on working hours. Indeed, in line with my previous estimations, column (7) also shows that the effects of the initial unemployment rate remain significant up to the 7-9 potential experience years interval. In this interval, the initial

unemployment rate is associated with a 0.175 percentage points increase in working hours for nurses in my sample.

5.4 The impact on Perceived Condition

The coefficients found and presented in Tables 4 and 5 all give support to the occurrence of scarring following a higher unemployment rate at time of labor market entry. However, as shown in section II, a range of theoretical arguments could be posited that would enable us to make different interpretations on the mechanisms driving these results. Thus, in order to further disentangle the channels via which scarring occurs, it would be useful to explore how nurses view their own condition over the first ten years after graduating, using what are known as happiness equations. I look at three aspects of nurses' perceived condition: whether they see themselves as being in a bad financial situation, whether they are generally happy in life, and whether they are satisfied with their income level. The fact that my sample consists only of females permits me to study perceived condition without having to worry about differences in values, expectations, stress levels and other sex-differences reported in this strand of literature (Clark, 1997; Nolen-Hoeksema and Rusting, 1999; Kahneman and Deaton, 2010). Also, a property useful to my discussion is that the way an individual perceives their own condition depends on one's relative condition among peers (Luttmer, 2005; Clark et al., 2008; Layard et al., 2010). Finally, although we are not studying wellbeing in the strict sense of the term, findings from this strand of literature inform us as to what we should expect from my estimations on perceived condition. Indeed, it has been established that unemployment depresses wellbeing, and that income increases it albeit for a short period of time (Blanchflower et al., 2014; Di Tella et al., 2010; Hovi, 2022). Çitçi and Begen (2019) have also shown that entering the workforce in a context of high unemployment is associated with long lasting decreases in job satisfaction.

Table 6 presents the results from estimating a two-staged least squares of equation (1) with the three perceived condition measures taken as dependent variables. Perceived financial condition of the household is represented by a dummy variable taking the value of 1 if a respondent reports a bad financial situation. Overall life satisfaction is shown by a dummy variable equaling 1 if a respondent reports being happy in life at the time of being surveyed. Income satisfaction is shown by a dummy variable taking the value of 1 to indicate a respondent who reports being happy with her current income.

Looking first at perceived financial condition in column (1), I can see that nurses who entered the labor market when the unemployment is high are more likely to report being in a bad financial condition. However, this effect dissipates with potential years of experience and becomes insignificant 6 years after graduating.[18]

A similar story is shown in column (2) which presents coefficients for the Life Satisfaction estimation. Indeed, a higher unemployment rate at time of graduation is associated with an initial decrease in the likelihood of reporting to be currently happy in life. This is followed by a yearly improvement in happiness, but the effect of the graduation unemployment rate remains significant throughout the period studied.

Lastly, the model with income satisfaction is estimated and its coefficients are shown in column (3). Following a 1% increase in the graduation rate, an initial drop in income satisfaction occurs, significant at the 5% level. This effect dissipates with years of experience, but I find that even during the 7 to 9 years of experience interval, the effect of the initial unemployment rate remains significant at the 5% level.

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[18] In line with Aassve et al. (2013), Martínez Mazza (2020), and Swartz et al. (2011), we have attempted to study the role of parents in smoothing the effects of adverse labor market entry. KLIPS provides data on whether and how much a respondent receives financial support from parents. However, our estimations yielded insignificant results.

	Bad Financial Condition	Happy in Life	Satisfied with Income
	(1)	(2)	(3)

Table 6 - **The impact on perceived condition**

A: Regression Results

	Bad Financial Condition (1)	Happy in Life (2)	Satisfied with Income (3)
GUR	0.515	-0.573	-0.426
	[0.196]***	[0.241]**	[0.179]**
GUR*POTEXP	-0.03	0.035	0.019
	[0.012]**	[0.015]**	[0.011]*
B: Effects for selected experience years			
Years 1-3	0.516	-0.652	-0.574
	[0.248]**	[0.316]**	[.276]**
Years 4-6	0.363	-0.385	-0.379
	[0.181]**	[0.228]**	[0.196]*
Years 7-9	0.145	-0.404	-0.365
	[0.147]	[0.183]**	[0.144]**
Observations	556	556	556

Notes: ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively. Standard errors are given in square brackets; Bad Financial Condition, Happy in Life and Satisfied with Income are dummy variables which take the value of 1 if reported by the observed individual. The model used is the augmented Provincial one (i.e. Quarterly Provincial unemployment rate). The financial condition estimation, presented in column (1), contains as additional controls the log after-tax wage and the household size. The life happiness estimation, presented in column (2), controls for age, marital status, the log after-tax wage, weekly work hours and household size. For the Income Satisfaction estimation presented in column (3), additional controls include the age, log weekly work hours and the log on household average monthly expenses.

6. Discussion

In the previous section, we have seen that an increase in the graduation unemployment rate carried scarring effects on income, with coefficients that remained negative and highly significant up to 6 years after joining the labor market. This is in line with the findings of

Kahn (2010) but in that paper, the wage effects of the local unemployment rate are shown to be persistent for up to 15 years. Kawaguchi and Kondo (2020) also find effects that are more persistent than ours (up to 18 years). However, both these studies use the National Longitudinal Survey of Youth 1979 (NLSY79), and neither focuses on a particular occupation as I do. My results are closer to those of Oreopoulos et al. (2012) in a study on Canadian college graduates who find wage effects that last for approximately 8 years. Other recent studies which have found negative wage effects to an increasing initial unemployment rate include Genda et al. (2010), Hershbein (2012), Brunner and Kuhn (2014), Speer (2015), Altonji et al. (2016), Cockx and Ghirelli (2016), Liu et al. (2016), Cribb et al. (2017), Schwandt and von Wachter (2019), Umkehrer (2019), Andrews et al. (2020), Rothstein (2020), and Barsbai et al. (2022).

My estimations on weekly work hours have generated results that show positive effects that dissipate in magnitude but remain highly significant even 10 years after joining the labor market. This means that an increase in the unemployment rate at time of graduation is associated with an increase in the work hours of nurses that slowly fades away. These results are in contradiction to those of Speer (2016) and Schwandt and von Wachter (2019) who find that working hours decreased following adverse initial labor market conditions. However, the nature of my analysis differs from theirs in terms of studied sample. I focus on a particularly homogeneous group belonging to the same occupation, whereas their studies are conducted on a country level (US).

To the best of my knowledge this is the first study that treats scarring from a perceived condition perspective as well. Potentially, the closest paper would be Maclean and Hill (2015) who looks at self-esteem and find that leaving school in an economic downturn decreases self-esteem over time. However, there are different strands of literature that share some similar ground with the work I have presented. Indeed, a number of papers have looked

at the effects of initial labor market conditions on health behaviour and attitude. For instance, initial labor market conditions have been shown to carry persistent positive effects on divorce, family formation, political beliefs, criminal activities, heart-attack incidences, overdoses, alcohol consumption, obesity, sleep patterns, and smoking (Engdahl et al., 2019; Giuliano and Spilimbergo, 2014; Li and Toll, 2021; Maclean, 2013; Maclean and Hill, 2015; Maclean and Hill, 2017; Cutler et al., 2015, Bell et al., 2018; Schwandt and von Wachter, 2019). These are in line with my findings which show a negative effect of higher unemployment at time of graduation on happiness and income satisfaction. The vast literature linking income to stress is also relevant and supports my results.

Taken together, my results can be reconciled and interpreted with models of human capital accumulation. My finding that a higher graduation unemployment rate has a negative (positive) effect on wages (work hours) suggests that nurses who join the labor market at a turbulent time can be exploited more easily by employers. Indeed, they work longer hours and earn less than their counterparts who graduated in luckier times. However, these effects dissipate as experience is accumulated, which indicates that a certain form of progress is happening year after year. The Gibbons and Waldman (2006) extension of the skill accumulation model suggests that, with experience, nurses may be accumulating either task-specific capital which improves their wages within the same job, or general human capital which promotes them to higher paying jobs in the hospital. Gathmann and Schönberg (2010) is a good illustration of this framework. In this spirit, my finding that the effect on weekly workhours is decreasing in years of experience could indicate that some form of promotion, albeit small one, may be taking place. These promotions would be to positions with shorter

shifts and better pay. Here, I build on the assumption that within the same job, a nurse is assigned to a specific shift-length that does not change.[19]

Unfortunately, I am unable to assess the quality of respondents' first employers nor know more about the particular tasks and interactions of nurses when they first started work. Such information would have enabled me to link my findings to models of job assignments which could inform me on the nature and origin of the skill accumulation taking place (Hayes et al., 2006; Lazear, 2009; Deming, 2017). Nevertheless, it is possible that nurses who begin work under not-so-favorable conditions are assigned to jobs of lower average quality, and that a catch-up process follows as human capital is accumulated on the job.

My findings are difficult to reconcile with models of changing tastes and adaptive aspirations (Rayo and Becker, 2007; Genicot and Ray, 2020). Indeed, the results from the perceived condition estimations suggest that the initial unemployment rate negatively impacts happiness and income satisfaction, persistently so for many experience years (across all ten years for income satisfaction). Similarly, interpreting my findings using models of mismatch between workers and tasks or workers and employers is intuitively unappealing considering that I am studying nurses and the chance of a mismatch is minimal compared to other fields (Topel and Ward, 1992; Liu et al., 2016). In fact, I have estimated equation (1) with "Work Satisfaction" as the dependent variable, and coefficients remained insignificant across all different specifications.

7. Concluding remarks

I study the effects of initial labor market conditions on wages, work hours and perceive condition using a sample of South Korean nurses obtained from the Korean Income and Labor panel Survey (KLIPS). Out of all the nurses in the KLIPS survey, I focus only on

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[19] It is noteworthy to mention that we have attempted to find whether initial labor market conditions have any effect on subsequent overtime work. Results were insignificant across all estimations.

females who graduated between 2000 and 2010, and who were born and schooled in South Korea. Using an identification strategy based on instrumental variables, I find that the unemployment rate at time of graduation has negative effects on nurses' wages that remain highly significant up to 6 years after joining the labor market. This is true when both the national and province level unemployment rates are used as predictors. Similarly, in both models a catch-up process occurs that rectifies the initial loss as years of potential experience accumulate. My estimations also yield a positive effect on weekly work hours, suggesting that nurses who graduate under higher unemployment work longer hours and for a lesser wage. This effect also decreases in magnitude with years of experience, but remains highly significant up to 10 years after graduating. Finally, I estimate a series of happiness equations in order to further inform myself on nurses' experiences over the first ten years after joining the labor market. I find that a higher unemployment rate at time of graduation is associated with respondents reporting worse financial conditions, less happy lives, and less income satisfaction.

My results are in line with models of skill accumulation, and contribute to the growing body of evidence linking human capital to the scarring effects of adverse initial labor market conditions. Also, by focusing on nurses only, my study offers occupation-specific evidence which remain scarce in the literature, yet is of considerable importance to informing theory (von Wachter, 2020). Thus, it would be worth replicating this study using another occupational group or in a different context in order to check how extrapolatable my results are.

Building on my findings and linking them to previous empirical works on the matter, a series of policy recommendations tailored to the South Korean nursing market are offered. Firstly, in order to mitigate the negative effects that joining the labor market during a high unemployment period may have on a nurse's human capital, I recommend implementing

policies of task rotations whereby nurses would get exposed to a number of learning

opportunities, and would be less harmed if they start with a bad first job (Lazear, 2009).

Secondly, strategies to improve and preserve good work environments must be actively

pursued, particularly so during and after periods of high unemployment. Indeed, a sound

work environment has positive effects on nurses' skill accumulation and wellbeing, hence on

the smooth operation of health institutions (Park and Oh, 2016). This is supported by Kim

and Kim (2021A) who show that stress, burnout, and emotional exhaustion are all

determinants of voluntary job quits among Korean nurses, whereas the match between

hospitals and nurses, organizational commitment and job satisfaction all decrease turnover in

the nursing profession. Such workplace improvement strategies could take the form of

reducing nurses' workload and lowering the nurses-to-patients ratio (Lee et al., 2012; Min et

al., 2022). Staffing policies should also be addressed, and staffing needs could be calculated

based on patients' needs and tasks performed instead of number of patients, since some

patients require more care than others. Staffing should also attempt to limit hiring nurses

based on fixed-term contracts, and attempt to foster a culture of long-term relationships

within nursing teams across various establishments (Bartel et al., 2014). Another policy that

would help with the workload problem is ensuring that nurses spend their workhours

performing nursing tasks only, and do not have to take on secretary duties, personnel

management, and others non-nursing responsibilities (Yun and Yu, 2021). This could start

with designing clearly formulated job descriptions and making sure that subordinates' job

descriptions are respected by their hierarchical superiors. This should have a relieving effect

on nurses' workload, thus improving their wellbeing and, in result, improving operations

within the Korean healthcare institutions (Min et al., 2022). Moreover, I recommend offering

training targeted at improving social capital within the nursing profession, as nurses' social

capital has been shown to have an important impact on the quality of care offered to patients

(Shin and Lee, 2016; Deming, 2017). In light of my results, I suggest that such training takes place early in a nurse's career, immediately after education or even be conducted in cooperation with the Korean Nursing Licensing Examination (KNLE). Lastly, salary conditions within the South Korean nursing profession should be examined, and nurses must be financially protected. Indeed, this is suggested by my results as well as the literature which repeatedly highlights how bad pay negatively affects nurses' retention intentions (Lee, 2019; Yun and Yu, 2021; Min et al., 2022).

Finally, my study is subject to a number of limitations. Indeed, there is a number of theoretical avenues I did not explore due to data constraints. For instance, additional information on tasks performed at work, or on interpersonal relations in the workplace would have informed me further on the mechanisms driving the effects that I found. Also, data on job offers received by nurses would help us further our understanding of nurses' reservation position and find whether hospitals hold a monopsony power which contributes to the scarring effects of initial unemployment conditions. Additionally, I would have liked to be able to better link these results to the high turnover rate in South Korean nursing. As far as my findings suggest, one reason behind the high rate of quits among nurses could be bad working conditions and their implications on their perceived condition following an unlucky career start.

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CHAPTER 3

INHERITANCE AND THE SOCIAL ISOLATION OF KOREAN ELDERS

Abstract: Little is known on the economic causes of social isolation among elders in spite of the phenomenon becoming a growing policy concern in many developed countries with ageing populations. Indeed, minimal work has been done on the question by economists compared to researchers from other disciplines such as Gerontology or Psychology. This paper fills this gap by assessing the role of inheritance as a novel economic determinant of social isolation among elders. In this direction, by drawing on bequest motive theory as well as aspirations theory I utilize a granular dataset from South Korea spanning the period 2008 – 2020. The nascent evidence from my IV, Fixed-Effects and Probit estimations suggests that adult children having high inheritance expectations is beneficial to parents. In particular, having higher inheritance expectations is found to increase the frequency of parent-child meetings, thus lowering the risk of parents' isolation. Additionally, mothers who report a higher likelihood of leaving an inheritance to their children are less isolated and disclose better well-being. Lastly, I find that the split of inheritance following a father's death has consequences on the subsequent isolation of mothers. To the best of my knowledge this is the first study that investigates the direct role of inheritance in the creation of social isolation, hence providing useful insights to policymakers both in South Korea and other parts of the world.

1. Introduction

It is now well-established among Health and Social scientists that humans need other humans to prosper and thrive. In that sense, humans appear to differ very little from other species (Cacioppo and Hawkley, 2009; Cacioppo et al., 2011). It is then not surprising to see that researchers are starting to raise the alarm in front of the dramatic levels of social isolation the modern world is bringing forth. Indeed, a pandemic of loneliness is ravaging our societies, particularly so in the more developed corners of the world where the breaking of social bonds has manifested itself as a post-industrial curse (Snell, 2017). McPherson et al. (2006) provided a good illustration of this when they showed how the number of American people who said they had no one with whom to discuss important matters nearly tripled between 1985 and 2004, and that the modal American respondent in 2004 reported having no confidant, compared to that of 1985, who had three.

In the extant substantial strand of literature, the terms "social isolation" and "loneliness" often appear jointly and are sometimes used interchangeably, which requires some clarification. Today researchers recognize "social isolation" as an umbrella term to be segmented into two distinct parts: objective isolation and perceived (or subjective) isolation. Objective isolation describes the real state of being alone and the factual absence of social network. Perceived isolation is the subjective evaluation of one's condition, and it is what is referred to when the term "loneliness" is employed (Dahlberg, 2007; Swader, 2019). This distinction allows for the reality that one may feel lonely despite being part of a tight-knit community and surrounded by people who care, or that one may lead a solitary life without feeling lonely (Peplau & Perlman, 1982; Pinquart & Sörensen, 2003). This has ignited a scholarly debate as to whether the quality of bonds is more important than quantity (Cacioppo and Hawkley, 2009; Cacioppo et al., 2015). In other words, should policy interventions tackle objective social isolation, or loneliness? Steptoe et al. (2013) posit that tackling problems of

isolation rather than loneliness would be more effective in addressing mortality, while Asante and Karikari (2022), Cacioppo et al. (2011), and Holtfreter et al (2016) suggest that loneliness is equally worrisome, if not more, and worthy of addressing. McWhorter et al. (2022) offer a good example of an intervention that succeeded in dealing with one aspect of social isolation but failed in another. They show that an iPad intervention aimed at reducing social isolation (objective and perceived) among older adults improved matters in the objective sphere, but failed at reducing the loneliness of participants.

The consequences and risks of social isolation have been widely explored in the literature and continue to draw an extensive interest from researchers. Among others, social isolation has been linked to alcoholism (Akerlind & Hörnquist, 1992), cardiovascular and mental health deterioration (Leigh-Hunt et al., 2017), diminished cognitive function in late-life (Beland et al., 2005; Evans et al., 2019), coronary heart disease (Boden-Albala et al, 2005), dementia (Fratiglioni et al., 2004), depression (Sen et al, 2022), nutritional risk (Locher et al., 2005), the contraction of common colds (Cohen et al,1997), suicidal ideation (Stickley and Koyanagi, 2016; Stravynski & Boyer, 2001), worse physical health (Asante and Karikari, 2022), morbidity and mortality (Cacioppo and Cacioppo, 2014; Eng et al., 2002). The literature review in section II dedicates a subsection to reviewing these risks.

The present study does not focus on the consequences of social isolation. Instead, I join the much smaller body of literature exploring the determinants of social isolation. In particular, my attention is drawn towards a gap in the literature, that of the economic determinants of isolation among older adults. Indeed, the majority of studies investigating the risk factors of social isolation do so from a biological or social standpoint. These risk factors have included education (Adler et al., 1994; Savikko et al., 2005), gender (Borys & Perlman, 1985), genetics (Distel et al., 2010), geography (Henning-Smith et al., 2019), presence of children (Connidis and Davies, 1990), marital status (Boden-Albala et al., 2005; Fratiglioni et

al., 2000; Pinquart & Sörensen, 2003; Tornstam, 1992), negative life events (Wenger & Burholt, 2004), the loss of a spouse (Chipperfield and Havens, 2001; House et al., 1988), the participation in social and leisure activities (Luo and Waite, 2014), among others. In terms of economic or socioeconomic factors, social isolation has been linked to employment (Hawkley et al., 2005), financial hardship (Salamah, 1991), income levels (Hawkley et al., 2008; Savikko et al., 2005), racial economic (dis)advantage (Adams et al, 1989) and socioeconomic class (Antonucci et al., 1999; Baum et al., 1999).

In this direction, I contribute to the small empirical body of work on the economic risk-factors of social isolation among older adults, and investigate whether inheritance plays any role in the creation of such isolation. In particular, I build on Aspirations Theory as proposed by Genicot and Ray (2017) and posit that children do not passively "expect" the receipt of inheritance, but rather "aspire" for it, which has ramifications for child-parent relations thus for the potential social isolation of parents. This distinction between expectation and aspiration has many important implications. Indeed, an aspiration is a long-term goal which drives effort and entails decision-making, whilst an expectation is a passive self-reported probabilistic observation of the future which does not influence one's choices or behavior (Ray, 2006). Thus, by modeling inheritance as an aspiration, I imply that children view parental care as an investment or effort necessary to reach their goal (the inheritance they aspire for), hence that the existence and the size of an inheritance is directly linked to how much children actively care for their parents. Furthermore, if inheritance is an aspiration, then failing to obtain the aspired inheritance constitutes what is known as an aspiration frustration which according to theory can alter one's behavior (Genicot and Ray, 2020). In line with this proposition, I posit that a child who was inheritance-frustrated following the death of a parent will offer less care for the surviving parent, thus contributing to that parent's isolation. Lastly, Aspirations Theory emphasizes the role of relativism when it comes to

satisfaction (e.g. Mitra and Ray, 2014). I apply this notion to our inheritance case by hypothesizing that an inheritor's satisfaction depends on the split of the total inheritance with other family members, which in turn affects the child's attitude towards the surviving parent.

My hypotheses are also largely informed by strategic bequest motives theory, also known as exchange bequeathing theory, which states that inheritance is a source of mutually beneficial exchanges (Bernheim et al., 1985). Under this bargain, parents obtain care from their children when they are old and in need of such support, in exchange for children obtaining an inheritance in proportion to the amount of care they provided. In such a scenario, a child who does not expect to receive an inheritance will not provide care to parents since there no exchange is anticipated, which makes the provision of care a strategic mistake. Hence, this literature which dismisses altruism as the primary criterion for inheritance distribution and parental encourages me to pursue inheritance aspirations as a potential culprit in the social isolation of parents.

For my empirical work I focus on South Korea, a country where social isolation and lonely deaths are becoming a major policy concern. In 2016, South Koreans aged 65 years or more faced a suicide rate of 53.3 per 100,000, the highest among OECD countries (Choi et al., 2019; WHO, 2017). In a sample of 9,553 elderly South Koreans, Kim et al. (2016) found that 1 out of 12 respondents reported suicidal ideation. In 2021, 31.7 percent of the overall households in the country were single-person households, and more than 20% of the population reported feeling lonely (Min-Sik, 2022). Furthermore, South Korea is a fast-ageing society, and adults aged 65 years or more are projected to constitute 38% of the population by 2050 (Howe et al., 2007). Clearly, the South Korean context is a fertile ground for studies exploring determinants of social isolation such as ours.

I exploit panel data spanning the period 2008 to 2020 from the Korean Longitudinal Survey of Ageing (KLoSA), a rich dataset which reports on Korean middle-aged and older adults (aged 45 years old or more). From this survey, I can access demographic and economic information about respondents, in addition to respondents' expectations about the future and their subjective assessments of their current lives. Furthermore, KloSA conducts exit interviews to gather data on respondents of earlier waves who have passed away, from which I am able to capture whether an inheritance was left behind and, if yes, how it was split amongst family members. Further information on the data used and the econometric approach adopted for the analysis of this data are reported in section 3.

I see a number of contributions for this study. Firstly, the vast majority of studies on social isolation focuses on the consequences of isolation rather than its causes, despite the importance of the latter for prevention purposes. Secondly, to the best of my knowledge this the first paper investigating the direct role of inheritance in the creation of social isolation, in the context of Aspirations' theory. Thirdly, this study offers a novel empirical application to Aspiration Theory, thus joining a growing body of literature in Development and Health Economics. Lastly, my findings provide useful insights to policymakers who are interested in tackling social isolation, both in South Korea and other parts of the world.

The rest of the paper is organized as follows: section 2 expounds upon the literature on objective and perceived social isolation, presents the studies on inheritance which are relevant to this context, and develops the research hypotheses. Section 3 describes the data used in the empirical investigation, and section 4 expands on the econometric methodology used for the empirical investigation. Section 5 presents my findings, which I discuss in section 6. Section 7 offers concluding remarks, policy implications and directions for future research.

2. Literature review

2.1 Social Isolation

Nicholson (2009, pp.1346) defines social isolation as "a state in which the individual lacks a sense of belonging socially, lacks engagement with others, has a minimal number of social contacts and they are deficient in fulfilling and quality relationships", a definition which captures both objective and perceived aspects of isolation. Objective social isolation can be defined as having minimal contact and relationships with family or friends on an individual level, and also with society on a broader level. Thus, the nature and structure of a person's social network informs us as to whether the person is socially isolated (Griffin, 2010). In terms of perceived social isolation, also referred to as loneliness, Steptoe et al. (2013) explain that it is the psychological reflection of social isolation. Pinquart and Sörensen (2003) define loneliness as a distressing feeling caused by the difference between the desired level of social relationships and the actual one. Loneliness is also described as a subjective feeling of isolation, lack of belonging and absence of companionship (Griffin, 2010; Luo et al., 2012; Perissinotto et al., 2012).

Both loneliness and social isolation have become significant public health concerns in need of urgent addressing. In some communities, these conditions are resulting in an increase in deaths from loneliness. "Death by isolation" has even entered the dictionary in countries where the phenomenon is widespread, such as in South Korea which refers to it as "Godoksa", or in Japan where it is called "Kodokushi" (Griffiths et al., 2022; Rashid, 2017). Indeed, the link between isolation, both objective and perceived, and mortality is well documented. Umberson and Karas Montez (2010) show that the risk of death is influenced by both quantity (i.e., objective) and quality (i.e., subjective) of social relationships. Penninx et

al. (1997) find that loneliness is a significant predictor of mortality in older adults. Luo and Waite (2014) report that lonely Chinese adults faced higher risks of mortality. Cacioppo and Cacioppo (2014) find that lonely older adults have impaired executive functioning, sleep, and mental and physical well-being which contributes to their higher mortality. Brummett et al. (2001) find that patients of coronary artery disease with less than three individuals in their social network have higher risks of cardiac death and all-cause mortality. This is relayed by Boden-Albala et al. (2005) who show that social isolation predicts mortality from strokes. Eng et al. (2002) find that more isolated men have higher risks of death from suicide as well as higher rates of all-cause mortality, while Giles et al. (2005) suggest that having more friends can protect against mortality.

Social isolation is often studied in conjunction with depression. Schoevers et al. (2000) fail to establish a strong relationship between depressive symptoms and isolation, while Dorfman et al. (1995) document a strong correlation between social isolation and depression. In a qualitative study examining social workers' views of depression, almost all of those interviewed perceived depression as a key cause of social isolation in older adults (McCrae et al., 2005). Sen et al (2022) show that social interaction, even virtual ones such as text messages or email, carry moderating effects on self-reported depression among older adults. Taylor et al. (2018) find that objective social isolation is unrelated to depressive symptoms, but that subjective social isolation from family and friends is associated with more depressive symptoms. This is relayed by Cacioppo et al. (2006) and Heikkinen and Kauppinen (2004) who find that loneliness is a predictor of depressive symptoms. Luo et al (2012) show that loneliness both affects and is affected by depressive symptoms. Iliffe et al. (2007) also find that depression increases the risk of isolation among older adults. A systematic review on interventions addressing social isolation and depression for clients in aged care is presented by Franck et al (2015).

2.2 Social Isolation in South Korea

Social isolation and loneliness have been identified as significant public health issues in South Korea, associated with increased depression, anxiety, and suicide (Chan et al., 2015; Kang et al., 2020; Kim et al., 2021; Lim et al., 2022; Park et al., 2021). Several factors have been identified as factors contributing to the high rates of social isolation and loneliness in South Korea. Among the youth, the country's highly competitive education system has been shown to lead to a lack of leisure time and opportunities for socialization. For the wider population, the country's rapid economic development and increased urbanization has been associated with a breakdown of traditional social support networks (Choi, 1996; Sung, 2001; Yi and Hwang, 2015). Urbanization has also contributed to the isolation of rural elders (Choi et al., 2020). Older adults have been identified as the most vulnerable group, as aging has been shown to contribute to loneliness, exclusion, and lower life satisfaction (Chung et al., 2019; Lim et al., 2016).

Kim and Lee (2022) and Ko et al. (2019) find that loneliness among Korean elders largely depended on gender, with men more likely to report suicidal thoughts and feeling lonely and depressed. Lee and Lee (2011) also relay that gender differences matter when it comes to depression of elders in Korea. Oh et al. (2015) find that living arrangements are significantly associated with depressive symptoms among Korean elders, and that these effects varied by gender. Jeong et al. (2022) find that males and the old-old have higher suicide rates. They also explain that these eldest exhibit greater levels of suicidal ideation and are less likely to ask for help from others. Jang et al., 2022 show that higher suicide rates in Korea are associated with older age, lower values of socioeconomic status, physical exercise, and religious activities, and with higher social isolation. Kim et al. (2002) have shown that there were strong associations between depression and lower socio-economic status in older Korean people. However, among elderly Korean women, Kwon et al. (2020) find that

depressive symptoms were found to be a critical factor of quality of life regardless of economic status. Kim et al. (2019) find that the degree of happiness among older Korean women living alone is a function of their self-esteem, which itself is dependent on the size of social network and the presence of social support. Do and Malhotra (2012) use and IV approach and find that Korean older widowed women co-residing with an adult child are better protected against depressive symptoms.

A major consequence of social isolation is the phenomenon of "lonely deaths", known as "Godoksa" in Korea, which is becoming a growing concern for policymakers. Indeed, thousands of middle-aged and elderly Koreans are dying alone every year, with their death going unnoticed for extended periods of time (Ministry of Health and Welfare, 2022). This issue is becoming increasingly worrisome considering the country's rapidly aging population and the low levels of life satisfaction among Korean elders, which has prompted the government to enact a Lonely Death Prevention Act in 2021 (Korean Law Information Centre, 2021). A number of factors have been found to contribute to this phenomenon, some of which are cultural and societal (Yi and Hwang, 2015). For example, the South Korean culture puts a high value on self-sufficiency, which can make it difficult for individuals to reach out for help when they are struggling with feelings of isolation and loneliness. Indeed, Confucianism, which can be thought of as the set of beliefs predominant in South Korean society, carries collectivistic values which prioritize the well-being of the group over the individual. These collectivistic values have traditionally been central to the formation and shaping of social networks among South Koreans as the concept of "jeong", the sacred bond between people, is characteristic of their culture (Nam, 2014; Tudor 2014). However, strict adherence to such values can create social isolation for those who are no longer able to contribute to the family and community, as they may feel pressure to conform to traditional expectations and sacrifice their own needs and desires over the wellbeing of the group. In this

spirit, it has been suggested that Korean elders may perceive themselves as a source of burden, which prevents them from seeking the help they need (Kim et al., 2016; Pan et al., 2022). Additionally, it has been suggested that the South Korean government is less inclined towards welfare and the provision of care towards elders because of its reliance on the collectivistic and caring values of Confucianism (Chang, 1997; Cho, 2003).

It is clear that culture is at the forefront of the conversation on social isolation in South Korea. Studies on filial piety, or the Confucian virtue of respect and obedience towards one's parents and elders, have shown that it is a deeply ingrained cultural value that is highly valued by older South Koreans (Kim and Kihl, 2021). Filial piety is a central aspect of South Korean culture, associated with a sense of moral responsibility and social harmony (Canda, 2013). Lew et al. (2011) and Choi and Wang (2013) suggest that this feeling of responsibility towards elders and ancestors was central to South Korea's industrialization and a driver for its economic success. Similarly, Kim et al. (2016) suggest that filial piety is an important value that shapes the behavior and attitudes of South Koreans towards their parents and elders. Filial piety has also been found to have a strong influence on the intergenerational relationships and family dynamics in South Korea (Park, 2021). For example, a meta-analysis by Pan et al. (2022) showed that filial piety was associated with less feeling of burden when providing care and support to parents in Eastern cultures, including South Korea.

Elderly Koreans value strong family ties and share a sense of interdependence among family members (Park et al, 2018). Some studies have even highlighted the effects of filial piety on mental health outcomes. For instance, Lee (2013) shows that family support, as a particular form of social support, has a negative relationship with suicidal ideation among older adults, and social support from the family reduces the relationship between depression and suicidal ideation. Park (2008) shows that suicidal ideation moderately decreases when the family's level of communication is high; however, depression increases when the level of

communication is low and suicidal thoughts rise rapidly. Kim and Lee (2022) find that contact and ties with family as well as being married were beneficial in reducing loneliness and later life-stages, particularly among men. Choi et al. (2020) find that meeting friends plays an important role in improving the quality of life of rural older adults. Roh et al. (2015) find that family contact, both face-to-face and remote, is associated with lower depression for Korean elders. Kwon et al. (2020) find that social support is a protective factor against the progression of depression among elderly Korean women. Nam and Lee (2019) identified social support as a crucially important factor in the lives of older adults who lived alone, who belonged to vulnerable groups, and who had chronic diseases. Chung and Park (2008) find that both the success of adult children and the existence of relationships were positively associated with successful ageing among low-income Korean elders. In their systematic review of suicidal ideation among Korean elders, Yoon and Cummings (2018) reiterate this important role played by family.

Considering the above, it is not surprising to see that a rapidly modernizing culture which is more rewarding of individualism compared to filial piety has been accused of being the primary driver of social isolation among Korean elders (Lee, 2016; Yasuda et al., 2006). Indeed, it is argued that the traditional extended family structure provided older adults with a sense of social support and belonging (Buja, 2016; Tudor, 2012). However, the rise of nuclear families and the increase in women's workforce participation have led to a decline in the traditional extended family structure, and are suggested to have made it more difficult for older adults to rely on their family members for care and support ((Chung and Kim, 2022; Kim and Kihl, 2021; Paik, 2009). In such a context, older parents may perceive themselves as burdensome, which leads to their isolation (Kim et al., 2016).

2.3 Inheritance with exchange motives

A relatively large literature has explored the altruistic motives behind inheritance and bequests (e.g., Arrondel and Masson, 2006; Barro, 1974; Becker, 1974, 1991, 1996; Becker and Tomes, 1979; Cox, 1987; Menchik and David, 1983; Lindbeck and Weibull, 1988; Tomes, 1981). In contrast, very little has been done in regard to the strategic motives of bequeathing. The strategic bequeathing motive, sometimes referred to as exchange bequest motive, states that parents use wealth as a bargaining strategy to obtain required services from children who are motivated to get a larger share from the parental wealth. When the parent has sizable wealth to be bequeathed and if there are more than one child, then the strategy is to divide wealth unequally and credibly threaten children of not leaving a bequest (or a relatively small one) if they do not provide the expected parental care (Bernheim et al, 1985; Chang and Luo, 2015). When strategic motive is operative, the service provided by each child in the family is positively related to the size of the potential wealth of parents. The arrangement involves parents agreeing to transfer their assets to their children upon their death as a quid-pro-quo to the support offered by the children when the parents are old and need support. In other words, parents may use the prospect of future bequests to induce their children to provide care to them when they are old and to have some control over the behavior of their offspring (Izuhara, 2008; Kotlikoff and Morris, 1989).

Bernheim et al. (1985) use the Longitudinal Retirement History Survey and find that children visited and called their parents more frequently when their parents had larger amounts of bequeathable wealth. They interpret this finding as evidence for an exchange theory of transfers in which bequests are made to children in exchange for their attention and care. Lakshmanasamy (2013) finds that Indian households exchange wealth largely for the support and services provided by the children. In the US, Caputo (2005) finds that intentions to leave inheritances to children are likely to affect adult daughters' decisions to provide personal care or do household chores for their parents. Further support for the exchange

hypothesis is provided by Ciani and Deiana (2018) who exploit Italian data and show that

parents who helped their adult children in the past are rewarded by higher chances of

receiving informal care later in life. Cox and rank (1992) find that inter-vivo family transfers

are more consistent with exchange rather than altruistic motives. However, Tomini et al.

(2016) study informal care in Europe and find evidence for both altruistic and exchange-

driven informal care.

A number of studies have looked at inheritance intentions and expectations. For instance,

sons' expectations of inheritance have been found to be positively associated with social

support provided to their parents, whereas daughters' expectations of inheritance were

negatively associated with support to their parents (Caputo, 2002; Silverstein et al., 1995).

Kim et al. (2013) offer some evidence against the exchange hypothesis, finding that current

support given to a child had positive effects on inheritance expectations, whereas support

given to a parent was not significant. Also, some studies have shown that racial differences

impact inheritance expectations and exchanges (e.g., Berry, 2006; Kao et al., 1997; McGarry

and Schoeni, 1995), while others have highlighted the role of culture, norms and beliefs (e.g.,

Horioka, 2014; Ikkink et al., 1999; Kohli and Künemund, 2003; Szydlik, 2012).

Moreover, inheritance expectations have been shown to affect a number of outcomes for

caregivers. For instance, some studies have looked at inheritance expectations and family

conflict, as misunderstandings or a lack of aligned perspectives regarding anticipated or

received inheritance can lead to family disputes (Fincher, 2016; Lawrence and Goodnow;

2011; Izuhara and Köppe, 2019). Tum (2000) suggests that discrepancies in views on

inheritance between parents and children could lead to family conflict and affect current

exchanges and relationships. In this same context, de Witt et al. (2013) explain that the

decision to leave and distribute an inheritance is often the result of reconciliating different

objectives such as leaving a lasting impact, or preserving family ties and avoiding family

conflict. It has also been suggested that the level of informal care offered to parents is positively associated with that offered by one's siblings, which may interpreted as siblings competing for inheritance (Gonzalez and Lopes, 2020).

The effect of inheritance expectations on economic outcomes has also been investigated. For instance, Doorley and Pestel (2020) find that receiving an inheritance reduces the probability of working full-time for German female heirs, in addition to decreasing their desired and actual working hours. They show that satisfaction with work decreases for men post-inheritance, while satisfaction with income increases for women. Basiglio et al. (2023) use Dutch data and find that expecting an inheritance reduces savings, increases the chances to dissave, and is positively associated with the intention to leave a bequest. They also find that expecting a large inheritance reduces the probability to work at a later age. Lundberg (2020) offers some evidence that individuals internalize expected inheritance, by showing that Swedish males adjust their savings following an inheritance loss while women adjust both their labor supply and savings. Other studies have looked at the benefits and costs of providing informal care to parents, recent examples of which are Caplin et al. (2016), Chai et al. (2021), Fu et al. (2021), Urwin et al. (2021) and Van Houtven et al. (2019)

In the case of Confucian South Korea, the eldest son was traditionally seen as the righteous heir to the largest portion of bequest, and often in its entirety (Prendergast, 2005). However, this trend seems to be changing following a cultural change and government interventions in the form of revisions to Korean inheritance laws designed to tackle this unfair bequeathing behavior (Chung and Gupta, 2007; Hwang and Kim, 2014; Kim et al., 2005). Nonetheless, Kim (2021), Nam et al. (2015), Lee (2015) and Yoo (2020) show that this norm remains largely present within Korean inheritance practices. Some studies, such as Kim (2008) and Yoo (2020), have looked at Korean inheritance from the lens of strategic inheritance motive theory. In this context, Canda (2013) explained that Koreans adult

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children who do not provide adequate care in the view of their parents and peers may experience diminished inheritance, alongside internal feelings of shame and guilt. However, Park (2014) analyzed parent –children pairs using the Korean Labor & Income Panel Study and reported that it was difficult to find evidence that children cared for their parents in order to receive an inheritance from them in the future. Yoo (2020) found that that the lower the educational level of the parents the greater the disparity in inheritance allocation proportion, which could be interpreted as showing that less educated people tend to maintain traditional ways of thinking and to favor the eldest son.

2.4 Hypothesis development

In this subsection, I present the research hypotheses following the theoretical arguments and empirical findings offered by the literature, and which serve as a guiding principle for this paper.

My first hypothesis draws on the strategic bequeathing motives theory presented above, and aspirations theory as offered by Genicot and Ray (2017). Indeed, I test whether adult children aspire for an inheritance rather than passively expect receipt of it. In other words, I propose that adult children perceive inheritance as an objective they can work towards accomplishing, and that they do so by offering care to their parents such as visiting, calling, or offering financial support. Under this hypothesis, I would expect to find that adult children who express a higher chance of receiving an inheritance provide more care to their parents, and that adult children who do not anticipate any inheritance provide minimal care to parents.

Similarly, my second hypothesis states that parents who express a higher likelihood of leaving an inheritance behind receive more care from their children hence are less socially isolated. The first and second hypotheses focus on the same question but from different angles, which allows for more robust findings. Indeed, the first hypothesis focuses on the

behavior of potential heirs, whereas the second one focuses on the consequences on parents. Under this hypothesis, I would expect my results to show that a parent who expresses a higher likelihood of leaving an inheritance reports lower markers of social isolation and better subjective wellbeing.

In this same explanatory arc, the third hypothesis of this paper posits that upon the death of a father and the subsequent split of inheritance, children who are frustrated and dissatisfied by the inheritance they have received will take less care of their mother, thus contributing to her social isolation and loneliness. This hypothesis is also in line with aspirations theory which suggests that individuals who fail to reach their aspiration target after working towards it can become frustrated and alter their behavior due to disappointment. Further in line with Genicot and Ray (2017), I suggest that the split of inheritance between heirs is a key determinant of one's satisfaction or frustration with inheritance, because the reaction of inheritors depends on their relative position among all other recipients of the inheritance. In sum, by testing this third hypothesis, I can capture whether inheritors who are frustrated following the distribution of their fathers' wealth will aspire for less inheritance from their mothers because of this negative experience, which limits the amount of care they "invest" towards their mothers.

3. Data

I exploit a granular dataset from the Korean Longitudinal Survey of Aging (KloSA), a nationally representative sample of the population aged 45 years and older, living in private households in Korea. The initial sample was recruited in 2006 using a multistage, stratified probability sampling of households across all geographic areas in Korea (except Jeju Island), and an identical survey has been repeated every even-numbered year in order to form a panel.

Interviews are conducted by trained interviewers using computer-assisted personal interviewing (CAPI) methods. The household response rate is 70.7%, and the individual response rate within households is 75.4%. KloSA was designed to provide basic data on population ageing in Korea for policy-making and cross disciplinary studies, including data on the social, economic, physical, and mental aspects of life of respondents. Since its launch, this rich dataset has been used by scholars in fields such as sociology, economics, healthcare, gerontology, psychology, family studies and demography. Detailed information on sampling design and survey approach can be found at the KloSA website (http://www.klosa.re.kr).

From KloSA, I analyze respondents surveyed from 2008 to 2020, disregarding the first wave of the survey (2006) due to the high number of missing observations. KloSA respondents are asked about the frequency of contact they hold with their parents and children, as well as their expectations about receiving and leaving an inheritance. Additionally, I am able to control for the distance between parents and children, the number of siblings, the number of children, as well as gender and age. Moreover, a key component of KloSA that is relevant to my study is the "Exit Survey" which takes place following the death of a past respondent, and where family members are asked a number of questions on the situation of the deceased prior to passing away. Indeed, among the many questions that form these exit interviews, family members are asked as to whether the deceased had left an inheritance, and how this inheritance was split between inheritors.

Together, these variables enable me to test the three hypotheses laid out in the previous section. Table 1 presents some descriptive statistics about the sample I work with. Appendix B offers the descriptions of the variables included in my estimations.

Table 1 - Descriptive statistics				
	Mean	S.D.	Min.	Max.
A: Adult children (N=2219)				
Likelihood of receiving inheritance	1.918	2.668	0	10
Age	57.059	6.864	45	84
Gender	0.537	0.499	0	1
Distance	2.276	1.449	1	4
N. of siblings	3.814	1.712	0	11
Visits	4.765	1.719	1	10
Contact	6.895	1.773	1	10
Net assets	16076.33	28143.76	-70000	588500
Owns home	0.812	0.391	0	1
B: Widows (N=748)				
Likelihood of leaving inheritance	3.066	3.144	0	10
ISOL	0.101	0.301	0	1
Sadness	1.627	0.791	1	4
Satisfied with children	6.826	1.833	0	10
Age (widows)	71.147	9.307	45	98
N. of alive children	3.625	1.529	0	9
SPLIT1	0.218	0.413	0	1
SPLIT2	0.135	0.342	0	1
Net assets	10235.52	15546.8	-35000	140500
Owns home	0.849	0.357	0	1

Notes: The total number of observations is 9210. All widows are females. Data is sourced from KloSA, spanning the period 2008 to 2020.

4. Empirical Specification

4.1 The model

To test the hypotheses laid out in section 2, a number of models are estimated. Firstly, I would like to find whether inheritance is simply a hopeful wish that is passively expected, or if it is a goal that adult children aspire for. If I can establish that individuals who express a higher likelihood of receiving an inheritance in the future invest more in caring for their parents, then this would suggest that inheritance is an aspiration, not an expectation. Indeed, a central element of aspirations theory is the aspirational property of objectives, meaning that they can motivate an individual to exert effort or invest to reach that goal. This feature makes aspiration models particularly interesting for development economists who look for ways to move people out of poverty (Appadurai, 2004; Genicot and Ray, 2020). To test this hypothesis, I estimate the model presented in equation (1).

$$y_{it} = \beta_0 + \beta_1 RIE_{it} + \beta_2 \omega_{it} + \gamma_t + u_{it} \tag{1}$$

y_{it} is the dependent variable of interest, meaning the variable showing the level of care offered to parents by individual vis-à-vis at time t. Two proxies for this measure are offered: the frequency of visiting parents, and the frequency of remote contact with parents (phone calls, emails etc.). RIE_{it} is the key predictor, and represents the likelihood of receiving an inheritance in the future as expressed by respondent vis-à-vis when they were interviewed at time t. Accordingly, the coefficient β_1 is the coefficient I am interested in, as a significant β_1 would mean that inheritance expectations affect how much care is offered to parents i.e., that inheritance may carry aspirational features. ω_{it} is a vector of control variables which include the age, a dummy variable for gender, the distance between the respondent's home and that of parents, and the number of siblings. γ_t captures year fixed

effects. These control variables have been included in the model following the findings of the literature which has suggested important effect of such variables on the degree of care offered to parents, particularly in the Korean context.

The second model I estimate is shown in equation (2). Unlike equation (1) which is estimated using the sample of adult children (i.e., the potential inheritors), equation (2) is estimated using the sample of female widows who have gone through an inheritance split following the death of their husbands, and who may leave an inheritance behind following their own deaths. With this model, I test whether parents who express a greater likelihood of leaving an inheritance behind report better subjective wellbeing and less social. This hypothesis builds on the intuition that expressing a higher chance of leaving an inheritance behind could cause children to invest more in caring for their parents, which improves the latter's condition and wellbeing. Additionally, equation (2) allows me to gauge the effects of the reaction of adult children following the split of inheritance after the death of their father. Aspirations theory suggests that individuals who held aspirations which were not fulfilled may become frustrated and change their behavior (Fruttero et al., 2021; Genicot and Ray, 2017; Genicot and Ray, 2020). Building on this premise, I have posited that adult children who perceive the split of inheritance as unfair will offer less parental care to their mother which contributes to her objective and perceived social isolation.

$$y_{it} = \beta_0 + \beta_1 LIE_{it} + \beta_2 SPLIT1_i + \beta_3 SPLIT2_i + \beta_4 \varphi_{it} + \gamma_t + u_{it} \qquad (2)$$

The dependent variable y_{it} in equation (2) represents the self-perceived condition of parents (satisfaction with children; frequency of "sad days") in addition to their objective social isolation (frequency of contact with friends or family). LIE, refers to the likelihood of leaving an inheritance behind as expressed by the respondent. SPLIT1 and SPLIT2 are

dummy variables showing how inheritance was split among children following the household head's death, and are used to represent the unfairness of the split. SPLIT1 takes the value of 1 if inheritance was not distributed equally between children. SPLIT2 accounts for South Korean bequeathing culture which has traditionally considered it acceptable to bequest the entirety or the majority of wealth to the eldest son. Thus, SPLIT2 takes the value of 1 if neither the entirety nor the majority of the inheritance went to the eldest son. Lastly, the control variables of equation (2), which are captured by the vector φ_{it} differ from those of ω_{it} in equation (1). φ_{it} includes the age, and the number of alive children. Equation (2) also accounts for year fixed effects.

As mentioned above, estimations of equation (1) are conducted using the sample of adult children i.e., the potential heirs, whereas equation (2) concerns the sample of parents or, to be more precise, the subsample of female widows and so for a number of reasons. Firstly, it is more convenient for the purpose of my study to look at inheritance when there is only one single parent, as motives behind parent-child exchanges (if any) would become clearer. For instance, should both parent be alive, it would be possible for a child to visit the parental home only with the intention of visiting one of the two parents. Additionally, focusing on widows limits the bias from missing information as, for example, parents might disagree or influence one another regarding the split of inheritance. Also, one of the spouses might be a prospective inheritor as well, which in turn might influence the level of care offered by children since they may perceive the living parent as an obstacle to their own inheritance. Lastly, it helps me in dealing with the problem of "who owns what" in a couple. For instance, it is possible that some assets vis-à-vis the household are the property of the husband while others belong to the wife, and my data does not enable me to capture such differences.

4.2 Estimation procedure

The models I have presented above suffer from potential endogeneity problems, mainly

omitted variable bias as well as risks of reversed causality. From the literature review I am

able to clearly see that the formation of inheritance expectations involves a complex

interaction between numerous elements. Hence, inheritance expectations may be influenced

by unobserved factors that also affect the level of parental care or the condition of parents. To

address these issues, I adopt an instrumental variable (IV) strategy in order to provide an

exogenous source of variation and establish causality by taking care of any confounding

influences (Angrist et al., 1996).

My first instrument of choice is a binary variable showing whether a respondent owns

the home they live in or not (OH). I use this instrument across all my estimations. Indeed, the

literature tells us that homeownership plays an important role in the formation of inheritance

expectations (Lawrence and Goodnow, 2011). Intuitively, it is not difficult to imagine how

adult children may covet their parent's home. It is also easy to see that whether children own

their current residential dwellings or not can affect their hopes for a sizeable inheritance.

Furthermore, following the distribution of an inheritance after the death of a household head,

the homeownership status of the widow may be indicative as to the split of inheritance that

took place. Additionally, the literature gives me no reason to suspect that the ownership of a

house may affect the degree of care offered to a parent, or the perceived social isolation of an

individual[20].

I further make use of another instruments, the log of net assets[21]. This instrument is

appealing as it fits within the context of an aspirations-based model which states that a

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[20] The case of homeless persons may be a valid counterexample. However, none of the respondents in our sample are homeless.
[21] A number of respondents reported negative values for net assets. We performed log transformation after adding a constant value to all observations so they become positive.

person's relative position in a wealth or income distribution is central to her aspiration behavior. Thus, it is reasonable to infer that the respondents' wealth affects their expectations vis-à-vis inheritance. Yet again, I find no reason to suspect a particular link between this instrument and the degree of care offered to parents, nor with a parent's perceived social isolation, except by the means of inheritance.

To test the validity of my instruments, I conduct the first-stage estimations of my models. Results are presented in Table 2, and we can see that my instruments are significant predictors of the endogenous regressors. All F-statistics are larger than 10 and we can cast away doubts regarding potential weakness of our instruments (Stock and Yogo, 2005).

Table 2 - First stage of IV regressions		
	RIE	LIE
INST1	0.483***	0.992
	[0.147]	[0.214]***
INST2	0.817***	2.944***
	[0.2]	[0.2]
F-test	13.97***	123.61***
N	6988	3540
R-squared	0.0268	0.2217

Notes: INST1 is a dummy variable taking the value of 1 if the respondent owns the current residential dwelling and 0 otherwise. INST2 is the log of Net Assets. RIE is respondents' (adult children) expressed likelihood of receiving an inheritance. LIE is respondents' (widows) expressed likelihood of leaving an inheritance. Data sourced from waves 2 to 8 of KLoSA. *** indicates significance at the 1% level.

Additionally, I perform the Sargan-Hansen test (Sargan, 1958; Hansen, 1982) to assess the over-identifying restrictions of our estimations. The null hypothesis for the Sargan-Hansen test indicates valid over-identifying restrictions. I report the p-value of the tests in the tables in the findings section under the relevant estimations. We can see that p-values are large hence that our identification strategy is correctly specified since we fail to reject the null-hypothesis.

I begin by estimating the presented equations using fixed-effects models. I have conducted Hausman tests to determine whether such a model is appropriate (Hausman, 1978). The null hypothesis for the Hausman test states that a random effects specification is more efficient, whereas the alternative hypothesis states that only fixed effects' results are consistent. The p-values I have obtained (reported in the tables) informed me that random-effects were not appropriate.

Furthermore, I have applied the two-stage least squares methodology to estimate my models using the instruments presented above. In the cases where the outcome variable was binary or ordinal, I supported my analysis by estimating probit and extended random-effects ordered probit regressions which accommodate endogenous covariates (Wooldridge, 2010; White, 1996). A number of papers in the pertinent literature estimate equations with ordered outcomes (see for example Koyama et al. 2021; von Ours 2021).

5. Findings

I begin my analysis by looking at adult children, hence the potential inheritors. I estimate the effect of children expressing a zero likelihood of receiving an inheritance on a proxy for the objective social isolation of their parents. In this case, the dependent variable is a dummy variable which takes the value of 1 if the respondent reports visiting parents less than once a

year. Considering that family plays a key role in the social network of parents, such an estimation would prove to be an informative starting point for our study.

Table 3 - Zero inheritance expectations vs. contact with parents		
	Fixed-Effects Model	Probit
	(1)	(2)
Expects no inheritance	0.025**	0.029***
	[0.01]	[0.009]
Gender_Female	0.319***	0.078***
	[0.017]	[0.011]
Distance	0.106***	0.123***
	[0.006]	[0.005]
Age	-0.026*	0.008***
	[0.001]	[0.001]
Number of siblings	0.01	0.002
	[0.03]	[0.003]
R-squared	0.073	-

Notes: N = 9210 adults children (potential inheritors); Dependent variable is a dummy variable which is equal to 1 if the respondent visits his/her parents once a year and 0 otherwise. "Expects no inheritance" is a dummy variable equal to 1 if respondent reports so and 0 otherwise. Distance is an ordinal variable representing the distance between respondent's living location and that of parents. Column (2) shows marginal effects. Estimations include year fixed effects. Standard errors are clustered around panel ID. Data sourced from waves 2 to 8 of KLoSA. ***, ** and * indicate significance at the 1%, 5% and 10% respectively.

Results are presented in table 3, where columns (1) shows coefficients from a fixed-effects model and column (2) shows marginal effects from a probit estimation. Across both columns, we can see that expecting no inheritance is associated with the respondent not visiting parents. Being a female also appears as positively associated with minimal contact with parents. This result is not surprising and was expected considering Confucian family ideology which dictates that wives should put their husbands' families first, hence limiting the degree of contact with their families of origin (Choi, 1983; Choi et al., 2019). Also

unsurprisingly, the distance separating parents and children emerges as a highly significant covariate. Taken together, these results indicate that inheritance expectations might be playing a part in the social isolation of parents.

	VISITS		CONTACT	
Table 4 - Inheritance expectations and contact with parents				
	FE Model	2SLS	FE Model	2SLS
	(1)	(2)	(3)	(4)
Inheritance Expectation (RIE)	0.018**	0.317**	0.015*	0.156
	[0.007]	[0.159]	[0.008]	[0.162]
Gender_female	-1.688***	-1.61***	-1.35***	-1.29***
	[0.071]	[0.109]	[0.078]	[0.114]
Distance	-0.722***	-0.728***	-0.372	-0.355***
	[0.025]	[0.032]	[0.026]	[0.032]
Age	-0.008	-0.026**	0.006	-0.002
	[0.005]	[0.011]	[0.006]	[0.011]
Number of siblings	-0.08	-0.04	0.221	0.246
	[0.134]	[0.197]	[0.203]	[0.242]
N	9210	7114	9210	7114
R-squared	0.218	0.154	0.018	0.011
Hausman (p-value)	0.000	0.000	0.000	0.000
Sargan-Hansen (p-value)		0.617		0.327

Notes: Respondents are adult children (potential inheritors). RIE is an ordinal variable representing the respondent's expressed likelihood of receiving an inheritance in the future. Visits indicates the frequency of physical visits the respondent pays to parents, while Contact represents frequency of remote communication (calls, emails, and such). The two instruments used in estimations (2) and (4) are a dummy variable for whether respondent owns their dwelling, and the log of net assets. Estimations include year fixed effects. Standard errors are clustered around panel ID. The null hypothesis of the Hausman test indicates that random effects is preferred. The null hypothesis of the Sargan-Hansen test of over-identifying restrictions indicates validity of the instruments. Data sourced from waves 2 to 8 of KloSA. ***, ** and * indicate significance at the 1%, 5% and 10% respectively.

To gain further insights and attempt to find causal evidence, I move on to estimating equation (1) using fixed-effects and a 2SLS. Table 4 shows the estimation results. In columns (1) and (2), the outcome variable is the frequency of in-person meetings with parents, whereas columns (3) and (4) show estimates when the dependent variable is the frequency of remote contact (e.g., phone calls). The key predictor (RIE) is ordinal and represents respondents' inheritance expectations. The coefficients reported in Table 4 show that only one form of parental contact is affected by inheritance expectations. Indeed, we can see that adult children seem to increase the frequency of in-person visits when they express a higher chance of receiving an inheritance. However, phone calls and other forms on distant contact is unaffected. Being a female is shown to be associated with lesser contact with parents, both in-person and remote. We can interpret these findings as evidence for a causal link between inheritance expectations and parental care, at least in its in-person meetings form which is arguably the most relevant to social isolation. Following these results, we can deduce that inheritance is aspired for rather than being passively expected by individuals in our sample. Indeed, inheritance expectations are affecting the frequency of visits paid to their parents, thus supporting the hypothesis that inheritance has an aspirational effect on children that motivates them to "invest" more visits to their parents in the hopes of obtaining an inheritance.

Building on these findings, I move on to the estimation of equation (2) which offers the perspective of the parent, or female widows to be precise. The first set of coefficients are shown in table 5. The key regressors are the respondent's expectation levels regarding the likelihood of leaving an inheritance behind (LIE), and the two dummy variables (SPLIT1 and SPLIT2) indicating how inheritance was distributed amongst children following their fathers' deaths. Two outcome variables are used to study the effects of these covariates on the wellbeing of respondents. The first one is the self-reported level of satisfaction with the

relationship with children. The second one is the frequency of days spent "sad" prior to the interview. As was highlighted in the literature review, these two aspects of elders' lives are central to their perceived social isolation.

Table 5 - The effects of past split of inheritance on mothers				
	SATISFIED WITH CHILDREN		FREQUENCY OF SAD DAYS	
	FE Model	2SLS	FE Model	2SLS
	(1)	(2)	(3)	(4)
Inheritance Expectation (LIE)	0.019*	0.035	-0.019***	0.009
	[0.01]	[0.047]	[0.004]	[0.02]
Uneven Split (SPLIT1)	-0.299***	-0.386***	0.201***	0.173**
	[0.113]	[0.138]	[0.056]	[0.068]
Untraditional Split (SPLIT2)	0.315**	0.333**	-0.021	0.005
	[0.136]	[0.165]	[0.068]	[0.076]
Age	-0.03***	-0.412***	0.014***	0.015***
	[0.007]	[0.009]	[0.003]	[0.004]
Number of children alive	0.214*	0.153	-0.05	-0.098**
	[0.12]	[0.157]	[0.05]	[0.049]
N	4470	3081	5422	3575
R-squared	0.018	0.0307	0.047	0.034
Hausman (p-value)	0.000	0.000	0.000	0.000
Sargan-Hansen (p-value)		0.884		0.495

Notes: Respondents are widows. LIE is an ordinal variable representing the respondent's expressed likelihood of leaving an inheritance in the future. The two instruments used in estimations (2) and (4) are a dummy variable for whether respondent owns their dwelling, and the log of net assets. Estimations include year fixed effects. Standard errors are clustered around panel ID. The null hypothesis of the Hausman test indicates that random effects is preferred. The null hypothesis of the Sargan-Hansen test of over-identifying restrictions indicates validity of the instruments. Data sourced from waves 2 to 8 of KloSA. ***, ** and * indicate significance at the 1%, 5% and 10% respectively.

Looking at table 5, we can see that an uneven split of inheritance following a father's death produces a causal link with a worsening condition for inheritors' mothers. Respondents are shown to report less satisfaction with children and more sad days, significant at 1% and consistent across both Fixed-effects and 2SLS estimations. On the other hand, when inheritance is not distributed according to the traditional norm which states that the eldest male should receive most or all of the inheritance, respondents report more satisfaction regarding their relationship with children. Taken together, these results may be indicative of the cultural change taking place in South Korea, where old bequeathing norms are being set aside. An interesting finding that emerges from the estimations shown in table 5 is that as respondents grew older, they became more satisfied with their children. However, and in line with the literature, we can see that growing old also brings more sadness for South Korean female elders.[22]

To draw better sense of these results, I split the sample of respondents between widows whose children have not inherited equally following their fathers' deaths, and those whose children did (Table 6). I conduct fixed-effects, probit and 2SLS estimations to establish whether mothers' reported likelihood of leaving an inheritance behind affects their own objective social isolation following the split of inheritance after husbands' deaths. Indeed, the outcome variable is a dummy variable equaling if respondents report a complete inexistence of contact with friends or family.

Looking at the coefficients (marginal effects in the case of Probit) of the key independent variable (LIE), I find that mothers' reported inheritance expectations does not matter when children have gone through an uneven split of inheritance. However, these same expectations become significant if children have inherited equal shares of wealth, and appear to lower the

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[22] For robustness, we have re-estimated these equations using random-effects ordered probit models. Coeffieicents as well as marginal effects are shown in appendices B and C.

probability of occurrence of objective social isolation of respondents. Thus, it appears that children are less likely to desert their mothers if they have experienced an even distribution of inheritance when fathers pass away.

Table 6 - Inheritance split and Isolation						
	CHILDREN INHERITED UNEQUALLY			CHILDREN INHERITED EQUALLY		
	FE	Probit	2SLS	FE	Probit	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Inheritance Expectation (LIE)	0.006	0.001	0.013	-0.008***	-0.009*	-0.035***
	[0.004]	[0.006]	[0.013]	[0.002]	[0.006]	[0.011]
Age	0.057***	0.003**	0.011**	0.029***	-0.002**	0.005***
	[0.012]	[0.002]	[0.005]	[0.01]	[0.001]	[0.002]
Number of children alive	0.06	-0.002	-0.009	-0.02	-0.002	0.001
	[0.071]	[0.01]	[0.081]	[0.021]	[0.005]	[0.024]
N	1186	1034	1034	4252	2550	2550
R-squared	0.013	-	0.011	0.017	-	0.022

Notes: Respondents are widows. Dependent Variable is ISOL, a dummy variable equalling 1 if respondent reports maximum one contact with friends or family per year. LIE is an ordinal variable representing the respondent's expressed likelihood of leaving an inheritance in the future. Columns 2 and 5 show marginal effects. The two instruments used in estimations (3) and (6) are a dummy variable for whether respondent owns their dwelling, and the log of net assets. Estimations include year fixed effects. Standard errors are clustered around panel ID. Data sourced from waves 2 to 8 of KloSA.

6. Discussion

Strategic bequest motives theory dictates that the service provided by each child in the family is positively related to the chance of receiving wealth from parents (Bernheim et al., 1985; Chang and Luo, 2015). A good example is provided by Caputo (2005), who showed how intentions to leave inheritances to children affect adult daughters' decisions to provide

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personal care or do household chores for their parents in the US. My findings relay a similar story. Indeed, the models I have estimated have generated significant evidence on the link between inheritance expectations and the provision of care to parents, at least so in the case of in-person visits. This has clear implications for the literature on objective social isolation, considering that adult children's wishes for inheritance appear to bring some life to their parents' social networks.

We can further interpret these results from the lens of aspirations theory, and state that Korean adult children appear to aspire for inheritance rather than expect it (Genicot and Ray, 2020). With an objective in mind, they invest effort in the hope of reaching their target. In my case, this effort takes the form of family visits. Interestingly, I found no significant change in the frequency of remote contact, such as phone calls or emails. This might be explained by the fact that phoning a parent can be considered as the minimum a child can do, and not be treated as "effort" or "investment". This is particularly true in the context of Korean attitude towards filial piety and reciprocity in parental care (Ko and Chapman, 2017). One may also suggest that beyond a certain point, a low frequency of remote contact between parent and child is synonymous with deeply rooted family issues that go beyond the scope of this study.

The main motivation behind this paper is to contribute to further our understanding of the factors that may cause social isolation and harm elders' wellbeing. From my results, it emerges that adult children aspiring for inheritance is a double-edged sword. On the one hand, it proves beneficial for parents who are likely to leave an inheritance behind. Indeed, we have found that widows who expressed a high likelihood of leaving an inheritance behind fared better across measures of both objective and perceived social isolation. On the other hand, this entails that poorer parents who have less to offer are more likely to be pushed towards isolation due to the little possibility for "exchange" with their children.

The findings of this study suggest that the split of inheritance in South Korea has a significant effect on children's attitudes towards their mother. Indeed, my estimates suggest that children "reward" their surviving parent when they receive an even share of inheritance. However, my approach to this particular question had limitations, in that I did not take into account the child's earlier inheritance expectations when gauging the effects of the split. Hence, I am not able to make clear and confident conclusions as to whether aspiration fulfilment and frustration have any role to play in this case. Also, it is important to keep in mind that this study was conducted in South Korea, a society with a distinct cultural and historical context. One important consideration when interpreting these findings is the cultural emphasis on filial piety in South Korean society (Canda, 2013; Kim and Kihl, 2021). Filial piety, or the respect and obedience that children owe to their parents, is highly valued in South Korean culture, and may play a role in mitigating any negative effects that inheritance might have on children's attitudes towards their mothers (Kim et al., 2016). Additionally, South Korean law and custom prescribe certain rules for the distribution of inheritance, which may also help to reduce any potential conflicts arising from inheritance disputes (Chung and Gupta, 2007).

While the findings of this study provide valuable insights into the relationship between inheritance and family relationships, it is clear that more research is needed to fully understand the effects of inheritance on the social well-being of older adults. Indeed, despite the saliency of this avenue, there is a relative dearth of research examining the relationship between the two. Furthermore, more research is needed for the examination of inheritance and social isolation among elders while considering cultural and historical context. Additionally, more research is needed regarding the role of inheritance (or lack thereof) in the well-being of other vulnerable populations low-income individuals, or racial and ethnic minorities.

7. Concluding remarks

In this study, I used data from the Korean Longitudinal Survey of Aging (KloSA) spanning the period from 2008 to 2020 to examine the effects of inheritance expectations on the degree of informal care offered to parents, and the social isolation of elders in South Korea. Following the literature, I examined factors linked to objective and perceived social isolations separately. I utilized home ownership and net assets as instrumental variables and addressed endogeneity by estimating a 2SLS as well as fixed-effect models and random-effects ordered probit regressions that accommodate endogenous covariates. My estimations yielded a positive causal link between children's inheritance expectations and the frequency with which they visit their parents. I found this to be robust to a range of specification approaches.

These findings have important implications for our understanding of the relationship between inheritance and family dynamics in South Korean society. They suggest that inheritance expectations play a significant role in shaping the care that older adults receive from their children, as well as their level of social isolation. These results may appear as shocking considering that the Confucian value of *filial piety* was thought to remain prevalent in South Korean society. I thus encourage more research to investigate the presence of role played by filial piety in today's Korean inheritance behavior.

To the best of my knowledge, this is the first paper which offers causal evidence on the role of inheritance expectations in the context of social isolation of elders. However, it is important to note the limitations of this study. Firstly, my sample was limited to older adults in South Korea, and the results may not generalize to other populations or cultures. Moreover, I would have liked to work with higher frequency data, as the respondents of the survey I have exploited are only interviewed once every two years. Lastly, I would have liked

to delve deeper in the study of inheritance frustration and its effects on parent-child relations, so I advise researchers to do so.

I believe this study to be important for policy makers interested in supporting the wellbeing of older adults and tackling issues that accompany the aging of society, particularly for the South Korean context. My recommendations are twofold. Firstly, I advise policy makers to invest in further researching the developments and current status of filial piety in South Korea. Building such an understanding would enable the design of more effective strategies for promoting the wellbeing of older adults in this context. Then, I recommend the creation of programs that monitor social isolation following the distribution of inheritance. Such a step would help us in developing our understanding of the effects of inheritance split on the wellbeing of elders.

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Definitions of variables	
RIE	Ordinal variable taking values between 0 and 10, showing respondent's expectations about the likelihood of receiving an inheritance in the future. 0 indicates a zero reported chance of receiving an inheritance, while 10 indicates a very high chance.
LIE	Ordinal variable taking values between 0 and 10, showing respondent's expectations about the likelihood of leaving an inheritance in the future. 0 indicates a zero reported chance of leaving an inheritance, while 10 indicates a very high chance.
SPLIT1	A dummy variable used to capture the (un)fairness of the split of inheritance following a father's death. This variable equals 1 if inheritance is distributed unequally between children, and 0 otherwise.
SPLIT2	A dummy variable used to capture the (un)fairness of the split of inheritance following a father's death. This variable equals 1 if inheritance was not split in accordance with Korean bequeathing tradition, and 0 otherwise. South Korean bequeathing tradition dictates that the eldest son receives all or the largest share of the inheritance.
Number_of_Children_Alive	Number of children alive
Number_of_Siblings	Number of siblings
Own_Home (INST1)	A dummy variable equaling 1 if respondent owns their dwelling, and 0 otherwise.
Log_Net_Assets (INST2)	Log of net assets
Sadness	An ordinal variable taking values between 1 and 4 showing respondents' self-reported frequency of days spent in a state of sadness. 1 indicates respondents' reporting being sad "rarely or none of the time (less than once a week)", while 4 indicates respondents who are sad "most or all of the time (more than 5 days a week)".
Sat_Children	An ordinal variable taking values between 0 and 10 showing

	respondents' self-reported degree of satisfaction with the current relationship held with their children. 0 and 10 indicate very low and very high levels of satisfaction respectively.
Age	Age
ISOL	Proxy for "objective social isolation". A dummy variable equalling 1 if respondent reports a maximum of one contact with friends or family per year, and 0 if more.
Visits	Frequency of in-person contact with parents on a yearly basis.
Contact	Frequency of remote contact (calls, emails, etc…) with parents on a yearly basis.
Expects_no_inheritance	A dummy variable equalling 1 if respondent does not expect to receive any inheritance in the future, and 0 otherwise.
Distance	Ordinal variable taking values between 1 and 4 representing the distance separating parents and children's homes. 1 and 4 indicate a very short and very large distance respectively.

	Coefficients	Marginal effects			
Inheritance split and sadness of Widows					
		1	2	3	4
Outcome variable: Sadness (1-4)					
Inheritance Expectation (LIE)	-0.024	0.007	-0.003	-0.003	-0.001
	[0.025]	[0.008]	[0.003]	[0.003]	[0.001]
Even Split (SPLIT1)	0.148*	-0.0458*	0.0192*	0.0184*	0.0083*
	[0.086]	[0.0192	[0.011]	[0.0106]	[0.005]
Traditional Split (SPLIT2)	0.013	-0.004	0.0017	0.0016	0.0007
	[0.097]	[0.03]	[0.0126]	[0.0121]	[0.005]
Age	0.011	-0.0034	0.0014	0.0013	0.0006
	[0.005]**	[0.002]**	0.001]**	[0001]**	[0.000]**
Number of Children alive	-0.027	0.008	-0.003	-0.003	-0.001
	[0.026]	[0.008]	[0.003]	[0.003]	[0.001]

Notes: Respondents are widows. The sample size is N=3575. Table shows coefficients and marginal effects from an ordered probit regression with dependent variable "Sadness". LIE is an ordinal variable representing the respondent's expressed likelihood of leaving an inheritance in the future. Standard errors are clustered around panel ID. Data sourced from waves 2 to 8 of KLoSA. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Inheritance split and Children satisfaction					
	Coefficients	*Marginal effects*			
Outcome variable: Satisfied with	*1*	*2*	*3*	*4*	*5*
Children relationship (1-5)					
Inheritance	0.0733***	-0.001***	-0.0006**	-0.0018***	-0.0028***	-0.0032***
Expectation (LIE)	[0.022]	[0.0004]	[0.0002]	[0.0006]	[0.0009]	[0.001]
Even Split (SPLIT1)	-0.129*	0.0018	0.0009	0.0032	0.005	0.006
	[0.078]	[0.001]	[0.0006]	[0.0019]	[0.003]	[0.004]
Traditional Split (SPLIT2)	0.158*	-0.0022	-0.0012	-0.0039*	-0.0061	-0.007*
	[0.089]	[0.0013]*	[0.0007]	[0.0022]	[0.0035]*	[0.004]
Age	-0.016***	0.0002***	0.0001**	0.0004***	0.0006***	0.0007***
	[0.005]	[0.0001]	[0.000]	[0.0001]	[0.0002]	[0.0002]
Number of Children alive	0.075***	-0.001**	-0.0006**	-0.0018***	-0.0029***	-0.0033***
	[0.027]	[0.0004]	[0.0003]	[0.0007]	[0.0011]	[0.0012]
		Marginal effects			
Outcome variable: Satisfied with	*6*	*7*	*8*	*9*	*10*
Children relationship (6-10)					
Inheritance	-	-0.0063***	-0.0049***	-0.0013**	0.0091***	0.0089***
Expectation (LIE)		[0.002]	[0.0015]	[0.0006]	[0.0028]	[0.0027]
Even Split (SPLIT1)	-	0.0111*	0.009*	0.0024	-0.016*	-0.015*
		[0.007]	[0.005]	[0.0016]	[0.0097]	[0.009]
Traditional Split (SPLIT2)	-	-0.0137*	-0.0106*	-0.003	0.0197*	0.0192*
		[0.0077]	[0.006]	[0.002]	[0.011]	[0.0108]
Age	-	0.0014***	0.0011***	0.0003**	-0.002***	-0.002***
		[0.0004]	[0.0003]	[0.0001]	[0.0006]	[0.0006]
Number of Children alive		-0.0064***	-0.005***	-0.0014**	0.0093***	0.0091***
		[0.0023]	[0.0018]	[0.0006]	[0.0033]	[0.0032]

Notes: Respondents are widows. The sample size is N=3081. Table shows coefficients and marginal effects from an ordered probit regression with dependent variable "Satisfied with Children". LIE is an ordinal variable representing the respondent's expressed likelihood of leaving an inheritance in the future. Standard errors are clustered around panel ID. Data sourced from waves 2 to 8 of KLoSA. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

CONCLUSION

This PhD dissertation has explored a number of issues pertaining to today's South Korean socioeconomic landscape. In a first chapter, I investigated some implications of the record dense stock of industrial robots in Korean industries. I used a dynamic monopsony framework and applied hazard and random effects logit models to panel data, and showed that robotization increases the wage elasticity of quits to non-employment for manufacturing workers while it depresses it for workers in services and in the whole economy. In the second chapter, I explored the scarring effects of graduating when the unemployment rate is high on Korean Nurses. This study is important considering the very high youth unemployment rate in South Korea, as well as the concerningly high turnover rate among the country's nurses. My IV approach yielded highly significant causal evidence for the presence of persistence in the case of the effects of initial labor marker conditions on wages, workhours, and subjective wellbeing. In the final chapter, I studied the problem of social isolation among South Korean elders. I contributed novel evidence to the small body of literature investigating the economic determinants of elders' social isolation. I drew on Strategic Bequeathing theory and Aspirations theory, and hypothesised that inheritance expectations of adult children affect the level of care they offer to their parents. I estimated a series of model which generated causal evidence in support of this hypothesis. Additionally, I found that the degree of fairness of an inheritance's split following the death of a father had implications on the degree of care offered by adult children to their mother. I interpreted this result as evidence for aspiration frustration, in line with Genicot and Ray (2017).

Taken together, this thesis offers multifaceted insights to policy makers looking to tackle the aforementioned issues in South Korea, as well as those from other countries facing

similar problems. It has offered a new perspective on the potential channels via which robotization may affect labor. Furthermore, each of this thesis's chapters has generated novel empirical evidence that can be used to inform theory. This is particularly true for my study on scarring in chapter 2. Also, this dissertation has produced a novel research avenue that could prove promising for policy i.e., the relationship between inheritance and social isolation.

As a final remark, I would like to list a number of directions for future research which I see as emerging from this dissertation and believe to have important implications for policy. Firstly, I recommend further efforts in applying dynamic monopsony models to the question of technological change, preferably using identification methods that would generate causal evidence which I do not do. Secondly, the problem of shortages and high turnovers in the Nursing profession is almost universal. Hence, it would be interesting to replicate my study in from chapter 2 using data on nurses from another country. Last but not least, I would like to direct economists attention to the urgent problem of social isolation and its determinants. Far too little is being done on the question in spite of the issue risking to blow out of proportion, especially in countries with ageing populations. We are already hearing abominable suggestions from individuals who are advocating for mass suicides, even going as far as suggesting mandatory euthanasia policies to deal with the burden of elders. The academic community must step up and face the rising challenge of ensuring our elders' wellbeing while generating opportunities for the younger generations.