Essays on Micro and Small Firms in Indonesia

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Abstract

I write three essays on micro and small firms in Indonesia. The first essay discusses the effects of the education of entrepreneurs—the managers cum owners of micro and small firms—on the firm performance and the entrepreneurs' earnings. I find some evidence that, on average, better educated entrepreneurs earn more hourly, monthly, and annually, though the return to education differs by sector. I also find female entrepreneurs benefit more from their education, so do entrepreneurs in urban areas. The second essay studies whether social health insurance in Indonesia, *Askeskin*, that owners of micro and small firms have access to help the firms cope with family hardships experienced by the households. I find some evidence of *Askeskin* reduces the adverse effects of deaths in the family in the previous year, outpatient care, and traffic accidents on net profits; *Askeskin* also protects total assets against owners' need of outpatient care. The third essay analyses the effects of an increase in real wage rates on small farms' investment in tractors, machines, equipment, and irrigation system, i.e., whether an increase in wages induces farmers to substitute labour for capital. I find some evidence that higher real minimum wages induce greater use of tractors on small farms; higher real agricultural wages encourage smallholders invest more in vehicles. I also find relatively large farms use more tractors as real wages (all types) increase; they also invest more in vehicles when farm labour become more expensive. By contrast, relatively small farms invest more in irrigation systems in response to higher real wages and more in farm equipment when real agricultural wages increase.

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Abbreviations

AFQT	Armed Forces Qualifying Test
Asabri	Social Insurance Plan for the Armed Forces personnel (*Asuransi Angkatan Bersenjata Republik Indonesia*)
Askes	Indonesia Health Insurance (*Asuransi Kesehatan Indonesia*)
Askeskin	Indonesia Health Insurance for the Poor (*Asuransi Kesehatan untuk Masyarakat Miskin*)
Astek Jamsostek	Labour Social Health Insurance
BLT	Direct Cash Transfer (*Bantuan Langsung Tunai*)
BPJS	Social Security Administrator Body (*Badan Penyelenggara Jaminan Social*)
BPS	Statistics Indonesia (*Badan Pusat Statistik*)
BSM	Scholarship for Poor Children (*Beasiswa untuk Siswa Miskin*)
CIA	Conditional Independence Assumption
CPI	Consumer Price Index
DAP	Draught Animal Power
EET	Entrepreneurial Education and Training
EIU	Economist Intelligence Unit
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
IFLS	Indonesian Family Life Survey
ILO	International Labour Organisation
Inpres	Presidential Instructions (*Instruksi Presiden*)
Jamkesmas	Community Health Insurance (*Jaminan Kesehatan Masyarakat*)
Jamsostek	Workforce and Social Insurance (*Jaminan Social dan Tenaga Kerja*)
JKN	National Health Insurance (*Jaminan Kesehatan National*)
JPS	Social Safety Net (*Jaring Pengaman Social*)
Kabupaten	District
Kecamatan	Sub-District
KHL	Minimum Descent Standard of Living (*Kebutuhan Hidup Layak*)
NCMS	New Rural Cooperative Medical Scheme
OLS	Ordinary Least Square
PKH	Family of Hope Programme (*Program Keluarga Harapan*)
Posyandu	Integrated Health Post
PT Askes	Insurance Schemes of Civil Servants
Puskesmas	Health Centre at Sub-District level (*Pusat Kesehatan Masyarakat*)
Raskin	Rice for the Poor Programme (*Beras Untuk Keluarga Miskin*)
RD Design	Regression Discontinuity Design

Abbreviations

Repelita	Five-Year Development Programme (*Rencana Pembangunan Lima Tahun*)
RMHC	Rural Medical Health Care
Rp	Rupiah
Sembako	Nine Basic Foods (*Sembilan Bahan Pokok*)
SKTM	Village Poverty Letter (*Surat Keterangan Tidak Mampu*)
SKY	Micro Health Insurance in Cambodia (*Sokapheap Krousat Yeugn*)
SMEs	Small- and Medium Sized Enterprises
Taspen	Saving Plans (*Tabungan Pensiun*)
VHI	Vietnam's Health Insurance
WHO	World Health Organisation
2SLS	Two-Stage Least Square

Table of Contents

LIST OF TABLES vi
LIST OF FIGURES vii

CHAPTER 1 ESSAYS ON MICRO AND SMALL FIRMS IN INDONESIA
1.0 Introduction 1

CHAPTER 2 EDUCATION AND ENTREPRENEURIAL SUCCESS: MICRO AND SMALL FIRMS IN INDONESIA
2.1 Introduction 10
2.2 Literature Review
2.2.1 Human Capital Theory and Signalling Theory 15
2.2.2 Returns to Education for Entrepreneurs 17
2.3 The Longer School Year in 1978 in Indonesia 25
2.4 Empirical Strategy and Data
2.4.1 Empirical Strategy 26
2.4.2 Data and Variables 31
2.4.3 Summary Statistics 34
2.5 Results
2.5.1 The Effects of the Longer School Year on Education 37
2.5.2 The Effects of Education on Firm Performance 41
2.5.3 The Effects of Education on Entrepreneurs' Earnings 45
2.5.4 Robustness Checks 48
2.6 Conclusion and Discussion 57

CHAPTER 3 DOES SOCIAL HEALTH INSURANCE HELP OWNERS OF MICRO AND SMALL FIRMS COPE WITH FAMILY HARDSHIPS? EVIDENCE FROM INDONESIA
3.1 Introduction 62
3.2 The Social Health Insurance in Indonesia—*Askeskin* 68
3.3 Literature Review
3.3.1 Internal Finance Theory of Growth 72
3.3.2 Firms' Growth and Financial Constraints 74
3.3.3 Economic Effects and Welfare Effects of Family Hardships 75
3.3.4 Impacts of Social Health Insurance 78
3.4 Empirical Strategy and Data
3.4.1 Empirical Strategy 83
3.4.2 Data and Variables 88

Table of Contents

CHAPTER 3 DOES SOCIAL HEALTH INSURANCE HELP OWNERS OF MICRO AND SMALL FIRMS COPE WITH FAMILY HARDSHIP? EVIDENCE FROM INDONESIA
3.5 Results
3.5.1 Basic Results 101
3.5.2 Use of Alternative Measures of Family Hardships 104
3.5.3 Use of Alternative Measures of Firm Performance 112
3.5.4 Regressions by Subsample 113
3.6 Conclusion and Discussion 118

CHAPTER 4 RISING WAGES AND MECHANISATION OF SMALL FARMS IN INDONESIA
4.1 Introduction 123
4.2 Small Farms, Wage Growth and Mechanisation in Indonesia
4.2.1 Agriculture and Small Farms in Indonesia 127
4.2.2 Wage Growth in Indonesia 129
4.2.3 Mechanisation of Small Farms in Indonesia 130
4.3 Literature Review
4.3.1 Theory of Induced Innovation 133
4.3.2 Wages, Farm Size, and Mechanisation 135
4.4 Empirical Strategy and Data
4.4.1 Empirical Strategy 139
4.4.2 Data and Variables 141
4.5 Results
4.5.1 Basic Results 145
4.5.2 The Effects of Real Wages and Landholdings on Mechanisation 149
4.5.3 Subsample: Mechanisation for Rice Farming 155
4.6 Conclusion and Discussion 161

CHAPTER 5 CONCLUDING REMARKS 164

REFERENCES 168
APPENDIX A1 MAIN ECONOMETRIC CHALLENGES FOR RETURNS TO EDUCATION 192

Table of Contents

APPENDIX A2 USING A FULL SAMPLE FOR THE EFFECTS OF THE LONGER SCHOOL YEAR ON EDUCATION
Figure A2.1 The effects of the longer school year on education 194
Figure A2.2 The effects of the longer school year on the proportion of entrepreneurs 194

APPENDIX A3 REGRESSIONS THAT CLUSTER STANDARD ERRORS BY DISTRICT
Table A3.1 First-stage, reduced-form, and second-stage regressions 195
Table A3.2 The effects of education on firm performance 196
Table A3.3 The effects of education on entrepreneurs' earnings 197
Table A3.4 The effects of education by industry 199
Table A3.5 Continuity of control variables at the threshold 200

APPENDIX B WHETHER AVAILABILITY OF INTERNAL FUNDS DEFINE FINANCIAL CONSTRAINTS 201

APPENDIX C LIST OF VARIABLES
Table C1 List of variables for essay 1 203
Table C2 List of variables for essay 2 206
Table C3 List of variables for essay 3 213

List of Tables

2.1	Summary statistics	35
2.2	First-stage, reduced-form, and second-stage regressions	40
2.3	The effects of education on firm performance	43
2.4	The effects of education on entrepreneurs' earnings	47
2.5	The effects of education by industry	49
2.6	Using other polynomial functions of the assignment variable	52
2.7	Using alternative assignment variables and definitions of the longer school year	53
2.8	Subsample	55
2.9	Continuity of control variables at the threshold	56
3.1	Summary statistics	94
3.2	The effects of *Askeskin* on total assets and net profits	103
3.3	Other measures of family hardships and total assets	106
3.4	Other measures of family hardships and net profits	109
3.5	Other measures of firm performance	112
3.6	Urban sample	114
3.7	Using micro firms (fewer than ten workers)	115
3.8	Using firms whose total assets are below Rp 50 million	116
4.1	Summary statistics	144
4.2	The effects of real wages on mechanisation	146
4.3	The effects of real wages by type of mechanisation	147
4.4	The effects of real wages and farm size (in 2007) on mechanisation	151
4.5	The effects of real wages and farm size (in 2007) by type of mechanisation	152
4.6	The effects of real wages by type of mechanisation for rice farming	157
4.7	The effects of real wages and farm size (in 2007) for rice farming	158

List of Figures

1.1	Finance, innovation and technology for small firms (5-19 workers) in Indonesia, East Asia and the Pacific, and all countries, 2015	4
2.1	Density of assignment variable (year of birth), 1960-1988	29
2.2	The first-stage regressions and the effects on education	37
2.3	The effects on firm performance	42
2.4	The effects on entrepreneurs' earnings	46
4.1	Average monthly national wages in Indonesia, 1997-2016	129

Chapter 1

Essays on Micro and Small Firms in Indonesia

Introduction

I write three essays on micro and small firms in Indonesia.[1] The first essay discusses the effects of the education of entrepreneurs—the managers cum owners of micro and small firms—on the firm performance and the entrepreneurs' earnings. The second essay studies whether social health insurance that owners of micro and small firms have access to help the firms cope with family hardships experienced by the households. The third essay analyses the effects of an increase in real wage rates on small farms' investment in tractors, machines, equipment, and irrigation system, i.e., whether an increase in wages induces farmers to substitute labour for capital.

Micro and small firms are potential engines of growth and innovation in developing countries. In Asia, 96 percent of firms are micro and small firms; they hire 62 percent of the labour force and contribute an average of 62 percent of gross domestic products (Asian Development Bank, 2014).[2] The figures for Indonesia are also large: Micro and small firms account for 99 percent of the firms, 50 percent of total employment, 45 percent of GDP, and 16 percent of total export (Asian Development Bank, 2014; Mourougane, 2012). Indonesia is one of the countries whose density of

[1] The definition of micro and small firms differs across institutions and countries. International Finance Corporation defines micro firms as enterprises with 1-9 employees and small firms 10-49 employees. In Indonesia, the Ministry of Small and Medium Enterprises and Co-operative and Bank Indonesia define, based on the 2008 Law, micro firms as firms whose net assets less than Rp 50 million (land and buildings are excluded) or those whose total annual sales are less than Rp 300 million; small firms are firms whose net assets are Rp 50-500 million or total annual sales Rp 300 million to Rp 2.5 billion (Kushnir et al., 2010; Mourougane, 2012).

[2] See also Ayyagari et al. (2014) for the evidence on job creation by small firms from a range of developing countries.

micro, small and medium enterprises (MSME) are the highest—100 firms to 1000 people, a figure that is higher than an average of 31 to 1000 people across 132 countries in MSME Country Indicators (Kushnir et al., 2010). The average firm size in Asian countries is one worker: the owner of the firm; for those firms that hire workers, most are micro firms that hire fewer than ten (Asian Development Bank, 2014). Hsieh and Olken (2014) report that in Indonesia less than one percent of firms grow beyond the size of ten workers.

Despite their economic importance, many micro and small firms in developing countries face high barriers to growth. There are several reasons. First, most micro and small firms use traditional and simple technologies. They lack capital inputs such as skilled workers, new machines and the know how to improve their production methods; workers in micro and small firms are typically badly paid or unpaid family members (OECD, 2017). In Indonesia, most owners of MSMEs possess a high-school certificate as their highest level of educational attainment and start a business with less than five years of transferrable work experience (Asia Pacific Foundation of Canada, 2018). In comparison to similar economies, Indonesia also ranks low in the Global Human Capital Index: Of 140 countries, Indonesia ranks 95th on health, with the average life expectancy of 62.9 years old, a figure that is much lower than East Asia and the Pacific's regional average of 84.3 years old. Its average score on skills is low too: it ranks 60th or lower on ease of finding skilled workers, quality of vocational training, skillsets of graduates, and digital skills among population (World Economic Forum, 2018). Indonesia also have poor development in research and technology: the government spends less than 0.1 percent of GDP on research and development (112th of 140); only 5 percent or less of the owners of MSMEs invest in technology and mechanisation (Asia Pacific Foundation of Canada, 2018; World Economic Forum,

2018).

Second, owners may lack entrepreneurial spirit. Many poor households or individuals in Indonesia, for example, start a business because they could not find better job opportunities elsewhere; micro and small businesses are their last resort rather than a first choice (Tambunan, 2012). A survey in Indonesia shows that regardless of age or gender, most owners of MSMEs have no intention to scale up their business: 65 percent and 42 percent of younger and older owners (aged 35 or older), respectively, prefer remaining their current size of operations; over half of male and female owners also have no plan to expand their operations (Asia Pacific Foundation of Canada, 2018).

Third, they have limited access to finance and infrastructure. Most of the micro and small firms rely on internal funds for financing needs; they rarely have usable collateral or tangible assets to get formal credits (Asian Development Bank, 2009; Bloom et al. 2010). In Indonesia, 70 percent of MSMEs in Asia Pacific Foundation of Canada (2018)'s survey cite lack of access to finance a key barrier to growth; 33 percent and 27 percent of the MSMEs view access to physical and technical infrastructure, respectively, a significant barrier to growth. Moreover, Indonesia ranks 71st out of 140 for its infrastructure, one of the 12 pillars in the Global Competitiveness Index that reflects a country's productivity and competitiveness (World Economic Forum, 2018).

The statistics in figure 1.1, which are from the World Bank's Enterprise Surveys in 2015, also show that most small firms in Indonesia rely heavily on internal funds and invest little in research and development. For example, similar to the world's and East Asia and the Pacific's average, 68.9 percent of small firms in Indonesia use internal funds to finance their investment and less than 20 percent of them use a bank loan.

Perhaps because they use little external finance, only 15 percent of Indonesian small firms report access to finance as the biggest business environment constraint, a rate that is 13 percentage points lower than the world's average. However, only 1.1 percent of small firms in Indonesia spend in research and development as compared to the world and regional average of 12.4 and 11.3 percent, respectively.

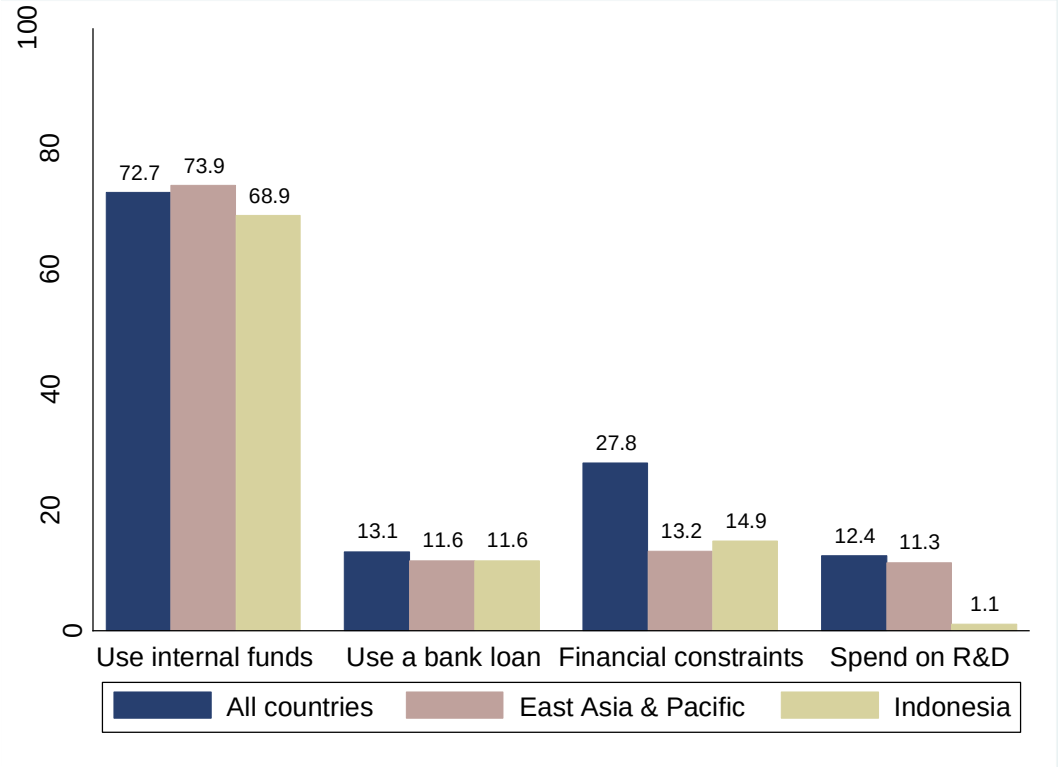


Figure 1.1 Finance, innovation and technology for small firms (5-19 workers) in Indonesia, East Asia and the Pacific, and all countries, 2015.[3]

Source: Author's calculation from Enterprise Surveys (2015).

To understand income and job creation potential of micro and small firms, we need to find out factors that help micro and small firms grow, which I aim to achieve in this thesis. I examine how education, social health insurance, and wage increase (as the economy grows) affect micro and small firms. Because finance, human capital and

[3] The data are from the World Bank's Enterprise Surveys (http://www.enterprisesurveys.org). For Indonesia, the survey interviewed 1,320 formal firms that comprises 482 small firms (5-19 workers), 452 medium firms (20-99 workers), and 386 large firms (100 or more workers) in manufacturing and service sectors from April through November 2015.

technologies remain key barriers to growth for micro and small firms in Indonesia, enhancement in these areas may help improving their (and Indonesia's) productivity and competitiveness. The Indonesian government has introduced a number of MSME programmes and government support policies to improve access to finance and market for MSMEs, but a large section of the sector underutilises the policy framework because of high interest rate associated with credit programmes and information asymmetries (Adam and Lestari, 2017; Asia Pacific Foundation of Canada, 2018; ILO, 2019). Instead, MSMEs in Indonesia are more aware of social policies such as universal-health programme, educational system reforms and minimum wage policy. The reported impact is positive but small, perhaps some of the policies are new and have not yet had impact on MSMEs (Asia Pacific Foundation of Canada, 2018). Therefore, better understanding on which social policy works is important for MSME development.

I contribute in three ways. One, in the first essay, I use regression discontinuity designs, an empirical strategy that approximates randomised trials, to examine the causal effects of education on firm performance, which complements papers that use less plausible identification strategies. I also contribute a piece to the puzzle of the relationship between education and performance of micro and small firms in developing countries. While evidence in the entrepreneurship literature pertains mostly to industrial countries, the rate of return to education may be different for micro and small firms in developing countries, such as Indonesia, which most businesses are informal and under the collaboration of family members.

Two, in the second essay, I study how social health insurance affects the ability of micro and small firms to cope with family hardships. I find social health insurance reduces the adverse effects of shocks on firms. I add to the very few papers in the

literature that discuss the indirect benefits of social health insurance. To the best of my knowledge, my work is the first paper that sheds some light on this intersection between micro and small firms and social health insurance literature. I also contribute to the empirical literature on financial constraints. Some papers in financial constraint literature investigate the links between internal finance and investment (and firm growth) and find internal funds increase firms' growth. I study whether social health insurance protects the resources and the internal finance of micro and small firms against family hardships, and it seems to partly help micro and small firms. My findings suggest a mechanism that can help micro and small firms secure their internal funds and hence their growth.

Three, in the third essay, I use fixed effects models to study the effects of rising wage rates on mechanisation by micro and small farms (2 hectares or less). Past studies find mixed results on this question; my findings therefore complement literature on how micro and small firms respond as the economy grows and goes through structural transformation. I study Indonesia, a developing country whose share of smallholders is large (the third largest in Asia) and land endowments vary across islands, which complements the papers on other Asian countries like Cambodia, China, and Thailand whose histories, land endowments, patterns of land ownership, and wage policy differ from Indonesia's.

I use the Indonesian Family Life Survey (IFLS), a continuing longitudinal socioeconomic and health survey by the RAND Corporation. The survey includes a representative sample of about 83% of the Indonesian population living in 13 of Indonesia's 26 provinces. I use three waves of the IFLS: The third wave (IFLS-3) fielded in 2000, the fourth wave (IFLS-4) in late 2007 to early 2008, and the fifth wave (IFLS-5) in late 2014 to early 2015. The IFLS provides individual-, household-, and

community-level data that cover multiple indicators of economic and non-economic well-being, which allow me to create various measures of relevant variables to answer the research questions.

Essay 1: Education and Entrepreneurial Success: Micro and Small Firms in Indonesia

Most micro and small firms in developing countries such as Indonesia are run by owner-managers who lack formal education, pay low wages, and involve in unproductive activities. A substantial economics literature has studied returns to education in terms of labour market outcomes, but evidence on the effects of education on entrepreneurs is comparably little, let alone those consider potential endogeneity of education. This essay examines the causal effects of an exogenous variation in entrepreneurs' education induced by a longer school year in 1978-79 in a fuzzy regression discontinuity design. The longer school year increased entrepreneurs' education, and I find some evidence that, on average, better educated entrepreneurs earn more hourly, monthly, and annually, though the return to education differs by sector. I also find female entrepreneurs benefit more from their education, so do entrepreneurs in urban areas. The positive gains from entrepreneurs' education suggest that investment in human capital, through general education, may increase the likelihood of entrepreneurial success.

Essay 2: Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia

Family hardships such as deaths and sickness of family members may hurt the growth of micro and small firms whose owners rely primarily on internal finance and family workers. With limited access to external finance and labour market, the owners may fail to cope with family hardships and fall into poverty. This essay examines whether the social health insurance in Indonesia, *Askeskin*, helps owners of micro and small firms recover from family hardships. The Indonesian government introduced *Askeskin* in 2005 to insure the poor and workers in the informal sector against financial risks that associated with health expenditures. I find some evidence of *Askeskin* reduces the adverse effects of deaths in the family in the previous year, outpatient care, and traffic accidents on net profits; *Askeskin* also protects total assets against owners' need of outpatient care. Social health insurance may, therefore, improve micro and small firms' growth, which further contributes to job creation, economic growth, and poverty alleviation in developing countries.

Essay 3: Rising Wages and Mechanisation of Small Farms in Indonesia

Small farms are predominant in Asian agriculture, but as economies grow and diversify, migration of farm workers out of agriculture may drive wages up and small farms out of business. Whether smallholders can adapt to the process of economic transformation through exploiting labour-saving production methods is a topic that needs more attention in the scant literature. This essay examines the effects of rising real wages, in both agricultural- and non-agricultural sectors, on mechanisation by small farms in Indonesia. I find, using fixed effects models, some evidence that higher real minimum

wages induce greater use of tractors on small farms; higher real agricultural wages encourage smallholders invest more in vehicles. I also find relatively large farms use more tractors as real wages (all types) increase; they also invest more in vehicles when farm labour become more costly. By contrast, relatively small farms invest more in irrigation systems in response to higher real wages and more in farm equipment when real agricultural wages increase. Over time, wage growth may speed up mechanisation of small farms, which may further increase productivity as seen in countries that adopt modern agricultural technologies.

Chapter 2

Essay 1: Education and Entrepreneurial Success: Micro and Small Firms in Indonesia

2.1 Introduction

In developing countries, micro and small firms are perceived as an important driver of economic growth by contributing their innovation, production techniques, and productivity throughout the economy (Baumol and Strom, 2007; van der Sluis et al. 2005). However, among these firms, only a small percentage of them survive beyond their first few years or grow beyond a few employees, particularly for younger, less profitable, and retail firms (McKenzie and Paffhausen, 2017). In Indonesia, for example, 99 percent of its firms are micro and small, with most run by owner-managers who lack formal education, involve in unproductive activities, and pay low wages (Burger et al., 2015). It is well known in labour economics that education raises workers' wages, but if education also has similar impact on entrepreneurs, it is crucial to know whether education a good investment for better firm performance.

To answer the question of whether education matters for micro- and small firms' performance and entrepreneurs in developing countries, I employ a fuzzy regression discontinuity (RD) design, which uses a longer school year in 1978-79 in Indonesia as an exogenous source of variations in education, to estimate the impact of education on entrepreneurs who operate a micro and small firm in Indonesia. The longer school year was a result of a sudden educational policy change that the government extended the school year in 1978 by six months (children started their school in January 1978, but the

school term lasted for 18 months until June 1979). Since the probability of experiencing the longer school year depends on entrepreneurs' year of birth, the sample is divided into two birth cohorts, in which I use as the instrumental variable for the longer school year: entrepreneurs who were born in 1971 or earlier experienced the longer school year if they entered primary schools in 1978 or earlier, and did not drop out of school before 1978; those who were born in 1972 or later (and entered primary schools in 1979 or later) did not. Because entrepreneurs' parents were unable to precisely control the year of birth or the year of entry to primary school of the entrepreneurs, I can exploit the fuzzy RD design to credibly estimate the causal effects of education on firm performance and entrepreneurs.

The theoretical literature on the economic returns to education suggests that investment in human capital increases earnings. For example, human capital theory posits that education and knowledge increase workers' productivity and earnings through improving their cognitive abilities (Becker, 1962; Mincer, 1975; Schultz, 1961); signalling theory suggests that more schooling adds values to individuals' attributes and productive capabilities, which become the signal for employees and employers to set a higher expected and offered wage (Spence, 1973). In the context of firm performance, Parker and van Praag (2006) argue that, like how they work on employees, education and experience can enhance entrepreneurs' performance through improving entrepreneurs' productivity and ability to deal with stakeholders (e.g., bankers, clients, suppliers, and workers).

Empirical literature in developing countries finds mixed evidence on the effects of education on the performance of micro and small firms. Some papers find education improves firm performance, efficiency, and survival rate (Martin et al. 2013; Unger et al. 2011; van der Sluis et al. 2005), while some suggest that education matters little and

other factors such as experience of workers and education of family members appear to be more important (Alvarez and Crespi, 2003; Satriawan and Swinton, 2007; Vijverberg, 1995). Papers that use instrumental variables approach find education improves entrepreneurs' performance, but the effects vary by the choice of instrument and the type of entrepreneurship. Hu (2015) instruments women's education for male entrepreneurs' education and finds 12.6-18.8 percent of returns; Parker and van Praag (2006) find, using number of siblings and father's education as the instrument, 13.7 percent of returns to education for entrepreneurs; however, Kolstad et al. (2014) find higher returns to education by instrumenting mother's education for entrepreneurs' education as compared to using father's education as the instrument; and Fossen and Büttner (2013) find higher returns for opportunity entrepreneurs who have better entrepreneurial spirit than for necessity entrepreneurs who lack motivation to grow their business.

Using the data from the fourth wave of the Indonesian Life Survey (IFLS4), I estimate the effects of education on 6,000 entrepreneurs along two dimensions: firm performance and entrepreneurs' earnings. I first estimate the effects of the longer school year on educational outcomes for entrepreneurs: their years of schooling and completion of senior high school. I then evaluate the effects of the two educational outcomes on firm performance and entrepreneurs.

The analysis produces two main findings. One, I do not find education improves firm performance. The estimates of the effects of all the measures of firm performance (total assets, net profits, stock of assets, and capital investment) are statistically insignificant in both basic estimation and robustness checks. The results on firm performance suggest that more schooling does little to boost the growth of micro and small firms, perhaps because these firms are run by entrepreneurs who start a business

out of necessity (instead of an opportunity) and lack interest to improve their business. These entrepreneurs start a firm perhaps because they could not find a better job and wait for an opportunity to switch to other pursuits. Two, I find the evidence that education increases entrepreneurs' earnings, but not for those who operate a farm business. I find both years of schooling and completion of senior high school increase entrepreneurs' hourly-, monthly-, and annual earnings. The results are robust to inclusion of demographic controls and district fixed effects, to the use of polynomials of various degree, and to the use of alternative assignment variable and definition of longer school year.

I contribute to the literature in three respects. One, I use a fuzzy RD design to examine the causal effects of education on the performance of micro and small firms and entrepreneurs, which complements the scant entrepreneurship literature that uses instrumental variable techniques (see, e.g., Hu, 2015; Kolstad et al. 2014; Parker and van Praag, 2006; van der Sluis et al. 2004). These papers instrument family background characteristics (e.g., family members' education and occupation) for entrepreneurs' schooling and find positive effect of education on entrepreneurs' performance. This method, however, relies highly on the availability and the quality of the instrument (Card, 1999; Dickson and Harmon, 2011). Card (1999) argues that parental education, for example, can affect entrepreneurs not only through entrepreneurs' education but also transfer of parents' ability to children by inheritance; therefore, the endogeneity of education may not be fully alleviated. Moreover, the magnitude of the effect of education may vary by the choice of instrument (Kolstad et al. 2014). By contrast, the RD design isolates variation in treatment randomly through the inability of participants to precisely manipulate the assignment variable near the threshold (for example, in this essay, entrepreneurs' parents were unlikely to control their children's year of birth six

or seven years before the longer school year in 1978) (Lee and Lemieux, 2010).[4] Thus, like randomised experiments, the RD design enables me to more rigorously estimate the effect of education on firm performance and entrepreneurs.

Two, I add to a growing literature on the impacts of education on micro and small firms and entrepreneurs in developing countries (see, e.g., the meta-analytic reviews by van der Sluis et al., 2005 and Unger et al., 2011). The rate of return to education for entrepreneurs may be different across countries by the stage of economic development and the natures of entrepreneurship. I study Indonesia, a country whose population of micro and small firms is huge and most are informal and under the collaboration of family members. Similar to the literature on the income effects of education (Corral and Reardon, 2001; Honig, 2001; Kolstad and Wiig, 2013; Panda, 2015; Yúnez-Naude and Taylor, 2001), my results suggest that schooling increases entrepreneurs' earnings though only for those who run a non-farm business. Moreover, the evidence for Indonesia is scant. To the best of my knowledge, Llewelyn and Williams (1996) is the only paper: it concludes a positive effect of high school education on technical and scale efficiency for farmers. I add to the literature by exploiting the RD design to estimate the causal effect of education.

Three, I contribute to the set of studies that have analysed the impact of reforming policies on micro and small firms in Indonesia. See, for example, Hamada (2010), Tambunan (2014), and Tsukada et al. (2010) on subsidised credit that makes formal credits more accessible; and Burger et al. (2015) and Rothenberg et al. (2016) on one-stop shops that aim to lower business registration costs. I contribute to this

[4] See Appendix A1 for main econometric challenges to study returns to education.

literature by examining the returns to education of entrepreneurs who run a micro and small firm, which the previous literature has not explored.

This chapter proceeds as follows. Section 2.2 presents the literature review. Section 2.3 provides a background of the longer school year in Indonesia. Section 2.4 describes the RD design identification strategies and data. Section 2.5 presents the main results and robustness checks. Section 2.6 concludes.

2.2 Literature Review

2.2.1 Human Capital Theory and Signalling Theory

Becker (1962)'s human capital theory puts forward that investments in education increase future productivity and earnings through improving cognitive skills; therefore, people who expect for higher earnings will invest in human capital, i.e., schooling, on-the-job training, medical care, or acquiring information about the economic system. However, the direct costs and opportunity costs of these investments are higher at people's younger age; the net earnings for young and inexperienced workers increase as they grow older and accumulate ability and knowledge. Schultz (1961) uses the concept to explain three economic puzzles: when productivity increases as people acquire more qualifications, without working longer, individuals' education can increase their real earnings; at macroeconomic level, a country whose growth in resources is slow may still enjoy high economic growth if workers are productive; and a huge amount of injection of physical capital may not help poor countries' growth if these countries lack investment in human capital.

To complement Becker's and Schultz' theoretical arguments, Mincer (1974) develops human capital model: earnings are largely a function of post-school investment, which includes on-the-job training, other forms of training, and work experience.[5] In other words, earning differentials are the results of schooling and post-school investment, and the latter accounts for earning differentials that are unexplained by schooling. In this model, work experience—the post-school investment—explains more for the earning differentials; age, on the other hand, matters little. For example, individuals with less education who enter the labour force earlier could acquire more work experience and reach higher relative levels of earnings profiles than their same-age counterparts who spend more years in school.

An alternative view is Spence (1978)'s signalling theory: earnings increase with education because of credential effects—that is, education provides information about cognitive abilities of individuals. In the job market, education profiles are observable characteristics of job applicants that direct employers' decision on the offered wages, even applicants' personality traits, work attitudes and so forth are unobservable. A wage schedule is then formed over productive capabilities of potential employees. Meanwhile, individuals can adjust their education—or signal—according to their expected wages, after taking into account the total costs. Individuals with high innate ability who find school less difficult and with more schooling get higher returns to their investment in education than those with otherwise. Eventually, a signalling equilibrium is formed and the cycles repeat: first, job applicants' observable characteristics direct

[5] See also Chiswick (1974) for an expanded version of schooling model that is similar to human capital model. The model considers the effects of covariates such as wealth, health, and migration (that correlate positively with schooling) in estimating the effects of formal schooling and post-school investments.

employers' beliefs and the offered wage schedules; second, individuals make their signalling decisions; lastly, hiring takes place based on applicants' attributes.

Both human capital theory and signalling theory may explain the returns to education for small firms and entrepreneurs (Parker and van Praag, 2006; van der Sluis et al., 2005). Like employees, education can improve entrepreneurs' knowledge and cognitive abilities, which, in turn, enhance their productivity and ability to deal with stakeholders (e.g., suppliers, clients, workers, and bankers). Likewise, more schooling add value to observable attributes of an entrepreneur and provide information (signal) to stakeholders to adjust their purchasing behaviour—for example, better educated entrepreneurs are more likely to obtain credits from banks than their counterparts who have less schooling. In this sense, education improves entrepreneurial skills and the returns are in the form of better firm performance.

2.2.2 Returns to Education for Entrepreneurs

Empirical studies on education find mixed results on how education affects firm performance and entrepreneurs. Several meta-analytic reviews suggest that the effects of education vary by type of education and the measures of firm performance. Van der Sluis et al. (2005), for example, find positive returns to formal education for entrepreneurs, regardless of the outcome measures: similar to the rate in industrial countries, the rate of return of a marginal year of schooling is 5.5 percent for entrepreneurs in developing and less developed countries. Unger et al. (2011), on the other hand, argue that the effects of entrepreneurial-related tasks (specific education) are larger than that of general education; Martin et al. (2013) also find evidence that

entrepreneurial education and training (EET) are associated with higher level of entrepreneurial capability, entrepreneurial selection, and entrepreneurial performance.[6]

More years of schooling may increase the technical efficiency of small firms by enhancing entrepreneurs' ability for managing inputs, either within a sector or across sectors. Burki and Terrell (1998) find, for example, in Pakistan, that manufacturing firms whose entrepreneurs have at least primary education are more efficient, but firms' efficiency also depends on whether the firms are new, have labour turnover problems and engage in subcontracting. Laszlo (2005) suggests that, among others, education affects earnings through marginal productivity of workers, labour allocation across activities and its production externality effects, and that the return to education is dominated by labour allocation across activities. Yang and An (2002) get similar finding in China that better educated farmers are more able to allocate productive inputs between sectors, which contributes for 14 percent of agricultural and non-agricultural profits. Yang (2004) finds that the degree of efficiency is higher when factor market is liberalised and households have greater flexibility to manage their inputs.

Nevertheless, some studies find little evidence of the effects of education on firm efficiency. For example, Satriawan and Swinton (2007) do not find education increases earnings of farm households in Pakistan through transferring inputs between farm and non-farm activities; instead, experience appears to be the channel through which education improves performance of farm activities in rural traditional setting. Similarly, Alvarez and Crespi (2003) and Vijverberg (1995) find, in Chile and Ghana, respectively, other factors appear to be more important: experience of workers,

[6] See also Mayer-Haug et al. (2013), in their meta-analytical review, for the findings of low returns to general education; Dickson et al. (2008) for positive returns to general education and specific programmes of entrepreneurial education.

educational attainment of family members, modernisation of physical capital and innovation in products make more efficient firms.

Small firms survive longer, the literature says, if entrepreneurs are more educated. Bates (1990), for example, finds entrepreneurs with four or more years of college are more likely to create a firm and remain in operation. The positive correlation between education and ability of entrepreneurs to raise debt capital for business start-ups explains the returns to education. Mengistae (2006) finds entrepreneurs' education and experience help small firms survive in an industry with intense competition. By contrast, Nafziger and Terrell (1996) find, in India, statistically significant but negative relationship between firm survival and education; firms whose owners are better educated do not survive long because owners quit for better opportunities in other pursuits.

A number of studies find additional years of schooling raise earnings of small firms in developing countries, but the effects vary by sector, firm size and business environment. Corral and Reardon (2001) and Panda (2015), for example, find farmers' education correlates with higher earnings in Nicaragua and India, respectively. Yúnez-Naude and Taylor (2001), however, argue that the returns to education are different across economic activities: post-primary schooling increases commercial farm income in Mexico, but primary and secondary schooling have little impact on non-farm firms. They suggest that perhaps general education provides little specific entrepreneurial skill and knowledge for individuals to engage in non-farm activities. Honig (2001) finds, in the West Bank, the link between firm profits and entrepreneurs' education is weaker as firm size increases, particularly in transitional environment such as a country with radical political, economic and social upheavals. Profits increase with firm size because

of cumulative human capital at organisation level and financial capital, but not education.

Educational attainments may also determine the income of hidden entrepreneurial activities, the informal sector that consists mainly of micro and small firms. Smith and Metzger (1998) find, in Mexico, completion of formal education, along with some effects from capital investment, increases per hour earnings among street vendors through enhancing worker productivity. Sonobe et al. (2011) argue that the education of informal entrepreneurs is particularly important in the presence of stiff competition. However, in some circumstances, education has little impact on firm performance. For example, Honig (1998) finds, in Jamaica, a college education matters for small firms but not for the self-employed who might switch to other pursuits, and that work experience and basic literacy and numeracy give more economic advantages to entrepreneurs. Dasgupta (2003) gives a similar conclusion: in India, education is less important as the nature of work in informal service does not require complex skill or high educational qualifications; instead, experience and background characteristics of the entrepreneurs help. Jiménez et al. (2015) argue that tertiary education, despite its positive influence in formal sector, reduces the entrepreneurship rates in informal sector because of greater awareness and sensitivity towards possible negative repercussions of informal activities when entrepreneurs are more educated.

A few studies use instrumental variables approach to identify the causal effects of education. Fossen and Büttner (2013), for example, use father's education as the instrument for education and find, in Germany, the rate of return of about eight percent to a year of education for opportunity entrepreneurs. In China, Hu (2015) instruments women's education for their husband's schooling and finds a marginal year of schooling brings returns of between 12.6 and 18.8 percent for male entrepreneurs who

are repatriates. Kolstad and Wiig (2013) use a number of instrumental variables, including the number of languages spoken by the father of the entrepreneur, the education of the eldest sibling, the availability of newspaper at home of the entrepreneurs during childhood, and whether the father's main occupation is farming; they find schooling increases firms' profits, but the effect varies by gender, health status and network of the entrepreneurs.[7] Parker and van Praag (2006) use the number of siblings and father's education as the instrument for education and suggest, in Netherlands, that education enhances entrepreneurs' performance both directly—with a rate of return of 13.7 percent—and indirectly, because each extra year of schooling decreases capital constraints by 1.18 percentage points. Van der Sluis et al. (2004) use background characteristics as the instrumental variable and find, in the U.S., more years of schooling improve firm performance, and the effect is larger than for employees.[8,9]

However, using family background characteristics such as parental education as instrumental variables is not without pitfalls. Card (1999) argues that the ability of parents is possibly transferred to their children by inheritance, and thus family background may have additional and direct effects on earnings that do not work through education. Moreover, the extent to which education influences firm performance may vary by the choice of instrument. For example, Kolstad et al. (2014), find education has

[7] See also another paper by the authors, Kolstad et al. (2014), which uses father's education and controls for sibling's education to study the returns to education in Bangladesh; they find an average rate of return of 11 percent.
[8] The higher returns to education for entrepreneurs may be due to fewer organisational constraints for entrepreneurs compared to employees (entrepreneurs have more personal control in how to use their human capital) (see, e.g., van der Sluis et al., 2007; van Praag et al., 2013).
[9] Some papers also use instrumental variables approach to study the effects of education. The papers, however, consider endogeneity problem of other variables in the earnings equation, instead of endogeneity of education. See, for example, Jolliffe (2004) who uses two-stage-least squares estimation to study the effects of education on farm and nonfarm activities in Ghana. The paper focuses on endogeneity of labour supply instead of education. In the context in informal sector in Africa, Sonobe et al. (2011) instrument years of vocational training, the years of prior work experience and the years of management of the current business for the initial firm size, but they do not account for endogeneity of education.

a larger effect on firm performance when mother's education is used as the instrument than when father's education is used as the instrument.

Some papers employ other quasi-experimental methods to study the causal effects of education on firm performance. Elert et al. (2015), for example, use propensity score method to examine, in Sweden, the effect of entrepreneurship education and training in high school on long-term entrepreneurial entry, performance, and survival. They find some evidence of the effect on entrepreneurial entry and performance but no effect on entrepreneurial survival. The method, however, cannot deal with unobservable variables such as innate entrepreneurial ability of entrepreneurs that may bias the estimates of schooling (Heckman et al., 1998).

Recent studies that use a randomised controlled trial find some impacts of training programmes on firm performance, which is through the programmes' impact on business practices. For example, Berge et al. (2014) find, in Tanzania, business training and business grants jointly improve business knowledge and practices of male and female entrepreneurs. The interventions increase profits and sales for male-owned firms in the short run, but do not affect the performance of female-owned firms. In rural Pakistan, Giné and Mansuri (2014) find business training programmes increase business knowledge, reduce business failure, and improve business practices among male entrepreneurs, while women show improved business knowledge but no improvement in profits and revenues. By contrast, Bruhn and Zia (2013) find, in Bosnia and Herzegovina, that their business and financial literacy programmes are effective to improve profits and sales for female-run firms. Nonetheless, the programmes have no impact on firm survival, while they improve business practices, investments and loan terms for surviving firms. Drexler et al. (2014) find, in the Dominican Republic, a rule-of-thumb training that teaches basic financial heuristics significantly improves micro

firms' financial practices and objective reporting quality. The training also increases revenue in bad weeks, but it leads to no improvement in average sales, investment behaviour or profitability of the firms in the treatment group.

However, Karlan and Valdivia (2011) find no impact of business training on revenue, profits, or employment for female microfinance clients who run a micro firm in Peru though the programme improves their business knowledge. In a review of studies on business training, McKenzie and Woodruff (2014) conclude little evidence that business training programmes affect sales or profitability of firms in developing countries, although a few studies find some positive short-term effects. The review suggests that owners' behaviour and motivations may help to explain why business training works on improving business practices but not the performance of micro firms. If the owners are less interested or able to implement the business practices learned, business training has no or little effect on firm performance. Another possibility is low statistical power: small sample size, heterogeneity in the sample, the intervention occurs at group level, and low take-up rates dilute the treatment effect, hence, reducing power. Even with a more homogenous sample, de Mel et al. (2014) further show that business training has little impact on firm performance. Through studying women in urban Sri Lanka, they conclude that business training may be more effective for new owners of micro and small firms, but not those in business: even though training improve business practices, they find no evidence that business training affects profits, sales or capital stock for women in business.

Some papers argue that entrepreneurs are a heterogeneous group and that the returns to education vary by their start-up motivations, attitudes, and personalities. For example, Block and Wagner (2010) find, in Germany, different outcomes between entrepreneurs who pursue different interest: Opportunity entrepreneurs, who voluntarily

engage in entrepreneurship for business opportunity, benefit more from formal education; by contrast, necessity entrepreneurs, who are pushed into entrepreneurship because of unemployment, gain more from specific education such as entrepreneurial education. Formal education also improves the survival and growth of opportunity entrepreneurs, but not necessity entrepreneurs. Fossen and Büttner (2013) further argue that opportunity entrepreneurs are more productive and their return to education is three percentage points higher than that of necessity entrepreneurs.[10,11]

Some studies suggest that personal initiative training is a better way to improve firm performance: building a proactive entrepreneurial mindset can turn firm owners into true entrepreneurs. For example, Campos et al. (2017) argue that the desire to succeed and proactive entrepreneurial mindset (self-starting, future-oriented, innovative, identifying and exploiting new opportunities, goal-setting, overcoming challenges, etc.) can be developed through psychology-based programmes, which are more effective than traditional business training in improving the performance of micro firms. They find, using a randomised controlled trial in Togo, personal initiative training delivers lasting improvements for both male and female owners: firm profits increase by 30 percent in comparison to a statistically insignificant 11 percent for traditional business training. Besides, personal initiative training improves business practice and the use of capital and labour inputs; and, compared to traditional business training, it has a larger impact on owners' personal initiative, innovation, product

[10] Reynolds et al. (2001) introduced the concepts of opportunity and necessity entrepreneurs in Global Entrepreneurship Monitor. See Gilad and Levine (1986); Reynolds et al (2005); and Shapero and Sokol (1982) for more details on the distinction in start-up motivations – "pull" and "push" hypotheses – between opportunity and necessity entrepreneurs.

[11] These two papers are the only empirical studies, to my best knowledge, on the effects of education by the nature of entrepreneurship. Most papers in entrepreneurship literature study what determine the choice of entrepreneurship and compare the characteristics between opportunity and necessity entrepreneurs.

diversification, and access to finance. In a more homogenous sample, Campos et al. (2018) show that the results hold when restricted to just women alone and that the effectiveness of personal initiative training does not differ by individuals' existing human capital level. Bruhn et al. (2018) find that, in Mexico, management consulting services increase entrepreneurial spirit and managerial practices, which, in turn, increases productivity, profits and return on assets in the short run and the number of workers employed in the long run.[12]

2.3 The Longer School Year in 1978 in Indonesia

In 1978, the government of Indonesia extended the school year by six months to change the start of 1979 school year. Schools in Indonesia used to start in January for a 12-month academic year, but to synchronise academic years with the government's budget years, Daoed Joesoef, the Minister of Education and Culture at the time, decided to shift the start of 1979 school year from the month of January to the month of July. He claimed that starting school in January would complicate education planning as fiscal year had ended at the time; in this sense, starting school in July, which was after fiscal year started, was more appropriate for education planning. He also claimed that ending the academic year in December was not good because school break would fall in rainy season, in which he thought could ruin a family vacation. To accommodate the change, in 1978, students were required to remain in the same grade until June 1979—that is, they started their school in January 1978 and finished in June 1979, a longer school year of 18 months (Tempo, 1978).

[12] See also Frese et al. (2016) and Solomon et al. (2013) who find a positive effect of personal initiative training programme on sales for micro and small firms in Germany and South Africa, respectively, but the studies suffer from low statistical power due to small sample size.

Community leaders and parents, however, disagreed with the change and argued that it could do harm more than good. Daoed Joesoef changed education policies suddenly—he announced the decision in mid-1978 and the change took effect immediately. Parents worried that the new policy would retard their children's learning and development; they also protested against the additional costs incurred because the minister reduced the tuition fees by only 50 percent for the six months, and it applied to students in public schools only. Furthermore, teachers were asked to revise lessons covered in 1978 without new curriculum and new teaching materials. Despite the opposition, Daoed Joesoef went ahead with the change and 1978-79 became the one-time longer term for schools in Indonesia (Tempo, 1978).

2.4 Empirical Strategy and Data

2.4.1 Empirical Strategy

The longer school year in 1978-79 fits a fuzzy regression discontinuity (RD) design, which allows me to exploit an exogenous variation of education among entrepreneurs induced by the longer school year. The year of birth of entrepreneurs determines, but not precisely, whether they experienced the longer school year: entrepreneurs who were born in 1971 or earlier and did not drop out of school experienced the longer school year; those who were born in 1972 or later and enter primary school after 1978 did not.

The fuzzy RD design I use contains three important variables: (i) the assignment variable—entrepreneurs' year of birth; (ii) the instrumental variable—the discontinuity between the 1971 and 1972 birth cohorts (or an indicator of whether an entrepreneur was born in 1971 or earlier); and (iii) the treatment status—whether an entrepreneur experienced the longer school year. Let yob_{ij} denotes the *year of birth* of entrepreneur *j*

of firm *i*; T_{ij} is the instrumental variable, *older cohorts*, an indicator equals one if entrepreneur *j* of firm *i* was born in 1971 or earlier and zero otherwise; and D_{ij} the *longer school year*, an indicator of whether entrepreneur *j* of firm *i* experienced the longer school year in 1978-79 and zero otherwise. I can write the exposition as follows:

$$T_{ij} = \begin{cases} 1 \text{ if } yob_{ij} < 1972 \\ 0 \text{ if } yob_{ij} \geq 1972 \end{cases}$$

The year of birth of entrepreneur *j* of firm *i* assigns her into the *older cohorts* (T_{ij} = 1) or the *younger cohorts* (T_{ij} = 0) and the year 1972 becomes the threshold that the probability of experiencing the longer school jumps discontinuously.

$$P[D_{ij} = 1|yob_{ij}] = \begin{cases} g_1(yob_{ij}) \text{ if } yob_{ij} < 1972 \\ g_0(yob_{ij}) \text{ if } yob_{ij} \geq 1972 \end{cases}$$

where $g(yob_{ij})$ is a function of yob_{ij} and $g_0(yob_{ij})$ and $g_1(yob_{ij})$ differ at the discontinuity in 1972. I can rewrite the probability of experiencing the longer school year, $P[D_{ij} = 1|yob_{ij}]$, and the *year of birth*, yob_{ij}, as

$$E[D_{ij}|yob_{ij}] = P[D_{ij} = 1|yob_{ij}]$$

$$= g_0(yob_{ij}) + [g_1(yob_{ij}) - g_0(yob_{ij})]T_{ij}$$

where T_{ij} switches off ($T_{ij} = 0$) at the discontinuity.[13] I can use T_{ij} as an instrumental variable for D_{ij} in a two-stage least square (2SLS) estimation.

[13] See Angrist and Pischke (2009) for more details about the fuzzy RD design.

To estimate the effects of education on entrepreneurs' performance, I implement the fuzzy RD design using an equation-by-equation 2SLS estimation. In the first-stage, I estimate

$$D_{ij} = \alpha_1 + \beta_1 T_{ij} + f\left(yob_{ij}\right) + \varepsilon_{1i} \quad (2.1)$$

where $f\left(yob_{ij}\right)$ is a polynomial function of the entrepreneur's year of birth; and ε_i is the error term. The coefficient β_1 measures the relationship between the instrumental variable, *older cohorts* (T_{ij}) and the *longer school year* (D_{ij}). In the second-stage, I estimate

$$Edu_{ij} = \alpha_2 + \beta_2 \widehat{D}_{ij} + f\left(yob_{ij}\right) + \varepsilon_{2i} \quad (2.2)$$

where Edu_{ij} is the educational outcomes of entrepreneur *j* of firm *i*—her years of schooling or an indicator of whether she completed her senior high school; $\widehat{D}_{ij}$ is the predicted value of entrepreneur *j*'s treatment status from the first-stage regression in equation 2.1. The coefficient β_2 shows the effect of the longer school year on education. In the third stage, I estimate

$$Y_i = \alpha_3 + \beta_3 \widehat{Edu}_{ij} + f\left(yob_{ij}\right) + \varepsilon_{3i} \quad (2.3)$$

where Y_i is firm *i*'s performance or entrepreneur *j*'s earnings; $\widehat{Edu}_{ij}$ is the predicted value of entrepreneur *j*'s educational outcomes from the second-stage regression (equation 2.2). The coefficient β_3 measures the effect years of schooling or completion of senior high school on firm performance or entrepreneurs' earnings; I expect β_3 to be positive if education improves firm performance and entrepreneurs' earnings.

For all three stages of regressions, I control for entrepreneurs' predetermined characteristics, including their age, gender, ethnicity, and whether entrepreneur *j* lives

in urban areas. I also include district fixed effects to control for heterogeneity across districts. In the specifications that examine the effects of the longer school year on education, I cluster the standard errors by year of birth to control for within-birth-cohorts error correlation (see section 2.5.1). (I also run the regressions that cluster the standard errors by district; see Appendix A2.)

The RD design relies on two key assumptions: (i) individuals cannot precisely manipulate treatment (Lee and Lemieux, 2010), and (ii) the government implemented no other education policies when it implemented the longer school term in 1978. The first assumption is likely to hold because parents of entrepreneurs could not control years of birth (the assignment variable) six or seven years before the longer school year in 1978. They could not precisely control year of entry to primary school either, because the longer school year was announced suddenly in mid-1978 and implemented immediately; parents were unlikely to bring forward or delay their children's entry to primary school.

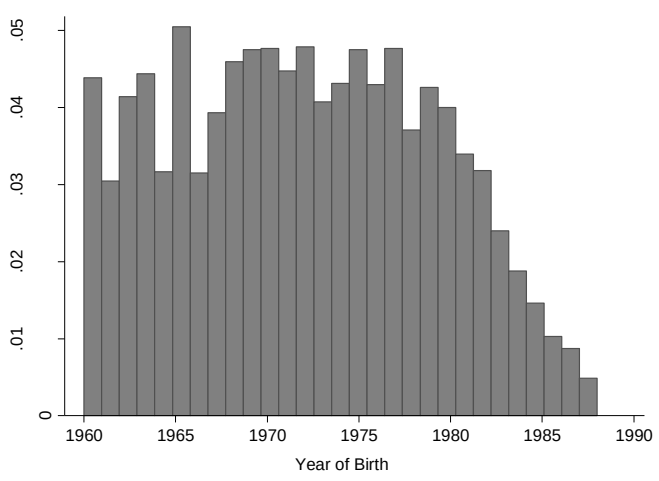


Figure 2.1. Density of assignment variable (year of birth), 1960-1988

Source: Author's calculation from IFLS-4 data

Figure 2.1, which illustrates the density of the year of birth of entrepreneurs who were born between 1960 and 1988 (the sample of entrepreneurs that I use), suggests

that entrepreneurs' year of birth is indeed unmanipulated. Despite the several spikes in the period of 1960-1965, the distribution of year of birth is smooth to the left and to the right of the 1972 threshold, which shows no evidence of the longer school year induced higher number of births in 1971.

The RD design also meets the second assumption: None of other education policies that the government implemented in the 1970s and early 1980s compromises the identification of the effects of the longer school year on entrepreneurs' education. One of the policies is a large school construction programme, the *Sekolah Dasar Inpres* programme that took place in 1973.[14] From 1974 through 1978, over 60,000 primary schools were constructed to increase children's enrolment rate—an average of two schools for every thousand children aged 5-14 (Duflo, 2001). The *Inpres* programme, therefore, does not weaken the validity of the RD design. Two other policies were implemented long after the longer school year in 1978: the six- and nine-year compulsory schooling in 1984 and 1994, respectively (International Bureau of Education, 2006).

I also check the validity of the RD design by changing the details in the basic specification and testing whether entrepreneurs' characteristics jump at the threshold. (See section 2.5.4 robustness checks.)

[14] *Sekolah Dasar* stands for primary school. *Sekolah Dasar Inpres* programme is one of the eight *Inpres* (*Instruksi Presiden*, Presidential Instructions) programmes during the era of President Suharto (Anwar, 2016).

2.4.2 Data and Variables

I use the fourth wave of the Indonesian Family Life Survey (IFLS) that the RAND Corporation did in 2007-2008.[15] It includes a representative sample of the Indonesian population, data on micro and small firms managed by the respondents and those on education, employment, and income, which allow me to examine whether education matters for how well the entrepreneurs and their firms do.

To construct the sample, I link the firms and farms with the entrepreneurs of the firms and the entrepreneurs' households using two modules in Book II (Household Economy) of IFLS-4: farm modules and non-farm modules. For the farms, the entrepreneurs are the respondents who answered the questionnaire; for the non-farm businesses, household members who run the business. This sample has 4,277 farms and 6,197 non-farm businesses. I merge these firms with the entrepreneurs' education and earnings in Book IIIA (Adult Information).

Then, I exclude medium and big firms and those managed by too old or too young entrepreneurs whose number of workers is 50 or more. I use the World Bank's definition: micro firms hire 1-9 employees and small firms hire 10-49 employees (Kushnir, Mirmulstein and Ramalho, 2010). I include entrepreneurs in the 1960-1988 birth cohorts only: I exclude entrepreneurs who were born in 1959 or earlier since they had completed high school in 1978 when the government extended the school year; I also exclude those who were born in 1989 or later because they were below 18 years old, the legal age to own or operate a business, when they were interviewed in 2007-2008. I also exclude firms that closed in 2008 or earlier. I then drop the observations

[15] For more details on the data, see Strauss et al. (2009a); the data are available at http://www.rand.org/labor/FLS/IFLS/html.

that consist of outliers in entrepreneurs' annual- and monthly wages.[16] The final sample has 7,736 micro and small firms run by 5,949 entrepreneurs.

In the basic specification, I construct the longer school year (D_{ij}), using the information on entrepreneur j's year of birth, her years of schooling, and the number of times she repeated a grade. The indicator D_{ij} equals one if entrepreneur j was born in 1960-1971, entered primary school at seven years old (so that they were in primary, junior high, or senior high school in 1978), and had at least one year of schooling (includes grade repetition); and it equals zero for those who were born in 1972-1988 and those who dropped out of school before 1978. About 60 percent of entrepreneurs in the 1960-1971 cohorts experienced the longer school year in 1978 while none of the entrepreneurs in 1972-1988 cohorts did. I also use *year of entry to primary school* to define the longer school year in robustness checks.[17]

I use two measures of educational outcomes: years of schooling and completion of senior high school. Years of schooling are the number of years of education plus the grade repetition of an entrepreneur. Completion of senior high school is an indicator equals one if an entrepreneur completed twelve years of education and zero if otherwise.

I use two sets of outcomes to measure entrepreneurial achievement: firm performance and entrepreneurs' earnings. The variables of firm performance I use include total assets, net profits, total asset purchased, total asset sold, equipment assets,

[16] Only two observations are dropped: one observation for each of the wages. Removing the outliers does not affect all the results in section 2.5—the significance and the sign of all estimates remain unchanged.

[17] The IFLS used the best guess of people's date of birth and expected people followed the usual schooling sequence that they started school when they were six years old and entered primary school one year later. This is because, as in many developing countries, in Indonesia, some people do not know their date of birth and dates of entering school accurately (Strauss et al., 2009b).

and non-equipment assets. I construct the value of net profits from a question on the amount of net profits generated by a business in the previous year. For those respondents who did not know their net profits, I use total revenue less total expenses to replace the missing value in net profits, and I include only positive net profits.[18] Total assets for non-farm businesses include: land, building, vehicles, and equipment for farm and non-farm businesses; total assets for farm businesses include: farm land, poultry, livestock, hard stem plants (coconut, coffee, cloves, rubber, etc.), house or building, vehicles, tractors, irrigation equipment, heavy equipment (farming machines, generator, etc.), and other assets. All the assets are owned by the entrepreneurs' household and used for their business in the previous year of the survey period. The variables are in logarithms; I add 1 to each of the variable before I take the logarithm. I also use other measures of firm performance in the specification by industry: for farm businesses, I include rental income from farm assets (in logarithm), legal ownership of land (dummy variable), number of plots, and the size of land (in hectares); for non-farm businesses, I include sole ownership (dummy variable), percentage of share, number of paid workers, number of unpaid workers, and access to formal credit (dummy variable).[19]

Entrepreneurs' earnings that I use are the sum of earnings from primary and additional jobs. I use three measures of earnings: hourly-, monthly-, and annual earnings. Annual earnings are the sum of gross salary (or wages) and bonuses in the previous year. To construct hourly earnings, I divide total earnings by total number of

[18] In the IFLS, only very few respondents answered the questions on total revenue and total assets. Respondents were first asked the amount of net profits, and only those who did not know the amount of their net profits were prompted the amount of total revenue and total expenses. Due to the data limitation, I do not use total revenue and total expenses as the measure of firm performance.

[19] Rental income from farm assets can be a source of investment diversification; I expect education increases the rental income from farm assets. Better educated entrepreneurs are also more likely to formalise their business, therefore they are more likely to obtain legal status for land and hire paid workers (and fewer unpaid family workers).

hours and weeks an entrepreneur work per year. Monthly earnings are the sum of gross salary (or wages) in the previous month of the interview date. All the variables are in logarithm.

The control variables I use include entrepreneurs' age, gender, ethnicity, and urban areas. Gender is an indicator equals one if male and zero if otherwise; ethnicity is an indicator of whether an entrepreneur a Javanese; and urban areas are an indicator equals one if an entrepreneur lives in urban areas and zero if otherwise.

2.4.3 Summary statistics

Table 2.1, which presents the summary statistics by birth cohorts, shows that the younger cohorts are better educated while the older cohorts earn more and run their firms better. In Panel A, the mean values show no causal effect of the longer school year on entrepreneurs' educational outcomes: On average, entrepreneurs who were born in 1972 or later have one more year of schooling as compared to the older cohorts. They are also more likely to complete primary, junior high, and senior high school than the older cohorts.

Panel B shows that, for most measures of firm performance, the two groups of firms systematically differ. The total assets, total equipment assets, and total non-equipment assets are larger for firms in the older cohorts; the differences are statistically significant. However, the difference in net profits between the two birth cohorts is small and statistically insignificant. Panel C shows a marked difference in entrepreneurs' annual earnings but no difference in their hourly- and monthly earnings. Entrepreneurs in the older cohorts have higher annual earnings in the previous year and

monthly earnings in the previous month, but the difference in monthly earnings is statistically insignificant.

Table 2.1 Summary statistics

	1960-71 cohorts (1)	1972-88 cohorts (2)	Difference (2)-(1) (3)	1960-88 cohorts (4)
A. Educational outcomes				
Years of schooling	7.93	9.11	1.18***	8.51
	(4.28)	(3.57)	(0.10)	(3.98)
Completed primary school	0.73	0.89	0.16***	0.82
	(0.44)	(0.31)	(0.01)	(0.39)
Completed junior high school	0.46	0.61	0.15***	0.54
	(0.50)	(0.49)	(0.01)	(0.50)
Completed senior high school	0.32	0.38	0.06***	0.35
	(0.47)	(0.49)	(0.01)	(0.48)
B. Firm performance				
Total assets	27.73	22.21	-5.52***	24.87
	(84.29)	(75.12)	(2.07)	(79.71)
Net profits	8.12	7.58	-0.54	7.84
	(18.31)	(19.78)	(0.50)	(19.09)
Total equipment assets	5.34	4.37	-0.97*	4.83
	(24.49)	(15.16)	(0.52)	(20.20)
Total non-equipment assets	22.39	17.84	-4.55**	20.04
	(78.25)	(72.10)	(1.95)	(75.15)
C. Entrepreneurs' earnings				
Hourly earnings	0.01	0.01	0.00*	0.01
	(0.04)	(0.02)	(0.00)	(0.03)
Monthly earnings	1.16	1.10	-0.06	1.13
	(3.18)	(7.64)	(0.16)	(5.92)
Annual earnings	13.15	9.59	-3.56**	11.31
	(74.26)	(21.86)	(1.42)	(53.96)
D. Control variables				
Age of entrepreneurs	41.40	29.24	-12.16***	35.10
	(3.50)	(4.09)	(0.10)	(7.17)
Male entrepreneurs	0.64	0.68	0.04***	0.66
	(0.48)	(0.47)	(0.01)	(0.47)
Javanese	0.46	0.39	-0.07***	0.42
	(0.50)	(0.49)	(0.01)	(0.49)
Urban areas	0.44	0.43	-0.01	0.43
	(0.50)	(0.49)	(0.01)	(0.50)
Number of observations	2,866	3,079	5,945	5,945

Notes: The numbers are mean values. The numbers in parentheses in columns 1, 2 and 4 are standard deviations; the numbers in parentheses in column (3) are standard errors. The numbers in Panels B-C are in millions of Rupiah. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

In Panel D, the mean values show that entrepreneurs have different demographic characteristics. Entrepreneurs in the older cohorts are 12 years older and less likely to be a male but more likely a Javanese. However, the two cohorts have similar proportion of entrepreneurs in urban areas, which is about 45 percent.

By comparing the average differences between 1960-71 and 1972-88 cohorts, the sample shows there are some positive effects of education on firm performance and entrepreneurs' earnings, but I see no evidence that the longer school year improves entrepreneurs' education. Using the RD design, I compare entrepreneurs the two birth cohorts near the 1972 threshold only: The 1971 and 1972 cohorts; the strategy will pick up the variation in educational outcomes, firm performance, and entrepreneurs' earnings around the discontinuity between the two cohorts (instead of between 1960-71 and 1972-88 cohorts that contain 29 birth cohorts in Table 2.1).

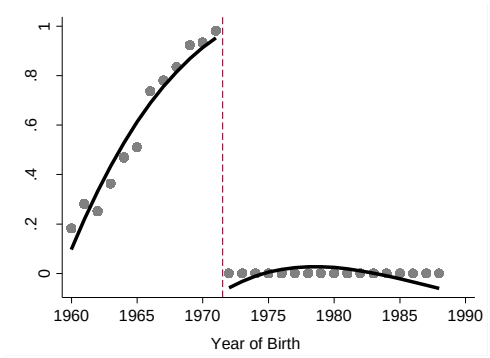
2.5 Results

I first examine the effects of the longer school year on education through 2SLS estimation, using the older cohorts (T_{ij}) as the instrumental variable for the longer school year (D_{ij}). I use two measures of educational outcomes: the years of schooling and completed senior high school. I then estimate the effects of education, using equation-by-equation 2SLS, on two outcomes: firm performance and entrepreneurs' earnings. Lastly, I do robustness checks.

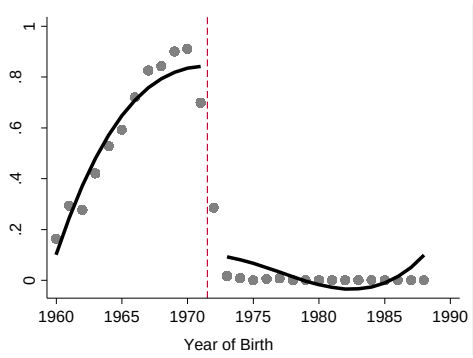
2.5.1 The Effects of the Longer School Year on Education

Figure 2.1 plots the proportion of entrepreneurs who experienced the longer school year and their average educational outcomes by birth cohorts. The solid lines illustrate the first-stage regressions or the reduced-form regressions of the second-stage regressions: the fitted regressions of the longer school year (D_{ij}) or educational outcomes (Edu_{ij}) on the older cohorts (T_{ij}) and year of birth cubic polynomial; the dash lines are the 1972 thresholds.

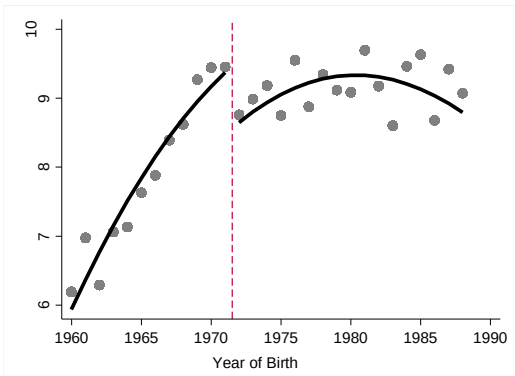
Panel A. The longer school year (using *year of birth* as the assignment variable)



Panel B. The longer school year (using *year of entry* as the assignment variable)



Panel C. Years of schooling



Panel D. Completed senior high school

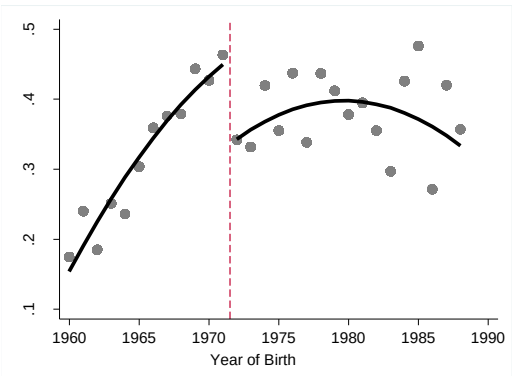


Figure 2.2 The first-stage regressions (Panels A-B) and the effects on education (Panels C-D)

Notes: Scatter points represent the averages, with fitted values based on regression models in the trend lines. The vertical dash lines represent the 1972 threshold.

Panels A-B, which illustrate the first-stage regressions, show a clear drop in the probability of experiencing the longer school year near the 1972 threshold. Panel A shows that, using *year of birth* to define the longer school year, the proportion of entrepreneurs who experienced the longer school year drops from 100 percent for the 1971 cohort to zero for the 1972 cohort, but to the left of the vertical dash line, it drops to about 20 percent for the 1960 cohort. Using *year of entry* to primary school to define the longer school year, Panel B shows similar results: The older cohorts are more likely to experience the longer school year; about 70 percent of the 1971 cohort experienced the longer school year, but only 30 percent of the 1972 cohort and none of the 1973-88 cohorts did. I use the older cohorts (T_{ij}) or the discontinuity in the probability of experiencing the longer school year between the 1971 and 1972 cohorts as an instrumental variable for the longer school year (D_{ij}).

The bottom graphs of Figure 2.2, which illustrate the reduced-form regressions of the second-stage regressions, show the longer school year increases years of schooling and probability of completing senior high school. In Panel C, the drop in the average years of schooling near the vertical dash line indicates that entrepreneurs in the 1971 cohort had 0.4 additional years of schooling than that of the 1972 cohort. The older cohorts' trend line shows the average years of schooling increases from 6 years for the 1960 cohort to about 9 years for the 1971 cohort. Panel D shows similar results: entrepreneurs in the 1971 cohort are more likely to complete their senior high school than that of the 1972 cohort; the proportion of completing 12 years education decreases by about ten percentage points between the 1971 and 1972 cohorts.[20]

[20] Selection bias may arise because, instead of the whole cohort of children who experienced the longer school year, only a subset of them becomes entrepreneurs, which is the working sample I use in this chapter. See Appendix A2 for the regressions that use the full sample of 30,337 individuals (both older and younger cohorts). Both panels in figure A2.1 (the regressions of

Table 2.2 reports the corresponding regression estimates. Column 1 includes a cubic polynomial of year of birth, column 2 adds a cubic polynomial of age, and column 3 adds demographic characteristics and district fixed effects.

Panel A, which presents the results from the first-stage regression, shows the older cohorts are more likely to experience the longer school year. Using *year of birth* to define the longer school year, the probability of experiencing the longer school year is 100 percentage points higher for the older cohorts; the results (in row 1 of Panel A) correspond to the drop between the 1971 and 1972 cohorts in Panel A of Figure 2.2. Using *year of entry* to primary school to define the longer school year, I get similar results: The likelihood of experiencing the longer school year is 0.77 higher for the older cohorts (row 2). The estimates are statistically significant and similar in all regressions.

Panel B, which presents the reduced-form regressions, shows the older cohorts are better educated, corresponding to the drop in years of schooling and probability of completing senior high school near the 1972 threshold in Panels C-D of Figure 2.2. Entrepreneurs in the older cohorts had 0.7 more years of education and about ten percentage points higher probability of completing senior high school; the estimates are large, positive, and statistically significant.

educational outcomes on the older cohorts and year of birth cubic polynomial) show a clear drop near the 1972 threshold, which suggests that people in the 1971 cohort have better educational outcomes, though the size of the effects is smaller. Figure A2.2 (the regression of the likelihood of being an entrepreneur on the older cohorts and year of birth cubic polynomial) illustrates no clear discontinuity near the 1972 threshold, which also means whether a person becomes entrepreneurs (whether a household has micro- and small firms) is independent of the longer school year.

Table 2.2 First-stage, reduced-form, and second-stage regressions

		(1)	(2)	(3)
A. First stage regression				
Using year of birth to define the longer school year				
1960-1971 cohorts	(1)	1.07***	1.07***	1.06***
		(0.04)	(0.04)	(0.04)
Adjusted R^2		0.66	0.66	0.68
Number of observations		5,949	5,949	5,949
Using year of entry to define the longer school year				
1960-1971 cohorts	(2)	0.77***	0.77***	0.77***
		(0.12)	(0.12)	(0.11)
Adjusted R^2		0.53	0.53	0.56
Number of observations		5,666	5,666	5,666
B. Reduced-form regression				
Years of schooling				
1960-1971 cohorts	(3)	0.91***	0.91***	0.67***
		(0.21)	(0.21)	(0.18)
Completed senior high school				
1960-1971 cohorts	(4)	0.12***	0.12***	0.10***
		(0.02)	(0.02)	(0.03)
Number of observations		5,945	5,945	5,945
C. Second-stage regression				
Years of schooling				
Longer school year	(5)	0.92***	0.75***	0.56***
		(0.14)	(0.18)	(0.15)
Completed senior high school				
Longer school year	(6)	0.11***	0.09***	0.09***
		(0.02)	(0.02)	(0.03)
Number of observations		5,945	5,945	5,945
Control variables				
Year of birth cubic polynomial		✓	✓	✓
Age cubic polynomial			✓	✓
Male, ethnicity, urban and district fixed effects				✓

Notes: Panel A presents the estimates from the regressions of *longer school year* on *older cohorts* and a set of control variables. In row 1, the longer school year equals one if an entrepreneur was born in 1971 or earlier and was still in school in 1978 and zero otherwise; in row 2, the longer school year equals one if an entrepreneur was enrolled in primary school in 1978 or earlier and did not drop out of school in 1978 and zero otherwise. Panel B presents the reduced-form estimate of the longer school year (a regression of educational outcome on *older cohorts* and a set of control variables). Panel C presents the corresponding 2SLS estimates (a regression of educational outcome on estimated longer school year obtained in the first-stage regression). The numbers in parentheses are robust standard errors, clustered by year of birth. The asterisk *** indicates statistical significance at 1%.

The estimates in Panel C show experiencing the longer school year improved entrepreneurs' educational outcomes. The longer school year increased the average years of schooling by 0.9 years in the regression that controls for year of birth cubic polynomial function. The estimate decreases to 0.75 and 0.56 once I control for age cubic polynomial function and all characteristics, respectively, in columns 2 and 3 of row 5. The longer school year also increased the probability of completing senior high school by about ten percentage points (row 6). (I get similar results in the regressions that cluster the standard errors by district. See Table A2.1 in Appendix A2.)

2.5.2 The Effects of Education on Firm Performance

Figure 2.3, which illustrates the reduced-form regressions for the longer school year (the regressions of firm performance on the older cohorts, controlling for year of birth cubic polynomial), shows no evidence that firm performance differs by entrepreneurs' education. All the graphs illustrate no clear drop in the averages near the 1972 threshold. The trend lines for total assets (Panel A) and net profits (Panel B) display a similar pattern: the averages are decreasing initially and then increasing slightly as the trend lines move from the 1960 cohort towards the threshold, but the trend lines become downward sloping and get steeper to the right of the threshold. Panel C shows a continuous increase in the average logarithm of asset purchased on both sides of the vertical dashed line but the averages start to decrease from the 1982 cohort to the 1988 cohort. The trend lines for asset sold (Panel D) and non-equipment assets (Panel F) are downward sloping, showing a continuous decrease in the averages from the left to the right of the 1972 threshold. As for the equipment assets in Panel E, the averages are

increasing from the 1960 cohort to the 1971 cohort, and the increase continues on the left of the vertical dashed line before a drop starts in the 1975 cohort.

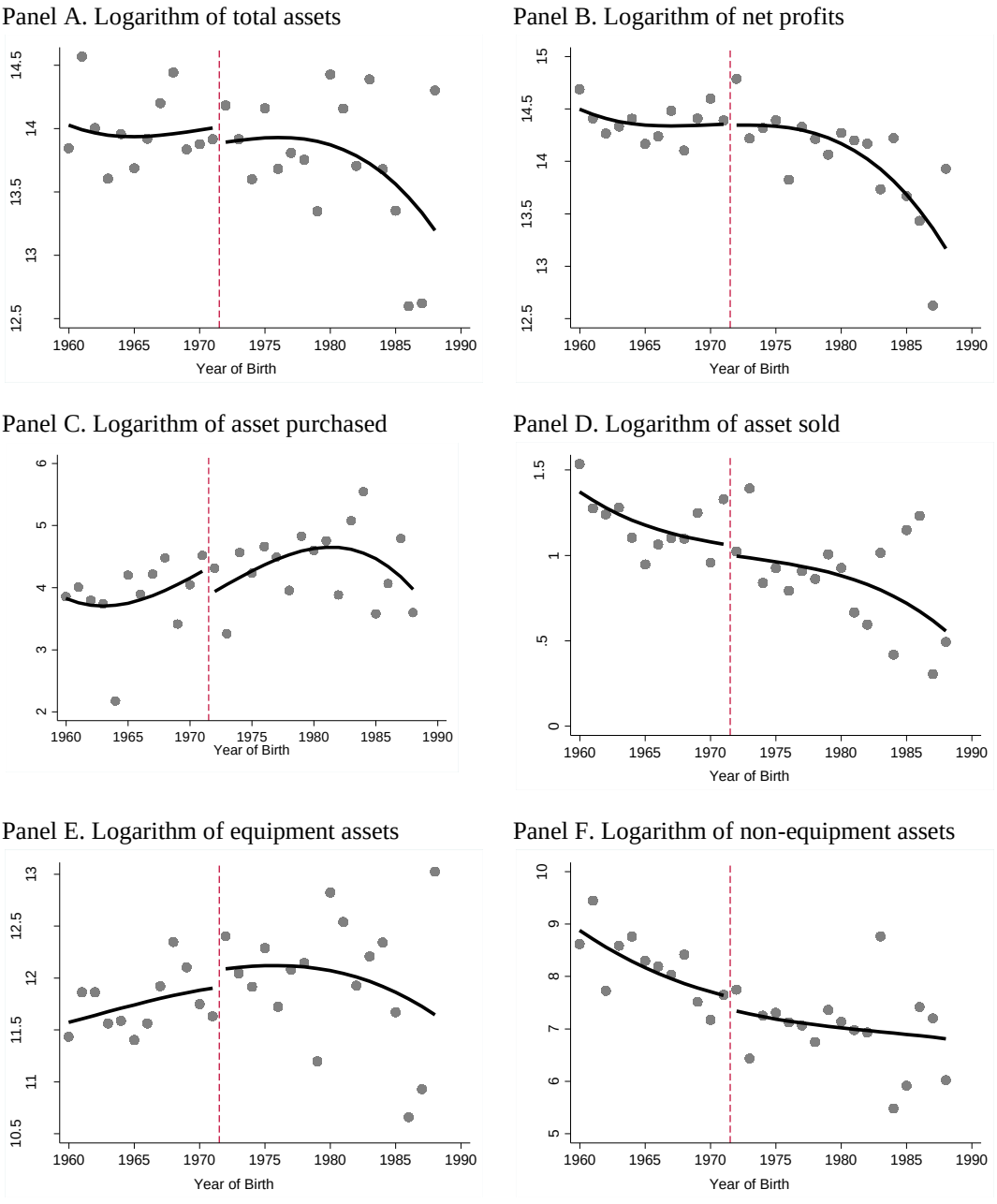


Figure 2.3 The effects on firm performance

Notes: Scatter points represent the averages, with fitted values based on regression models in the trend lines. The vertical dash lines represent the 1972 threshold.

Table 2.3 The effects of education on firm performance

Dependent variable (in logarithm)		Reduced-form	The effects of		
			longer school year	years of schooling	completing senior high school
		(1)	(2)	(3)	(4)
A. Growth of firms					
Total assets	(1)	0.23	0.19	0.32	2.30
		(0.25)	(0.22)	(0.41)	(2.87)
Net profits	(2)	-0.08	-0.06	-0.13	-0.90
		(0.28)	(0.25)	(0.33)	(2.35)
B. Stock of assets					
Assets purchased	(3)	0.29	0.21	0.41	2.88
		(0.33)	(0.29)	(0.54)	(3.81)
Assets sold	(4)	-0.02	-0.01	-0.03	-0.20
		(0.17)	(0.14)	(0.35)	(2.47)
C. Capital investment					
Equipment assets	(5)	0.03	0.01	0.02	0.15
		(0.30)	(0.26)	(0.42)	(2.96)
Non-equipment assets	(6)	0.19	0.15	0.26	1.85
		(0.53)	(0.50)	(0.71)	(5.01)
Number of observations		5,949	5,949	5,945	5,945

Notes: The number in each cell in column 1 is the estimate of *older cohorts* from a regression of firm performance on *older cohorts*. Column 2 reports the corresponding 2SLS estimates. Columns 3-4 present the equation-by-equation 2SLS estimates of the effects of years of schooling or completing senior high school on firm performance. All regressions control for year of birth cubic polynomial, age cubic polynomial, gender (1 if male), ethnicity (dummies), urban (1 if urban), and district fixed effects. The numbers in parentheses are standard errors.

Table 2.3 reports the corresponding results. The estimates are from models that control for year of birth cubic polynomial, age cubic polynomial, demographic characteristics, and district fixed effects. Column 1 shows the reduced-form regressions of the longer school year; column 2 the regressions of firm performance on the longer school year; column 3 and column 4 the equation-by-equation 2SLS regression on a marginal year of schooling and completion of senior high school, respectively.

The estimates in Table 2.3 confirm the trends in Figure 2.3: I find no evidence that education improves firms' performance; the estimates of βs in equations 2.1, 2.2,

and 2.3 are all statistically insignificant. The results in columns 1-2 indicate no relationship between the longer school year and firm performance. The estimates of total assets, asset purchased, and capital investment are positive but statistically insignificant. I also find no evidence of the longer school year affects net profits and asset sold; the estimates are negative and statistically insignificant.

The estimates in columns 3-4 show no evidence that better educated entrepreneurs run their firms better. Even though the estimates of the effect of education on total assets, asset purchased, and capital investment are statistically insignificant, the positive magnitude of the estimates show that a marginal year of schooling correlateds with about 32, 41, 2, and 26 percent increase in total assets, asset purchased, equipment assets, and non-equipment assets, respectively. Similarly, completion of senior high school correlates with more assets and capital investment, though the estimates are statistically insignificant. However, the estimates for net profits and asset sold are negative and statistically insignificant.

Taken together, I find no evidence that education matters for firm performance. In the equation-by-equation 2SLS regressions, I do not find the number of years in school and completion of senior high school increase firms' growth, stock of assets, and capital investment. The results are different from the literature in education that finds positive returns to education (see, e.g., Corral and Reardon, 2001; Panda, 2015; Yúnez et al., 2001). However, the results may also suggest the story of another side of the coin: owners learn some skills and knowledge from education, but if they run a business only because they cannot find a better job and they lack the entrepreneurial spirit, they may be less interested to implement the skills learned and to grow their business (Block and Wagner, 2010; Fossen and Büttner, 2013; McKenzie and Woodruff, 2014). Furthermore, some studies suggest that education matters little if a firm operates in

informal sector that requires no complex skills or high educational qualification (Dasgupta, 2003; Jiménez et al., 2015). The results may reflect that the returns to education differ by the natures of entrepreneurship and sectors. For example, in the sample that I study, 91 percent of non-farm businesses do not apply for any permit or registration.

2.5.3 The Effects of Education on Entrepreneurs' Earnings

In this section, I examine the effects of education on entrepreneurs' earnings: hourly-, monthly-, and annual earnings. Hourly earnings show the average of wage rates based on the number of hours and weeks an entrepreneur worked in the previous year; monthly earnings are the total wages in the previous month; and annual earnings are the total wages in the previous year. Figure 2.4 illustrates the reduced-form estimates; Table 2.4 presents the reduced-form estimates in column 1 and the effects of the longer school year, years of schooling, and completion of senior high school in columns 2-4, respectively.

Figure 2.4 and Table 2.4 show some evidence that education increases entrepreneurs' earnings. The trend lines in the graphs seem to decrease between the 1971 and 1972 cohorts, which indicates entrepreneurs in the 1971 cohort get higher hourly-, monthly-, and annual earnings, by about 20 percent, than that of entrepreneurs in the 1972 cohort. Wages are decreasing initially and then increasing to the left of the vertical dash lines, but the trend lines fall between the 1971 and 1972 cohorts; to the right of the vertical dash lines, wages are increasing for 1972-80 cohorts and then decreasing for 1981-88 cohorts. The reduced-form and 2SLS estimates in Panel A of Table 2.4 confirm these effects; the estimates are positive and statistically significant

(columns 1 and 2). The estimates of years of schooling show that entrepreneurs' hourly-, monthly-, and annual earnings are 31, 42, and 40 percent higher, respectively, for each additional year of schooling. Entrepreneurs who completed senior high school also earn three- to four-fold more. (The effects of senior high school seem to be large, but given the average annual earnings of Rp 11 million or about US$963 in 2008 (the sample period) for example, the increase does not seem to be peculiar.) The estimates of years of schooling and completion of senior high school are positive, large, and statistically significant.

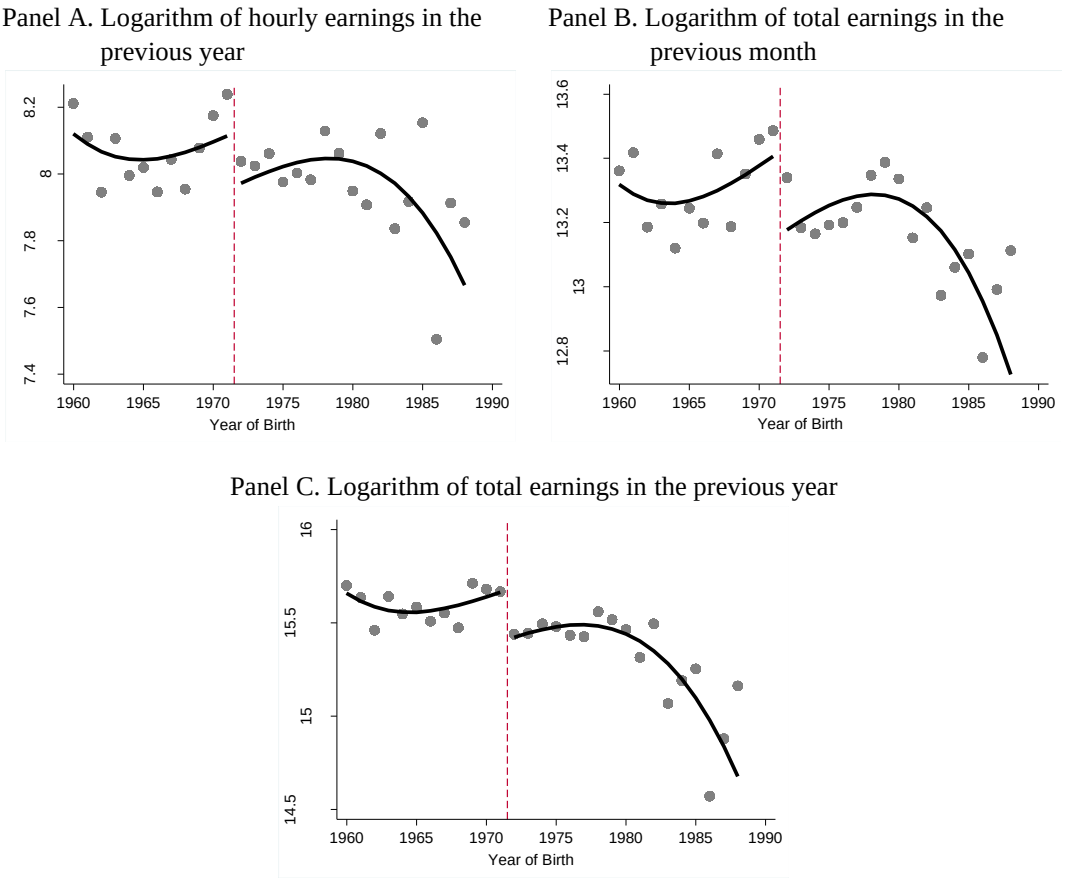


Figure 2.4 The effects on entrepreneurs' earnings

Notes: Scatter points represent the averages, with fitted values based on regression models in the trend lines. The vertical dash lines represent the 1972 threshold.

Table 2.4 The effects of education on entrepreneurs' earnings

Dependent variable (in logarithm)		Reduced-form	The effects of		
			longer school year	years of schooling	completing senior high school
		(1)	(2)	(3)	(4)
A. Income from all businesses					
Hourly earnings	(1)	0.21***	0.20***	0.31**	2.19**
		(0.07)	(0.06)	(0.13)	(0.93)
Monthly earnings	(2)	0.30***	0.28***	0.42***	3.47***
		(0.09)	(0.07)	(0.15)	(1.33)
Annual earnings	(3)	0.29***	0.27***	0.40***	2.94***
		(0.05)	(0.05)	(0.14)	(1.06)
B. Income from farm businesses					
Hourly earnings	(4)	0.08	0.08	0.14	1.03
		(0.09)	(0.07)	(0.21)	(1.62)
Monthly earnings	(5)	0.13	0.15	0.24	2.55
		(0.18)	(0.15)	(0.29)	(3.45)
Annual earnings	(6)	0.09	0.11	0.13	1.23
		(0.11)	(0.09)	(0.23)	(1.72)
C. Income from non-farm businesses					
Hourly earnings	(7)	0.23***	0.21***	0.32**	2.36**
		(0.09)	(0.08)	(0.17)	(1.22)
Monthly earnings	(8)	0.37***	0.33***	0.50**	2.93**
		(0.08)	(0.06)	(0.20)	(1.67)
Annual earnings	(9)	0.33***	0.29***	0.46**	3.42**
		(0.06)	(0.06)	(0.20)	(1.52)

Notes: The number in each cell in column 1 is the estimate of *older cohorts* from a regression of entrepreneurs' earnings on *older cohorts*. Column 2 reports the corresponding 2SLS estimates. Columns 3-4 present the equation-by-equation 2SLS estimates of the effects of years of schooling or completing senior high school on earnings. All regressions control for year of birth cubic polynomial, age cubic polynomial, gender (1 if male), ethnicity (dummies), urban (1 if urban), and district fixed effects. The number of observations is about 5,400 in rows 1 and 3; 5,070 in row 2; 1,900 in rows 4 and 6; 1,600 in row 5; and 3,500 in rows 7-9. The numbers in parentheses are standard errors. The asterisks *** and ** indicate statistical significance at 1% and 5%, respectively.

Panels B-C, which present the results by type of business, show some evidence that education increases the earnings of entrepreneurs in non-farm businesses but not those in farm businesses. The estimates in Panel B show that years of schooling and

completion of senior high school correlate positively with the earnings of entrepreneurs in farm businesses though the estimates are statistically insignificant. By contrast, the estimates in Panel C are positive and statistically significant, implying a positive return to years of schooling and completion of senior high school for entrepreneurs in non-farm businesses.

In sum, I find more years of schooling and completion of senior high school increase entrepreneurs' earnings. The estimates of education are positive and statistically significant except for entrepreneurs in farm businesses. Even though I cannot conclude that education makes entrepreneurs run their farm businesses better, high correlation between the variables may imply some effects of education. The results on better educated entrepreneurs earn more are in line with Mincer's hypothesis and the empirical literature that education increases entrepreneurs' productivity and earnings through improving their knowledge and cognitive skills (Corral and Reardon, 2001; Panda, 2015; Van der Sluis et al., 2005).

2.5.4 Robustness Checks

As further reassurance of the validity of the RD design, in addition to the two assumptions that I discussed in section 2.4.1, I change the details in the basic specifications: (i) I study the effects by industry, (ii) I include alternative polynomial function of the assignment variable (the year of birth), (iii) I use alternative assignment variable and/or definition of the longer school year, and (iv) I use subsample. I also test whether entrepreneurs' observed characteristics are continuous at the threshold.

Table 2.5 The effects of education by industry

Dependent variable		Reduced-form	The effects of		
			longer school year	years of schooling	completing senior high school
		(1)	(2)	(3)	(4)
A. Farm business					
Total assets	(1)	0.17	0.11	0.27	1.82
		(0.21)	(0.20)	(0.46)	(2.97)
Total asset sold	(2)	0.23	0.23	0.36	2.36
		(0.41)	(0.35)	(0.82)	(5.32)
Total asset purchased	(3)	0.02	0.04	0.05	0.32
		(0.28)	(0.23)	(0.81)	(5.29)
Net profits	(4)	-0.50	0.05	-0.82	-5.33
		(0.55)	(0.04)	(0.93)	(5.66)
Rental income from farm assets	(5)	0.09	0.09	0.15	0.95
		(0.48)	(0.42)	(0.76)	(4.92)
Legal ownership of land	(6)	0.01	0.01	0.01	0.05
		(0.06)	(0.05)	(0.04)	(0.34)
Number of plots	(7)	0.01	0.00	0.00	0.04
		(0.04)	(0.03)	(0.04)	(0.35)
Size of land	(8)	-0.11**	-0.10**	-0.08	-0.69
		(0.05)	(0.04)	(0.06)	(0.46)
B. Non-farm business					
Total assets	(9)	0.20	0.18	0.24	1.92
		(0.36)	(0.32)	(0.55)	(4.34)
Total asset purchased	(10)	0.52	0.40	0.69	5.46
		(0.55)	(0.48)	(0.72)	(5.72)
Total asset sold	(11)	-0.05	-0.06	-0.07	-0.54
		(0.13)	(0.11)	(0.33)	(2.59)
Net profits	(12)	0.19	0.18	0.27	2.12
		(0.17)	(0.15)	(0.28)	(2.19)
Sole entrepreneurship	(13)	-0.02	-0.02	-0.02	-0.19
		(0.02)	(0.01)	(0.02)	(0.18)
Percentage of share	(14)	-1.32	-1.21	-1.82	-14.35
		(0.94)	(0.82)	(1.46)	(11.55)
Number of paid workers	(15)	0.02	0.02	0.02	0.18
		(0.03)	(0.03)	(0.06)	(0.45)
Number of unpaid family workers	(16)	0.00	-0.01	0.00	-0.03
		(0.03)	(0.03)	(0.05)	(0.40)

Table 2.5 The effects of education by industry (continued)

Dependent variable		Reduced-form	The effects of longer school year	The effects of years of schooling	The effects of completing senior high school
		(1)	(2)	(3)	(4)
B. Non-farm business					
Access to formal credits	(17)	0.01	0.01	0.01	0.09
		(0.02)	(0.01)	(0.02)	(0.20)

Notes: The number in each cell in column 1 is the estimate of *older cohorts* from a regression of firm performance on *older cohorts* and a set of control variables. Column 2 reports the corresponding 2SLS estimate. Columns 3 and 4 present the equation-by-equation 2SLS estimates of the effects of years of schooling or completing senior high school on firm performance. All variables are measured in logarithm, except ownership of land, legal ownership of land, sole ownership, percentage of share, and access to formal credits. All regressions control for year of birth cubic polynomial, age cubic polynomial, gender (1 if male), ethnicity (dummies), urban (1 if urban), and district fixed effects. The number of observations is about 2,250-2,300 in rows 1-5, 1,500 in rows 6-8, and 3,600-3,700 in rows 9-17. The numbers in parentheses are standard errors.

Table 2.5, which presents the results of the regression by industry, shows no evidence that education improves firm performance. In Panel A, none of the estimates of education is statistically significant, indicating years of schooling and completion of senior high school matter little for farm assets, stock of assets, net profits, legal ownership of land, number of plots and land size for farm businesses. Panel B shows similar results: I do not find evidence that years of schooling and completion of senior high school affect the performance non-farm businesses. The results are similar to those in basic results: the estimates remain statistically insignificant though the sign of some estimates changes.

Table 2.6 checks whether the estimates in the basic specifications (Tables 2.3 and 2.4) are sensitive to omissions of control variables and the choice of polynomial functions. Columns 1-4 examine the effects of years of schooling; columns 5-8 completed senior high school. Columns 1 and 5 drop cubic polynomial of age,

demographic characteristics, and district fixed effects; columns 2 and 6 drop demographic characteristics and district fixed effects; columns 3 and 7 use year of birth quadratic polynomial; and columns 4 and 8 quartic polynomial. (Columns that use alternative polynomial functions also control for cubic polynomial of age, demographic characteristics, and district fixed effects.)

Overall, the results in Table 2.6 correspond to those in basic specifications: the estimates show no evidence that education increases total assets and net profits, though the estimates show the evidence of better educated entrepreneurs earn more. In Panel A, all the estimates of education on total assets and net profits remain statistically insignificant, regardless the choice of polynomial functions and omissions of control variables. On the other hand, the estimates in Panel B show an additional year of schooling increases hourly-, monthly-, and annual earnings by 17-34, 27-44, and 28-43 percent, respectively. The effects of completion of senior high school on entrepreneurs' earnings remain positive, large, and statistically significant.

Table 2.7 presents the results for alternative assignment variables and definitions of the longer school year. Columns 1 and 3 use year of entry to primary school to define the longer school year whereas columns 2 and 4 use year of entry to primary school as the assignment variable and the definition of the longer school year. I use year of entry as the alternative for the longer school year because some children might not enter primary school at seven years old.

Table 2.6 Using other polynomial functions of the assignment variable

Dependent variable (in logarithm)		The effects of							
		years of schooling				completing senior high school			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Firm performance									
Total assets	(1)	0.12	0.12	0.23	0.12	0.89	0.86	1.50	0.90
		(0.30)	(0.30)	(0.47)	(0.32)	(2.24)	(2.23)	(2.98)	(2.48)
Net profits	(2)	0.01	0.02	-0.20	-0.09	0.09	0.12	-1.26	-0.72
		(0.24)	(0.24)	(0.39)	(0.26)	(1.82)	(1.81)	(2.48)	(2.05)
B. Entrepreneurs' earnings									
Hourly earnings	(3)	0.17**	0.17**	0.34**	0.26***	1.30**	1.31**	2.29**	2.01***
		(0.08)	(0.08)	(0.15)	(0.09)	(0.63)	(0.63)	(0.97)	(0.75)
Monthly earnings	(4)	0.27***	0.27***	0.44***	0.34***	2.09***	2.10***	3.27**	2.90***
		(0.09)	(0.09)	(0.18)	(0.11)	(0.72)	(0.72)	(1.34)	(0.99)
Annual earnings	(5)	0.28***	0.28***	0.42**	0.28***	2.10***	2.10***	2.79***	2.22***
		(0.09)	(0.09)	(0.17)	(0.10)	(0.71)	(0.71)	(1.08)	(0.79)
Control variables									
Year-of-birth quadratic polynomial				✓				✓	
Year-of-birth cubic polynomial		✓	✓			✓	✓		
Year-of-birth quartic polynomial					✓				✓
Age cubic polynomial			✓	✓	✓		✓	✓	✓
Gender, ethnicity, urban, and district fixed effects				✓	✓			✓	✓

Notes: The number in each cell is the equation-by-equation 2SLS estimate of the effects of years of schooling or completing senior high school on firm performance and entrepreneurs' earnings. The number of observations is 5,945 in rows 1-2, 5,397 in row 3, 5,068 in row 4, and 5,412 in row 5. The numbers in parentheses are standard errors. The asterisks *** and ** indicate statistical significance at 1% and 5%, respectively.

Table 2.7 Using alternative assignment variables and definitions of the longer school year

Dependent variable (in logarithm)		Effects of years of schooling		Effects of completing senior high school	
		Assignment variable: year of birth	Assignment variable: year of entry	Assignment variable: year of birth	Assignment variable: year of entry
		Longer school year: using year of entry	Longer school year: using year of entry	Longer school year: using year of entry	Longer school year: using year of entry
		(1)	(2)	(3)	(4)
A. Firm performance					
Total assets	(1)	0.30	3.78	1.90	9.51
		(0.42)	(11.37)	(2.70)	(12.19)
Net profits	(2)	-0.35	-2.57	-2.27	-6.47
		(0.37)	(8.24)	(2.31)	(9.74)
B. Entrepreneurs' earnings					
Hourly earnings	(3)	0.29**	0.80	1.96**	4.08
		(0.13)	(1.03)	(0.83)	(3.70)
Monthly earnings	(4)	0.38***	0.10	2.81**	0.69
		(0.15)	(0.32)	(1.09)	(2.33)
Annual earnings	(5)	0.06***	0.07***	0.84***	0.88***
		(0.01)	(0.01)	(0.16)	(0.13)

Notes: The number in each cell is the equation-by-equation 2SLS estimate of the effects of years of schooling (columns 1-2) or completing senior high school (columns 3-4) on firm performance and entrepreneurs' earnings. All regressions control for year of birth cubic polynomial, age cubic polynomial, gender (1 if male), ethnicity (dummies), urban (1 if urban), and district fixed effects. The number of observations is 5,662 in rows 1-2, 5,144 in row 3, 4,825 in row 4, and 5,158 in row 5. The numbers in parentheses are standard errors. The asterisks *** and ** indicate statistical significance at 1% and 5%, respectively.

The results in Table 2.7 remain broadly similar to the basic results: I find some evidence that education increases entrepreneurs' earnings, but the effects on hourly- and monthly earnings become statistically insignificant when I use year of entry to primary school as the assignment variable. The estimates in columns 1 and 3 show years of schooling and completion of senior high school increase earnings but not firm growth. An additional year of schooling increases hourly-, monthly-, and annual earnings by 29,

38, and 6 percent, respectively; the effects of completion of senior high school remain large and statistically significant. I get similar results in columns 2 and 4 when I use year of entry to primary school as the assignment variable, but the estimates of hourly- and monthly wages become statistically insignificant.

In Table 2.8, I analyse the effects of education by subsample because employment opportunities and business decision making could be different between males and females, so are between rural and urban areas (Psacharopoulos, 1995; Psacharopoulos and Patrinos, 2018).

Table 2.8 shows some evidence on positive returns to education for female entrepreneurs and those in urban areas, but little evidence that education matters for firm performance. The estimates in Panel A show no effects of years of schooling and completion of senior high school on total assets and net profits (the estimates are statistically insignificant), except for total assets of the firms run by female entrepreneurs. In Panel B, the estimates in columns 1 and 5 show that education increases entrepreneurs' earnings in urban areas, while the results in columns 2 and 6 show no impact of education in rural areas. In columns 3 and 6, the estimates show entrepreneurs' earnings do not differ by their years of schooling and completion of senior high school. By contrast, the estimates in columns 4 and 8 suggest that better educated female entrepreneurs earn more monthly and annually.

Table 2.8 Subsample

Dependent variable (in logarithm)		The effects of years of schooling				The effects of completing senior high school			
		Urban	Rural	Male entrepreneurs	Female entrepreneurs	Urban	Rural	Male entrepreneurs	Female entrepreneurs
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Firm performance									
Total assets	(1)	0.67	-0.05	-0.16	0.84	5.17	-0.29	-1.71	4.70*
		(0.77)	(0.52)	(0.73)	(0.54)	(5.96)	(3.28)	(8.01)	(2.71)
Net profits	(2)	0.25	-0.36	-0.54	0.12	1.91	-2.30	-5.87	0.43
		(0.47)	(0.55)	(0.70)	(0.35)	(3.65)	(3.40)	(8.30)	(1.86)
B. Entrepreneurs' earnings									
Hourly earnings	(3)	0.29*	0.20	0.46	0.11	2.40	1.16	4.84	0.66
		(0.17)	(0.21)	(0.34)	(0.12)	(1.48)	(1.18)	(4.49)	(0.70)
Monthly earnings	(4)	0.49**	0.30	0.53	0.24*	4.31*	2.11	7.76	1.54*
		(0.24)	(0.23)	(0.33)	(0.13)	(2.47)	(1.57)	(8.76)	(0.79)
Annual earnings	(5)	0.43**	0.30	0.56	0.20*	3.54*	1.74	6.01	1.24*
		(0.21)	(0.23)	(0.38)	(0.11)	(1.92)	(1.25)	(5.43)	(0.74)

Notes: The number in each cell is the equation-by-equation 2SLS estimate of the effects of years of schooling or completing senior high school on firm performance and entrepreneurs' earnings. All regressions control for year of birth cubic polynomial, age cubic polynomial, gender (1 if male), ethnicity (dummies), urban (1 if urban), and district fixed effects. The numbers in parentheses are standard errors. The number of observations is about 2,350-2,600 in columns 1 and 5, 2,700-3,370 in columns 2 and 6, 3,440-3,920 in columns 3 and 7, and 1,630-2,030 in columns 4 and 8. The numbers in parentheses are standard errors. The asterisks ** and * indicate statistical significance at 5% and 10%, respectively.

Overall, the results are quite robust to the use of polynomials of various degree and to the use of alternative assignment variable and definition of longer school year: I find no evidence that years of schooling and completion of senior high school increase total assets and net profits. I find better educated entrepreneurs earn more; in the regressions by subsample, education increases the earnings of entrepreneurs in urban areas and female entrepreneurs.

Table 2.9 Continuity of control variables at the threshold

Dependent variable		(1)	(2)
Age	(1)	-0.26***	-0.34***
		(0.06)	(0.07)
Male	(2)	-0.03	-0.04
		(0.02)	(0.02)
Javanese	(3)	-0.01	-0.02
		(0.02)	(0.02)
Urban areas	(4)	0.03	0.03*
		(0.02)	(0.02)
Variable used to define longer school year			
Year of birth		✓	
Year of entry			✓

Notes: The number in each cell is the 2SLS estimate of the longer school year (a regression of a control variable on estimated longer school year obtained in the first-stage regression). Each regression includes the year of birth cubic polynomial. The numbers of observations in columns 1 and 2 are 5,949 and 5,666, respectively. The numbers in parentheses are robust standard errors, clustered by year of birth. The asterisks *** and * indicate statistical significance at 1% and 10%, respectively.

Table 2.9 presents a validity check on whether the assumption of the RD design holds. In order for the strategy to work, all other factors determining the educational outcomes must not correlate with the *longer school year*. I employ the same regression model as equation 2.2, I regress the predetermined characteristics, including age, gender, race, and urban areas, on the predicted value of *longer school year*. Columns 1 and 2 use year of birth and year of entry to primary school, respectively, to define the longer school year.

The results show the longer school year is independent of the characteristics but correlated to entrepreneurs' age. Using age as the independent variable in equation 2.2, I find the estimate of age negative and statistically significant. When I use other characteristics as the dependent variable, the estimates are small and statistically insignificant. For example, I do not find the longer school year reduces the proportion of Javanese people and male entrepreneurs or induce more people to migrate to urban areas in 1978-79. (I get similar results in the regressions that cluster the standard errors by districts. See Table A2.5 in Appendix A2.)

2.6 Conclusion and Discussion

The key finding is that education does not seem to improve the performance of micro and small firms though it increases entrepreneurs' earnings. Education does not seem to increase the firms' total assets, net profits, stock of assets, and capital investment; all the estimates are statistically insignificant. On the other hand, the results on entrepreneurs' earnings show that one more year of education increases earnings by 30-40 percent, while completion of senior high school increases earnings by three to four-fold though better educated entrepreneurs in farm businesses do not seem to earn more. A number of specification checks support these results (using different polynomial functions of the assignment variable, alternative assignment variable, and subsample).

In contrast to the previous literature on entrepreneurship, the results on firm performance show no impact of education, but the findings support recent impact evaluations of education and training programmes in developing countries (Berge et al., 2015; Bruhn and Zia, 2013; de Mel et al., 2014; Drexler et al., 2014; Karlan and Valdivia, 2011). These papers find that business training programmes have no impact

on micro and small firms' profits, sales or capital stocks even though the programmes improve the owners' business practices or knowledge (such as stock taking and accounting knowledge). One possible explanation for these results is that the entrepreneurs I study are those who lack motivation to grow their firms, in which Banerjee and Duflo (2011) called "reluctant entrepreneurs" and Reynolds et al. (2001) called "necessity entrepreneurs". They may start a business because they lack better employment option; they may manage to run their business well enough to survive, but without the talent, the skills, or the motivation needed to grow their business; some even prefer to keep their business tiny to avoid additional capital costs. McKenzie and Woodruff (2014) suggest that education programmes may become less effective if entrepreneurs are less interested or able to implement practices or knowledge taught. Block and Wagner (2010) and Fossen and Büttner (2013) argue that entrepreneurs are heterogeneous and that, in contrast to those who have high entrepreneurial spirit, education has relatively smaller impact on necessity entrepreneurs; Amit and Muller (1995) and Vivarelli (2004; 2013) find necessity entrepreneurs have relatively inferior performance and shorter spell of entrepreneurship. McKenzie and Woodruff (2014) argue that sample heterogeneity can reduce the power to detect changes in firm performance. The single estimate that I obtain, which treats entrepreneurs as a homogeneous group, may therefore understate the average returns to education for entrepreneurs, particularly for those who are true entrepreneurs.

Another possibility is informality of micro and small firms that I study. For example, 91 percent of non-farm businesses that I study do not apply for any permit or registration. Dasgupta (2003) finds education has no impact on the profitability of small firms in informal sector. The nature of work in informal service, such as a street vendor, requires no complex skill or high education qualifications. It is also possible that, like

what McKenzie and Woodruff (2014) suggest for traditional business training, education does not result in a large enough change on mechanisms that can trigger firm growth or it does not teach the right set of skills that entrepreneurs need.

The findings on education increases earnings are in line with the human capital theory of Becker (1962), Mincer (1974), and Schultz (1961) and the signalling theory of Spence (1973). The theories suggest that education improves entrepreneurs' knowledge, cognitive skills, and attributes that increase their productivity and earnings. However, the results I get differ by sector: education increases earnings of entrepreneurs in non-farm businesses but not those in farm businesses. Although statistically insignificant, the positive estimates for farm businesses may still suggest some degree of positive correlation between education and earnings. The previous literature also suggests a mixed picture on returns to education by sector, farm size, and business environment (Corral and Reardon, 2001; Honig, 2001; Panda, 2015; Yunez-Naude and Taylor, 2001). I find positive educational impacts on entrepreneurs' earnings but not firm performance perhaps because the measure I use for earnings includes the income from both primary and additional jobs; therefore, the results may reflect the impact not only on entrepreneurship but also labour market outcomes. Moreover, whether better educated entrepreneurs who earn more invest their money to grow their firms may depend on their interest and desire to succeed, which remains a question for future research.

The findings on education increases entrepreneurs' earnings but matters little for firm performance may have important policy implications. Despite the prevalence of the assumption that investment in education in developing countries can produce skilled workers and enhance entrepreneurship, there is debate over whether general education tells the whole story of entrepreneurship. In this chapter, the entrepreneurs that I study

have low average education attainment: the average education of entrepreneurs is 8.5 years, with about 50 percent and 35 percent completed junior and senior high school, respectively (see Table 2.1), perhaps because, like Burger et al. (2015) suggest, they have been forced to leave school and started a business out of necessity. Therefore, policies that benefit opportunity-driven entrepreneurs may not have the same effect on these entrepreneurs who lack motivations as they may not use their education as productively as opportunity entrepreneurs (Fossen and Büttner, 2013). Policies that target the micro-and-small-firm industry as a whole may appear ineffective if the ratio of necessity entrepreneurs in an economy is large, which can lead to inadequate policy conclusions. For example, several studies in developing countries find no significant impact of business training programmes (Berge et al., 2015; Bruhn and Zia, 2013; de Mel et al., 2014; Drexler et al., 2014; Karlan and Valdivia, 2011) and microfinance and microinsurance (Angelucci et al., 2015; Banerjee et al., 2015; Cole et al., 2013; Crépon et al., 2015) on profits or revenue for micro and small firms, perhaps because the policies had not successfully targeted entrepreneurs who are opportunity-driven. A better way to improve enterpreneuship could be developing key behaviours associated with a proactive entrepreneurship mindset such as through personal initiative training programmes (Campos et al. 2017; 2018).

One limitation of this chapter is that it does not estimate the effects of specific education and entrepreneurial-related education. Entrepreneurs who have similar levels of general education but different entrepreneurial performance may raise the questions of whether they differ in terms of more specific types of education and experience. The existing literature that considers the issues either emphasises little on endogeneity of education (van der Sluis et al., 2005; Martin et al., 2013; Unger et al., 2011) or use a small sample (McKenzie and Woodruff, 2014). Future work could go in this direction

to study how exogenous variation in specific education affects entrepreneurs and how the effects differ by the natures of entrepreneurship.

I also do not explore the mechanisms through which education influences firm performance and entrepreneurs' earnings. The evidence of better educated entrepreneurs earn more could suggest that education enhances their skills and cognitive abilities that help them make optimal decision on business practices, use of inputs, innovation, product diversification, and so forth. It could also be that, like what Spence (1963)'s signalling theory suggests, a higher education degree enables enterpreneurs bargain better with stakeholders. However, it could also be that the natures of entrepreneurship change the returns to education for entrepreneurs. It is worthwhile to consider entrepreneurs as a heterogenous group in studying entrepreneurs' performance. There are some evidence that entrepreneurs' profile differs markedly in terms of their individual personality and perceptions, which inspire or hinder their engagement in entrepreneurship (van der Zwan, 2016; Campos, et al, 2017; 2018). Future research could study whether education affects entrepreneurial performance through entrepreneurs' decision making process, ability to deal with stakeholders, and start-up motivations.

Chapter 3

Essay 2: Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia

3.1 Introduction

Most micro and small firms in developing countries operate within the informal sector, rely on family workers, have limited internal resources, and lack access to formal credits (IFC, 2017; Kushnir et al., 2010); therefore, they can be vulnerable to family hardships experienced by the owners. Family hardships, such as illnesses and deaths of family members, can constrain firm growth by shrinking the financial positions and the pool of family workers, which, in turn, can cause micro and small firms to fail. The economic costs of family hardships are large, particularly for hardships that afflict the breadwinner of a household, and, if other family members are unable to increase their own labour supply, family hardships can lead to poverty (Gertler and Gruber, 2002; Lindelow and Wagstaff, 2005; Wagstaff, 2007). Because micro and small firms account for much of the employment, national output, and the number of firms in developing countries, it is crucial to understand how to empower micro and small firms to withstand family hardships.[21]

Perhaps affordable and widely accessible insurance programmes can help micro and small firms to weather family hardships, which motivate the major research question I address in this chapter: Does social health insurance help owners of micro and small firms cope with family hardships? I study the social health insurance in

[21] In 2014, for example, 62% of employment, 42% of GDP, and 96% of firms in Asia were from micro and small firms (ADB, 2014).

Indonesia, *Askeskin* (*Asuransi Kesehatan untuk Masyarakat Miskin*), that aims to insure the poor and the informal sector against financial risks associated with health expenditures. The insurance was free, with its premiums (Rp 5,000 monthly per beneficiary) fully funded by the government of Indonesia, making the product accessible to the poor who could not afford any insurance. The *Askeskin* programme had good outreach: it covered 60 million people and 120 million in 2005 and 2014, respectively, and would include the whole population in Indonesia by 2019 (Cotlear et al., 2015).

I investigate how being a social health insurance recipient, through its interaction with family hardships, affects the growth of micro and small firms. Social health insurance may improve the performance of micro and small firms through two mechanisms: One, by improving the health of recipients and the access to formal healthcare, social health insurance can improve productivity and human capital of family workers. Two, by reducing healthcare expenses of recipient households, social health insurance can alleviate financial hardships that owners of micro and small firm experience. However, social health insurance could also induce higher healthcare expenses incurred if recipients visit healthcare services more often or choose expensive healthcare providers.

The net effect of social health insurance on firm growth is thus theoretically ambiguous, and depends on its effect on labour productivity and owners' finance. The empirical findings on the economic effects of social health insurance in developing countries are mixed. Some conclude that social health insurance improves health outcomes (e.g., Nguyen and Wang, 2013; Rosella et al., 2010; Wang et al., 2009) and healthcare utilisation (e.g., Ahmed and Khan, 2011; Gruber et al., 2012; Nguyen and Wang, 2013; Wagstaff and Prahan, 2005; Yip et al., 2008), and reduce medical

expenses (Babiarz et al., 2010; Levine et al., 2015; Nguyen et al., 2012; Wagstaff, 2010). However, social health insurance may not always work for everything: some papers find social health insurance reduces financial risk but has no impact on health outcomes (Barros, 2008) or healthcare utilisation (Babiarz et al., 2010; Nguyen, 2011b; Thornton et al., 2010; Wagstaff, 2010); and some further argue that higher healthcare utilisation is associated with higher financial burden (Wagstaff et al., 2009; Palmer et al., 2015).

The literature on internal finance suggests that, theoretically, internal finance correlates positively with small firms' growth, but the correlation differs by the degree of external financial constraints (Carpenter and Petersen, 2002a; Pál and Kozhan, 2009). Without the access to external finance, firms' investment is sensitive to the availability of internal funds, and the effects are particularly pronounced for small and young firms (Carpenter et al., 1994; Carpenter and Petersen, 2002b; Oliner and Rudebush, 1992). However, if small firms are able to finance their investment through bank loans or equity finance, the effects of internal finance on firms' growth would become smaller (Carpenter and Petersen, 2002a; Cleary, 1999; Kadapakkam et al., 1998).

Empirical studies support the hypothesis that small firms' growth depends primarily on internal finance, and small firms use little outside credits. One reason is that high agency costs and imperfect capital market make raising external finance relatively costly and difficult (Gertler, 1988; Gertler and Hubbard, 1988; Hubbard and Kashyap, 1990; Myers, 1984). Moreover, difficulties dealing with banks, collateral requirements, and high interest rates also constrain small firms to obtain external finance (Beck et al., 2005; Demirgüç-Kunt and Klapper, 2012). However, small firms can still grow if public policies help them to obtain external finance or improve their

productivity. For instance, good institutional development on financial intermediary, stock market and legal system can improve small firms' access to external funding (Audretsch and Elston, 2002; Beck et al., 2005; Beck et al., 2006; Beck et al., 2008). Even when external financial constraints are binding, small firms may generate funds internally through enhancing productivity and cost minimisation (Guariglia et al., 2011; Musso and Schiavo, 2008).

I answer the research question by using the data on about 5,900 micro and small firms in non-farm sector in Indonesia. The dataset I use comes from the fourth wave of the Indonesia Family Life Survey (IFLS-4), which the RAND Corporation did in 2007; it includes a representative sample of about 83% of Indonesian population living in 13 of 26 provinces. The survey has various firm- and household-level information that allow me to construct multiple measures of firm growth and family hardships as well as to control for a large number of observed characteristics in estimating the causal effects of social health insurance.

To identify how the exogenous variation in *Askeskin* status affects firm growth, I implement a regression-control strategy by controlling for the variables used by the government to identify *Askeskin* recipients and observable differences in micro and small firms. In some specifications, I find *Askeksin* partially helps owners of micro and small firms withstand family hardships: *Askeskin* reduces the adverse effects of deaths in the family in the previous year, outpatient care, and traffic accidents on firms' net profits; *Askeskin* also protects the firms' total assets against owners' outpatient care need. However, I find, among households that did not experience sickness and deaths in the family in the previous year, *Askeskin* household firms have smaller total assets and net profits. As for the effects of family hardships, I find owners' outpatient care need

reduces both total assets and net profits of non-*Askeskin* household firms, but I do not find other family hardships matter.

Building on the previous literature, my contribution is three fold. One, I examine whether social health insurance helps micro and small firms cope with family hardships experienced by the owners—the first in the literature that study the indirect effect of social health insurance on micro and small firms. A large literature has studied how social health insurance affects health outcomes, healthcare utilisation, and healthcare spending (e.g., Acharya et al., 2013; Bellows et al., 2011; Cotlear et al., 2015; Ekman, 2004; Lagarde and Palmer, 2011; Meyer et al., 2011); however, there is almost no evidence on what happens to these people who become healthier and more financially viable later in life. Only very few papers have studied other effects of social health insurance (Babiarz et al., 2010; Yip et al., 2008.), and none has casted the light on whether social health insurance affects the growth of micro and small firms.[22] My findings can provide some insights for policymakers to evaluate more aspects of the return to social health insurance, a programme that has proven to be politically popular in many developing countries.

Two, I also contribute to the empirical literature on internal finance that studies the relationship between internal finance and small firms' growth. Some examples are Angelini and Generale (2008), Beck and Demirgüç-Kunt (2006), Carpenter and Petersen (2002a), and Vargas (2012). These papers find financially unconstrained small firms grow faster than those firms that lack internal finance. Several papers suggest that good institutional development and direct financial aids make external finance more

[22] Babiarz et al. (2010) discuss the effects of social health insurance on clinical outcomes such as weekly patient flow, average monthly income of clinics, and the proportion of monthly gross income from medicine sales; Yip et al. (2008) relate social health insurance to the probability of village visits in China.

accessible and lack of internal funds less harmful to micro and small firms (Audretsch and Elston, 2002; Beck et al., 2005; 2008; Beck, Demirgüç-Kunt et al., 2006; Hyytinen and Toivanen, 2005). However, none of these papers extends the discussion on how the access to external finance or alleviation of internal financial constraints helps micro and small firms recover from the owners' experience of family hardships. De Mel et al. (2011) is the only paper from a similar line of literature that studies the effects of a randomly allocated grant on microenterprises' recovery from a major natural disaster in developing countries. I fill the gap by studying whether social health insurance a useful external source that speeds up the recovery process of micro and small firms following a family hardship, and I find some evidence that it does.

Three, I add to the studies that have focused on policies that aim to improve the access to finance and financial viability of micro and small firms in developing countries. Microfinance and microinsurance may be the most commonly used interventions for the poor. However, there is debate over the effectiveness and the outreach of these programmes (Banerjee et al., 2014; Banerjee et al., 2015; Cole et al., 2013; Rooyen et al., 2012; World Bank, 2008b).[23] Some recent studies find, using a randomised controlled trial, little impact of the two programmes on firm profits and growth in several countries: for example, India (Banerjee et al., 2015), Mexico (Angelucci et al., 2015), and Morocco (Crépon et al., 2015). I contribute to this policy evaluation literature by studying the effect of social health insurance, which also targets the poor but has better outreach. I include the poor who run a micro and small firm only, in contrast to previous studies that have used a sample of the poor who may or may not own a micro and small firm.

[23] Rooyen et al. (2012) provide a good review of literature on microfinance.

This chapter proceeds as follows. Section 3.2 describes the *Askeskin* programme. Section 3.3 summarises the empirical literature on internal finance, family hardships, and social health insurance. Section 3.4 describes the empirical strategy and the data. Section 3.5 presents the results, and section 3.6 concludes.

3.2 The Social Health Insurance in Indonesia—*Askeskin*

When Indonesia adopted a multipart National Social Security System (Law 40/2004), only about 28 percent of the Indonesian workers were covered by formal insurance: 17 percent by *Askes*, *Asabri*, and *Taspen* for the public sector and 11 percent by *Jamsostek* for the private sector (ILO, 2008; Mboi, 2015).[24] About 67% of the workers, who were in informal sector or non-complying small firms, were uninsured. Even within the formal sector, only under half of the employed workers were active members of social insurance funds; the number declined when workers shifted to informal sector due to an economic slowdown (ILO, 2008).

The government introduced the *Askeskin* programme in 2005 to cover who were left out—the poor and workers in the informal sector. It covered up to 60 million people in 2005, which increased rapidly to 76.4 million in 2007 and more than 120 million in 2014. The programme was renamed *Jamkesmas* (*Jaminan Kesehatan Masyarakat*,

[24] *Askes* stands for *Asuransi Kesehatan* (Health Insurance for Civil Servants); *Asabri* stands for *Asuransi Social Angkatan Bersenjata Republik Indonesia* (Health Insurance for the Armed Forces and Police), *Taspen* stands for *Dana Tabungan and Asuransi Pegawai Negeri* (The Fund for Civil Servants); and *Jamsostek* stands for *Jaminan Social Tenaga Kerja* (Social Insurance for Private Sector Workers). The *Askes* scheme covers civil servants and their families, as well as retirees of the civil service, including those from the military. All the beneficiaries contribute two percent of their base salary regardless of the number of dependants. *Jamsostek* is the health insurance for formal private sector workers. The scheme requires employers to contribute three to six percent of private sector workers' salaries, depending on the marital status of the beneficiary (ILO, 2008).

Community Health Insurance) in 2008 to include the near-poor and then *JKN* (*Jaminan Kesehatan National*, National Health Insurance) in 2014 to integrate all state-owned health insurance schemes into a single scheme, making it one of the largest social health schemes in the world (EIU, 2014; Cotlear et al., 2015).

To provide comprehensive and high-quality care to its beneficiaries, *Askeskin* offered generous benefits. Each beneficiary was entitled a fully subsidised premium of Rp 5,000 per month (about US$6 per year in 2005), which the government financed through the central government's budget from the energy subsidy reductions.[25] The beneficiaries and their dependents could receive free treatment, including basic outpatient care, third-class inpatient treatment in grade A-D hospitals, obstetric service package at the public health centre (*Puskesmas*), mobile health services and special services for remote areas, immunisation programmes, and medicines.[26] Only public healthcare providers participated in the programme, but not until the third year that about 120 private hospitals joined to serve the poor (Sparrow et al., 2013; Thabrany, 2008).

The targeting process of *Askeskin* was flexible and varied across districts. BPS (*Badan Pusat Statistik*, Statistics Indonesia) identified recipients using a proxy means test with 14 asset indicators and produced a list of eligible recipients and quotas for each district.[27] The district government, however, could conduct their own surveys and

[25] The premium rate increased to Rp 6,500 per person per month under *Jamkesmas* in 2007 (EIU, 2014). After the programme evolved into *JKN*, only the poor and the near poor received free coverage, other insurance programmes (i.e., for civil servants, the military, the police, pensioners, and staff of state enterprises) involved financial contributions by both the employer and the employee (Mboi, 2015).

[26] Type D hospitals provide basic secondary care at district level, type C hospitals cover secondary and tertiary care in larger districts, type B hospitals give referral care at provincial level, and type A hospitals serve national referral care. See Thabrany (2008) for more details.

[27] The indicators are: (1) floor type; (2) wall and roof type; (3) toilet facility; (4) electrical source; (5) cooking fuel source; (6) drinking water source; (7) frequency of meat consumption; (8) frequency of meal consumption; (9) frequency of purchase of new clothes; (10) access to

draw up their own list of recipients. The targeting process identified eligible households, but the membership of *Askeskin* was individual, with each member in a poor household entitled to hold an *Askeskin* card. In the first year of the *Askeskin* programme, the JPS (*Jaring Pengaman Social*, Social Safety Net) health card and SKTM (*Surat Keterangan Tidak Mampu*, village poverty letters) were accepted to claim the insurance benefits (Arifianto et al., 2005; Harimurti et al., 2013; Sumarto and Bazzi, 2011).

Under *Askeskin*, the government's health insurance agency, *PT Askes*, was responsible for reimbursement of money to healthcare providers, but the Ministry of Health took over the administrative role in 2008. *PT Askes* received money from the Ministry of Health annually and disbursed the funds to hospitals quarterly, and charged ten percent of the premiums for administrating and promoting *Askeskin*. The agent paid primary care services by capitation and reimbursed hospitals on a fee-for-service basis for both inpatient and outpatient care. However, the reimbursement process was inefficient: Hospitals either did not receive the funds or received the money in the last quarter of the year; moreover, the budget allocated was insufficient to pay the total claims. In 2008, the Ministry of Health replaced *PT Askes* as the administrator because *PT Askes* failed to deliver the required services (Thabrany, 2008; World Bank, 2012).

In the first year of its implementation, *Askeskin* faced a number of challenges. First, targeting the poor was challenging. The programme suffered from considerable inclusion and exclusion errors; the leakages to the non-poor were large and many of the poor were not captured (Sumarto and Bazzi, 2011). Second, the reimbursement process

public health facilities; (11) primary source of income; (12) educational attainment of household head; (13) amount of savings and type of assets; and (14) floor width. Unfortunately, the data used to devise the official proxy-means test are not available to researchers (Sumarto and Bazzi, 2011).

was inefficient. *Askeskin* funds were misallocated and the Ministry of Health had shortage of funds to reimburse hospitals in time. Some hospitals rejected serving the poor because their previous claims had not been paid (Thabrany, 2008). Third, poor public information caused low utilisation of *Askeskin* card. Both recipients and healthcare providers were unclear about the procedures to beneficiaries, administrative procedures, and responsibilities for healthcare providers (Bachtiar et al., 2006). Fourth, the access to basic primary care services was unequal across Indonesia. Health workers, such as doctors and midwives, were unevenly distributed, and the problem was particularly pressing in remote rural areas (World Bank, 2008a). Fifth, scepticism of the programme had left *Askeskin* card underutilised. Some recipients preferred not to use their cards to avoid perceived stigmatisation from health providers and longer waiting times due to additional administrative requirement. Some also perceived *Askeskin* financed care as being inferior quality to that self-paying care (Harimurti et al., 2013).[28]

The government has tried to improve the *Askeskin* programme. It refined the targeting system, through the National Targeting System and Unified Data Base for Social Protection Programmes, to minimise targeting errors and reduce leakages and under-coverage.[29] It also improved healthcare delivery and financing by upgrading health facilities, expanding the number of beds at hospitals, improving service quality of health providers, and improving the provision of health services in rural and remote

[28] See also Alatas et al. (2013), ILO (2008), Perdana (2014), Simmonds and Hort (2013), Sumarto and Bazzi (2011), and Thabrany (2008) for various challenges that the *Askeskin* programme encountered.

[29] The targeting system is for all the social assistance programmes in Indonesia, including BLT (*Bantuan Langsung Tunai*, Direct Cash Transfer), PKH (*Program Keluarga Harapan*, Family of Hope Program), Raskin (*Beras untuk Keluarge Miskin*, Rice for the Poor Program), Jamkesmas (*Jaminan Kesehatan Masyarakat*, health insurance) and BSM (*Beasiswa untuk Siswa Miskin*, scholarship for poor children) during the period after 1997 – 98 Asian Financial Crisis. See Hastuti et al. (2012), Sumarto and Bazzi (2012), and Perdana (2014) for more details of the programmes.

areas. Moreover, in 2011, the government enacted the BPJS (*Badan Penyelenggara Jaminan Social*, Social Security Administrator Body) law to pool and harmonise fund reimbursements and administration of all insurance schemes in Indonesia (Harimurti et al., 2013).

Some recent papers evaluate the operation of *Askeskin* and find the programme has favourable impacts on the access to healthcare services, healthcare utilisation, and out-of-pocket health expenditure among the poor. For example, Aji et al. (2013) find that out-of-pocket health expenditures for *Askeskin* recipients are 11-34 percent lower than that of for non-recipients. Sparrow et al. (2013) conclude that *Askeskin* improves access to healthcare services through increased outpatient care utilisation. Quayyum et al. (2009) find that *Askeskin* provides some degree of financial protection to households in the poorest quintiles in Serang and Pandeglang districts of Banten Province that incur catastrophic payments.

3.3 Literature Review

3.3.1 Internal Finance Theory of Growth

The model of internal finance posits that growth of small firms is often constrained by the quantity of internal finance. Theoretically, the effects of internal finance on growth in assets differ by the degree of external finance constraints: (i) when external finance constraints are binding, a marginal dollar of internal finance will generate a dollar of growth in assets; (ii) if firms can access to debt, which depends on firms' collateral, an additional dollar of internal finance will generate slightly more than a dollar of growth

through a "leverage effect";[30] and (iii) the relationship becomes much weaker when firms are able to obtain external equity finance (new share issues). Most small firms raise little external finance, thus their growth is constrained by the availability of internal finance (Carpenter and Petersen, 2002a).[31]

Even though external finance brings higher growth in assets, most small firms use limited external finance due to large wedge between the costs of internal and external finance (Hubbard, 1998; Shiantarellie, 1996). The marginal cost of obtaining external finance (debt and new share issues) is higher than that of internal finance because: One, asymmetric information limits lenders' ability to monitor small firms' use of funds and investment outcome; therefore, small firms incur relatively high cost of credits. Small firms also have less collateral, higher risk of financial distress, higher risk of moral hazard, and are more likely being credit rationed. Two, small firms may not prefer issuing shares either because of issue costs, adverse selection problems and lemon premiums. Even the wedge is modest, small firms may also forgo external finance because low-cost funds are desirable to keep them competitive in the market.[32]

[30] The leverage effect of debt increases the return of capital employed through the surplus generated between the return of capital and the cost of debt.
[31] The quantitative prediction of the three assumptions follows only if one examines the expansion of the entire set of assets of the firm. Carpenter and Petersen (2002a) use change in total assets that includes all investment uses of internal finance to examine the growth of the whole firm. By contrast, in the literature that examines the growth of an individual component (e.g., fixed investment or physical investment), regressions of the individual component on internal finance have estimates below unity, which implies the fact that each dollar of additional finance must allocated across several types of investment, not just the individual component.
[32] Small firms tend to operate at a growth rate where marginal revenue of expansion equals marginal cost of finance. Marginal revenue of expansion, which measures the marginal returns to expanding firms' assets, is the multiply of marginal revenue and marginal physical product. Small firms have elastic marginal revenue because of competitive market and trivial market shares; marginal physical product is also elastic in the sense that diminishing returns are unlikely to take place as fixed inputs are not required for the growth of the whole firm. See Carpenter and Petersen (2002a; 2002b) for more details.

3.3.2 Firms' Growth and Financial Constraints

Why are internal funds important to micro and small firms? Some studies find that internal funds are the primary source of finance for small firms, which determines firms' growth. In a paper that examines internal finance theory of growth, Carpenter and Petersen (2002a) find a significant and slightly greater than a dollar-for-dollar relationship between internal finance and small firms' growth; the relationship, however, becomes weaker if small firms can access to external finance. Pál and Kozhan (2009) find a smaller effect of internal finance in Europe: A euro increase in internal funds generates less than a euro of income for small firms though the effect of short-term credits is larger. A number of papers also find evidence that internal finance fosters the growth of small firms and that financially constrained small firms grow slower (see, e.g., Angelini and Generale, 2008; Beck and Demirgüç-Kunt, 2006; Hutchinson and Xavier, 2006; Mateev and Anastasov, 2010; Musso and Schiavo, 2008; Rein, 2003; Vargas, 2012).[33]

Some studies report that most micro and small firms finance their activities primarily through internal funds rather than raising external funds (see, e.g., Beck et al., 2006; Beck et al., 2008; Daskalakis et al., 2013). Internal funds are the first preference for small firms because agency costs and capital market imperfections make raising external funds relatively costly and difficult to small firms (Gertler, 1988; Gertler and Hubbard, 1988; Hubbard and Kashyap, 1992; Myers and Majluf, 1984).[34] Moreover,

[33] See Appendix B for the discussion on whether availability of internal funds defines financial constraints for small firms.

[34] See also Clementi and Hopenhayn (2006) for theory of endogenous financing constraints that argues borrowing constraints arise as part of the optimal design of a lending contract under asymmetric information; Mateev et al. (2013) and Myers and Majluf (1984) for the discussion of pecking-order theory that explains—due to information asymmetries in capital markets—SMEs have a "pecking order" of preferred capital sources in which retained earnings will be the first source accessed, followed by bank debt, private external equity, and the public debt or equity; Bernanke and Gertler (1989) for the effects of agency costs on premiums on external

other external financial obstacles such as difficulties dealing with banks, collateral requirements, high interest rates, and lack of money in the banking system also deter small firms from raising external funds (Beck et al., 2005; Demirgüç-Kunt and Klapper, 2012). Many small firms find it difficult to raise external funds, and thus retained earnings are a key determinant of growth (Carpenter et al., 1994; Carpenter and Guariglia, 2008; Guariglia, 2008; Mercer and Morgan, 1972; Rahaman, 2011).

There are several pathways for micro and small firms to secure their growth from the effects of financial obstacles. Some papers highlight the role of public policies in alleviating external financial obstacles. For example, good institutional development such as financial intermediary development, stock market development, legal system efficiency, and elimination of corruption can improve the access to external funding (Audretsch and Elston, 2002; Beck et al., 2005; 2006; 2008). Providing direct financial aids to small firms is another mechanism the government can reduce financial obstacles for micro and small firms (Hyytinen and Toivanen, 2005). On the other hand, others argue, even in the presence of external financing constraints, small firms may generate funds internally through global engagement (Bridges and Guariglia, 2008), productivity enhancement (Guariglia et al., 2011), and cost minimisation (Musso and Schiavo, 2008).

3.3.3 Economic Effects and Welfare Effects of Family Hardships

Reducing labour supply in a household is one effect that family hardships have on financial status of the household. For example, Khan et al. (2015) argue that, in

funds; and Myer (1977) and Gupta (1982) on determinants of borrowing or choosing external finance. For a recent survey of financing constraint literature, see Abdulsaleh and Worthington (2013).

Bangladesh, deaths of family members reduce labour supply and hence the income of the poor. Karan et al. (2014) report that, in India, heart diseases and cancer reduce workforce participation. Lindelow and Wagstaff (2005) and Zhang et al. (2014) find, in China, health shocks are associated with a substantial reduction in income.[35] The effect of family hardships can be transitory, as Beegle (2003) finds in reduced farms activities and wage employment in Tanzania, or last more than three years as Yamano and Jayne (2004) find on crop production and asset level for farmers in Kenya. On the other hand, Bachmann and Booysen (2003) and Powell-Jackson and Hoque (2012) find little evidence of ill health affects income of households.

Medical payments are another way that family hardships affect financial resources of households. Khan et al. (2015) and Powell-Jackson and Hoque (2012) find, in Bangladesh, morbidity and maternal illness result in a large reduction in household resources, driven almost entirely by spending on healthcare. Studies that find similar results (for various family hardships) include Alam and Mahal (2012a) for South Asia, Bales (2013) and Mitra et al. (2016) for Vietnam, Karan et al. (2014) for India, Lindelow and Wagstaff (2005) for China, Mahal et al. (2008) for Nigeria, Murphy et al. (2013) for Ukraine, and Wagstaff and Lindelow (2014) for Laos. However, Somkotra and Lagrada (2009) argue that some spending on healthcare are not imperative because households' voluntary choice to seek care from more costly private providers.

In addition to household income or financial resources, family hardships may influence households in other ways. Affected households may cut their consumption (Beegle et al., 2007), reduce their expenditure (Wagstaff, 2007), sell productive assets

[35] See also Beegle et al. (2007) for, in Tanzania, the effect of an adult death on income growth; Cai (2010) for the relationship between health and labour supply in Australia; Pohl et al. (2013) for the impact of accidents on employment in Chile; and Bales (2013) for the effect of severe illness, adult death and onset of disability on labour supply in Vietnam.

(Alam and Mahal, 2014a), reduce schooling for children (Mitra et al., 2016), deplete their savings (Wagstaff and Lindelow, 2014), or borrow money (Khan et al., 2015) to cope with family hardships.[36] Some may even become more likely to engage in low risk but low return activities, hold more liquid but less productive assets, and reduce their investment (Dercon, 2002). Such strategies, however, can have implications for chronic poverty and long-term welfare effects for the households' ability to generate income and to cope with future hardships (De Weerdt and Dercon, 2006; Gertler and Gruber, 2002). Nevertheless, some claim that the effects of family hardships are transitory (Davies, 2010) and some report no effect of family hardships on consumption and expenditure (Bales, 2013; Beegle, 2003; Khan et al., 2015; Lindelow and Wagstaff, 2005; Powell-Jackson and Hoque, 2012; Townsend, 1994).[37]

Some studies show that the effects of family hardships appear to vary across subgroups and types of outcome. Financial risk of family hardships appears to be more pronounced on, for example, the poor (Bales, 2013; Dercon and Krishnan, 2000), women and female-headed households (Mitra et al., 2016; Pohl et al., 2013), rural areas (Mitra et al., 2016), people with lower socioeconomic status (Karan et al., 2014; Shi et al., 2011) and less educated individuals (Pohl et al., 2013; Rocco et al., 2011).[38]

In the case of Indonesia, the evidence on welfare and economic outcomes of family hardships is mixed. Genoni (2012) reports that illness episodes reduce earnings significantly, but the effects on consumption are relatively small and statistically

[36] See also Bachmann and Booysen (2003); Carrin et al. (1999); Dercon et al. (2005); Duraisamy et al. (2006); Karan et al. (2014); Leive and Xu (2008); Mahal et al. (2013); Mitra et al. (2015); Murphy et al. (2013); Wagstaff and van Doorslaer (2003); Wagstaff and Lindelow (2014); Yamauchi et al. (2008); and Yilma et al. (2014) for more examples about various household outcomes.
[37] See Alam and Mahal (2014b) for the review of literature on the economic impacts and welfare impacts of health shocks.
[38] Some papers report that households in urban areas are more vulnerable to family hardships, see Begum and Sen (2004); Günther and Harttgen (2009); and Wagstaff (2007).

insignificant, and there is no evidence of asset depletions. Sparrow et al. (2014)'s findings corroborate Genoni's results. Gertler and Gruber (2002) find a weak relationship between consumption and illnesses as the healthcare is heavily subsidised in the country. Thomas et al. (2006) find evidence of health has a causal effect on economic prosperity of male members, but the effect is much weaker among females.

Several papers in the limited literature find family hardships hamper small firms' growth through various channels. For example, Axel (2016) finds, in Vietnam, sickness in the family generates income loss to microenterprises through the inverse relationship between catastrophic health expenditures and investment. Isoto et al. (2016) find, in Uganda, uninsured health shocks reduce the productivity of credit-constrained farm households, but access to microcredit mitigates partially the negative effects. Nguyet and Mangyo (2010) find, in Indonesia, health shocks reduce the labour hour worked by household heads, and the effects are stronger in farm than in non-farm households. By contrast, Parinduri (2014) finds no impact from sickness in the family; instead, deaths of family members reduce micro and small firms' total assets, and the adverse effect is greater on relatively small firms. De Mel et al. (2011) find, in Sri Lanka, lack of access to capital inhibits microenterprises' recovery following a natural disaster, and firms that receive randomly allocated grants recover profit levels better and faster than other damaged firms.

3.3.4 Impacts of Social Health Insurance

Most studies use healthcare utilisation as the primary outcome of whether health insurance improves access to healthcare services. Several reviews of literature report favourable outcome of health voucher programmes, community-based health insurance,

social health insurance and removal of user fees on healthcare utilisation (see, e.g., Bellows et al., 2011; Lagarde and Palmer, 2011; Meyer et al., 2011; Spaan et al., 2012). In the context in developing countries, empirical studies in Vietnam show that health insurance schemes such as voluntary health insurance, Free Health Care for Children under Six programme, and Vietnam's Health Insurance (VHI) improve inpatient and outpatient care utilisation among adults and children (Nguyen, 2011a; Nguyen and Wang, 2013; Wagstaff and Prahan, 2006). Maternal health voucher programme in Bangladesh also increases the use of maternal healthcare and formal health services, especially among the poor (Ahmed and Khan, 2011; Nguyen et al., 2012). Similarly, in Thailand, the Thai 30-Baht programme has positive effects on healthcare utilisation among the poor, the elderly, and small hospitals (Gruber et al., 2012; Panpiemras et al., 2011). Health insurance in other countries, including Cambodia (Levine et al., 2015), China (Wagstaff et al., 2009; Yip et al., 2008), Colombia (Giedion and Uribe, 2009; Hassan et al., 2013; Miller et al., 2009), and Mexico (Barros, 2008) also improve the use of healthcare services.[39]

Some empirical studies, however, find social health insurance has very weak or no effects on the use of healthcare. For example, while Babiarz et al. (2010), Lei and Lin (2009), and Wagstaff and Yu (2007) find a small impact of China's healthcare reform on the use of some healthcare services, King et al. (2009) find no effect of the Mexico's Seguro Popular on the use of medical services. Similarly, Nguyen (2011a) finds, in Vietnam, no evidence on the effects of public health insurance for children's outpatient healthcare utilisation. Robyn et al. (2012) report that, in Burkina Faso, the community-based health insurance has no impact on treatment-seeking and utilisation

[39] See also Gnawali et al. (2009); Jütting (2004); Moreno-Serra and Smith (2012); Powell-Jackson et al. (2014); Smith and Sulzbach (2008); Trujillo, Portillo, and Vernon (2005); and Wagner et al. (2011).

of facility-based professional care. Thornton et al. (2010) find no indicator of Nicaragua's voluntary health insurance programme improves healthcare utilisation among informal sector workers.

In addition to improving utilisation of health care, many health insurance in developing countries provide financial protection to the targeted population against family hardships. For instance, in Bangladesh, poor women who receive cash incentives from the voucher programme incur a smaller payment for maternal services (Nguyen et al., 2012). Similarly, the SKY micro health insurance programme in Cambodia has statistically strong impacts on cutting out-of-pocket health spending (Levine et al., 2015). Rural Medical Health Care (RMHC) and New Rural Cooperative Medical Scheme (NCMS) in China, with adequate coverage of illnesses, are effective in providing financial risk protection (Babiarz et al., 2010; Wagstaff and Yu, 2007; and Yip and Hsiao, 2009). Public health insurance in Colombia protects the poor from financial risk associated with medical cost and incidence of catastrophic health spending (Giedion and Uribe, 2009; Miller et al., 2009). In Vietnam, social health insurance and free healthcare reduce the financial burden for the poor (Nguyen, 2011a; Nguyen and Wang, 2013; Wagstaff, 2010; Wagstaff and Prahan, 2006).[40]

Healthcare, however, may not always become less burdensome financially for households with health insurance. For example, Lagarde and Palmer (2011) review the empirical literature and conclude no evidence of health expenditures decrease after removal of user fees on healthcare services. Similarly, Fink et al. (2013) find, in Burkina Faso, having a health insurance is associated with small but no statistically significant reductions in average out-of-pocket health expenditure. Health insurance in

[40] See also Barros (2008); Ekman (2004); Jütting (2004); Parmar et al. (2012); Powell-Jackson et al. (2014); Spaan et al. (2012); Thornton et al. (2010); and Wagner et al. (2011).

China, as Lei and Lin (2009), Wagstaff et al. (2009), and Wagstaff and Lindelow (2008) argue, increases rather than reduces out-of-pocket health expenditure, primarily due to increased healthcare utilisation and the insured are more likely to seek care when sick and to seek higher-level providers. Nguyen (2011a), Palmer et al. (2015) and Wagstaff (2010) report, in Vietnam, no evidence of protective effects of public health insurance against health expenditures associated with health shocks. Levy (2002) finds no evidence on uninsured households encounter higher economic risks than those insured.

Healthier population, the empirical literature argues, is another notable outcome of social health insurance. Community-based health insurance schemes, for example, improve health status in rural China (Wang et al., 2009) and reduce infant mortality rates in Brazil (Aquino et al., 2008; Macinko et al., 2006; Rocha and Soares, 2010; Rosella et al., 2010). Similarly, the universal health coverage in Thailand improves infant mortality rate among the poor through increasing the access of healthcare (Gruber et al., 2012). Studies on other countries find health insurance reduces delays in seeking care for children (Kraft et al., 2009); reduces the number of sick days of insured individuals (Nguyen and Wang, 2013; Wagstaff and Prahan, 2006); and improves health of children in the immediate post discharge period (Quimbo et al., 2011).[41]

Health insurance, however, may sometimes have little or no impact on health outcomes. In China, for example, Wagstaff and Yu (2007) find some evidence that the World Bank's Health VIII project reduces days of sickness in Gansu province, but the effects are weak on other health outcomes. Chen and Jin (2012) and Lei and Lin (2009) report no evidence of China's New Cooperative Medical Scheme improves health

[41] See also Bellows et al. (2011); Miller et al. (2009); and Moreno-Serra and Smith (2012).

status. Fink et al. (2013) find, in Burkina Faso, community-based health insurance results in negative health effects on population aged 65 and older, but no impact on health for children and working adults. Barros (2008) finds, in Mexico, weak effect of public health insurance on health outcomes. Other studies on developing countries, including Lagarde and Palmer (2011), Levine et al. (2015), and Meyer et al. (2011), conclude that health insurance has no effect on health of the targeting population.

Overall, the evidence indicates that social health insurance may not always work for everything. Some find that health insurance increases use of healthcare and protects households against financial risk but has no impact on health outcomes (Barros, 2008). In some cases, health insurance provides financial protection but does not improve healthcare utilisation (Babiarz et al., 2010; Nguyen, 2011b; Thornton et al., 2010; Wagstaff, 2010; Wagstaff and Yu, 2007). Health insurance may induce higher use of healthcare but not reduce financial burden (Nguyen, 2011a; Wagstaff et al., 2009). Besides, the insured population may have better health status but still incur high medical expenses (Palmer et al., 2015). The impacts of health insurance vary across illnesses (Wagstaff, 2010; Wagstaff and Yu, 2007), utilisation of different health care services (Gnawali et al., 2009; Panpiemras et al., 2011), and socioeconomic status (Acharya et al., 2013; Gnawali et al., 2009; Wagstaff et al., 2009).

Studies in Indonesia suggest a mixed picture of the effects of social health insurance on healthcare utilisation, financial protection and health status. Cuevas and Parker (2010), for example, find health insurance improves use of inpatient and outpatient cares for both adults and children; the impacts are greater for lower income groups and rural areas. The health insurance, however, appears to have a weak impact on the incidence of health spending and health status. Johar (2009) reports under-utilisation of health card programme because of inelastic demand for healthcare, great

variation of demand with income, health-seeking behaviour of recipients, lack of widespread promotion, and inadequate public health system. Sparrow et al. (2013) find, using difference-in-differences estimation and propensity score matching method, *Askeskin* programme increases the use of outpatient care among the poor, but increases out-of-pocket health payments in urban areas.

However, the literature of social health insurance provides little insight on other aspects of the effect of social health insurance—for example, what happens to its recipients who are healthier and more financially viable later in life. I add to the literature by studying whether social health insurance, through its interaction with family hardships, affects growth of micro and small firms; thus, my study links the three lines of literature (internal finance, family hardships, and social health insurance). I hypothesise that family hardships correlate with slower firm growth, but the correlation becomes weaker if the owners' household is insured.

3.4 Empirical Strategy and Data

3.4.1 Empirical Strategy

I use the potential outcome framework to study whether social health insurance, *Askeskin*, helps micro and small firms cope with family hardships. To simplify the exposition, I consider a simple model of the effects of *Askeskin* on total assets. Let *i* and *j* denote a firm and its owner (a household), respectively; D_{ij} the *Askeskin* status, which equals one if household *j* of firm *i* is *Askeskin* insured and zero if otherwise; and Y_{ij} the total assets of firm *i* owned by household *j*. Equation 3.1 below shows the causal effects of *Askeskin* on firm *i*'s total assets:

$$Y_{ij} = \alpha + \beta D_{ij} \quad (3.1)$$

The coefficient of *Askeskin* status, β, measures the causal effect of *Askeskin*, which is also the differences in potential total assets (or net profits) by *Askeskin* status: for example, Y_{1ij} is firm *i*'s potential total assets if household *j* is insured, while Y_{0ij} the potential total assets if household *j* is not insured—that is, I can rewrite equation 3.1 as $Y_{ij} = Y_{0ij} + (Y_{1ij} - Y_{0ij})D_{ij}$. Nevertheless, we can never observe both potential total assets for firm *i* at the same time: if household *j* is insured, we get to observe Y_{1ij} but not Y_{0ij}; likewise, if the household is uninsured, we observe only Y_{0ij}. So, in practice, we need to estimate the individual causal effects of *Askeskin* on firm *i*'s total assets.[42]

Alternatively, I approximate the causal effects of *Askeskin* by the average of $(Y_{1ij} - Y_{0ij})$, in which I rewrite as $E[Y_{1ij}|D_{ij} = 1] - E[Y_{0ij}|D_{ij} = 1]$ or $E[Y_{1ij} - Y_{0ij}|D_{ij} = 1]$ where $E[Y_{1ij}|D_{ij} = 1]$ is the total assets of *Askeskin* household firms if the households are insured; $E[Y_{0ij}|D_{ij} = 1]$ is the total assets of *Askeskin* household firms if the households had not been insured. Under plausible settings, non-*Askeskin* household firms that have similar characteristics can be the counterfactual for *Askeksin* household firms, and $E[Y_{0ij}|D_{ij} = 1]$ can be approximated by the average potential outcome of non-*Askeskin* household firms. Therefore, I compare the total assets between *Askeskin* household firms and non-*Askeskin* household firms to estimate the causal effect of *Askeskin*.

A comparison of total assets by *Askeskin* status, however, does not give us the average causal effect of *Askeskin*. Equation 3.2 below shows that the average difference

[42] See Chapter 2 in Angrist and Pischke (2009) for potential outcome framework.

between the two groups of firms can be the result of not only *Askeskin* status but also differences in the firms' characteristics and other factors.

$$E\left[Y_{ij}\middle|D_{ij}=1\right]-E\left[Y_{ij}\middle|D_{ij}=0\right]=E\left[Y_{1ij}\middle|D_{ij}=1\right]-E\left[Y_{0ij}\middle|D_{ij}=1\right]$$
$$+\left\{E\left[Y_{0ij}\middle|D_{ij}=1\right]-E\left[Y_{0ij}\middle|D_{ij}=0\right]\right\} \quad (3.2)$$

The term $E\left[Y_{1ij}\middle|D_{ij}=1\right]-E\left[Y_{0ij}\middle|D_{ij}=1\right]$ is the average causal effects of *Askeskin* on total assets of *Askeskin* household firms. The other term, $E\left[Y_{0ij}\middle|D_{ij}=1\right]-E\left[Y_{0ij}\middle|D_{ij}=0\right]$, where $E\left[Y_{0ij}\middle|D_{ij}=1\right]$ is the total assets of *Askeskin* household firms if the households had not been insured and $E\left[Y_{0ij}\middle|D_{ij}=0\right]$ is the total assets of non-*Askeskin* household firms, is selection bias that captures the differences in total assets attributed to other factors regardless of the households' *Askeskin* status.

Selection bias, which contaminates the causal estimation of equation 3.2, can be a result of omission of variables—both observed and unobserved—that correlate with firms' total assets and *Askeskin* status. For example, a larger household with more household members (workers) may have its firm grows faster and is more likely to be insured than that of a smaller household—household size correlates positively with total assets and *Askeskin* status. Some variables such as those the authority used in the proxy means test to identify eligible *Askeskin* recipients are not made public; therefore, these variables may not be observable by researchers.

I use regression-control strategy to estimate the average causal effect of *Askeskin* by conditioning on a vector of observed control variables, which helps to remove selection bias. If the conditional independence assumption (CIA) is satisfied, the potential outcomes are orthogonal to the *Askeskin* status conditional on a vector of observed characteristics, X_{ij}, and selection bias disappears.

$$\{Y_{0ij}, Y_{1ij}\} \perp\!\!\!\perp D_{ij}|X_{ij} \tag{3.3}$$

Equation 3.3 shows that *Askeskin* status (D_{ij}), the causal variable of interest, is independent of the potential outcomes (Y_{0ij}, Y_{1ij}), after we conditional it on the observed characteristics (X_{ij}). Equation 3.4 shows that, given CIA, conditional on X_{ij}, comparisons of average total assets between firms have a causal interpretation:

$$E\left[Y_{ij}\middle|\, X_{ij}, D_{ij} = 1\right] - E\left[Y_{ij}\middle|\, X_{ij}, D_{ij} = 0\right] = E[Y_{1ij} - Y_{0i}|X_{ij}] \tag{3.4}$$

By including observed characteristics (X_{ij}) that correlate with total assets and *Askeskin* status in the regression, these characteristics capture the confounding effects and eliminate the bias in the estimation of the effect of *Askeskin*. Based on the law of iterated expectations, conditional on observed characteristics also helps to eliminate the bias from omitted unobserved variables.

$$E\left(Y_{ij}\middle|X_{1ij}, X_{2ij}, D_{ij} = 1\right) = E\left(Y_{ij}\middle|X_{1ij}, D_{ij} = 1\right) \tag{3.5}$$

Equation 3.5 shows that the average effect on total assets conditional on observed characteristics, X_{1ij}, only is equivalent to those conditional on both observed characteristics, X_{1ij}, and unobserved characteristics, X_{2ij}. Local governments select eligible households by a means test score with 14 asset indicators, so households that get *Askeskin* should have similar—both observed and unobserved—characteristics.[43] By controlling for observed characteristics and asset indicators indicating households' eligibility, we can overcome selection bias.[44]

[43] See footnote no. 27 for further details.
[44] See Chapter 2 in Wooldridge (2010) for discussion of conditional expectations, independence assumptions and law of iterated expectations; Chapter 3 in Angrist and Pischke (2009) and Chapter 2 in Angrist and Pischke (2015) for regression-control strategy and conditional

To answer the question on whether *Askeskin* helps owners of micro and small firms withstand family hardships, I use the following specification to examine the causal effects of *Askeskin*:

$$Y_{ij} = \alpha + \beta D_{ij} + \gamma H_{ij} + \pi D_{ij} H_{ij} + \delta X_{ij} + \varepsilon_i \quad (3.6)$$

where Y_{ij} is total assets (or net profits) of firm *i* owned by household *j*; D_{ij} is an indicator of whether household *j* of firm *i* is *Askeskin* insured; H_{ij} is an indicator of whether household *j* of firm *i* experienced deaths of family members in the previous year (family hardships); $D_{ij}H_{ij}$ is the interaction between *Askeskin* and family hardships; X_{ij} is a vector of control variables (household-, firm-, and owner characteristics, and knowledge of health facilities that may correlate with whether an owner has *Askeskin*, whether she experienced family hardships and total assets of her firm); and ε_i is the error term. I also include a set of district fixed effects (to control for differences across districts that may affect firm performance) and dummy variables for whether household *j* of firm *i* has other type of insurance. I cluster the standard errors at the district level as *Askeskin* is assigned by district governments. I use ordinary least squares (OLS) regression to estimate equation 3.6; the coefficient of interest is π, which measures the change in the effect of family hardships by *Askeskin* status.

To make *Askeskin* household firms and those owned by non-*Askeskin* households more comparable, I control for all observed characteristics available in the data that may correlate with *Askeskin* status, family hardships, or firm performance. First, I control for household characteristics, which are the indicators used in the proxy means test for selecting *Askeskin* recipients, as well as other characteristics that indicate

independence assumptions; and Dale and Krueger (2002) for an excellent example of how selection on observables eliminates omitted variable bias.

a household's living conditions.[45] Second, I include firm characteristics that may correlate with the variables of interest. For example, the number of family workers may affect the firms' total assets and the probability of a household experiences family hardships. Third, I also control for owners' characteristics and households' knowledge of the location of healthcare services. Owners who have a larger household, for example, are more likely to earn more, experience family hardships and be *Askeskin* recipients; older and more experienced owners are more likely to run their firm better and experience family hardships than younger ones. Besides, knowing the location of the nearest healthcare facility may help to improve human capital and firm performance and reduce the probability of a household experiences family hardships. These control variables are past characteristics; therefore, they are not themselves potential outcome variables caused by *Askeskin* status.

3.4.2 Data and Variables

I use the data from the third and the fourth rounds of the Indonesian Family Life Survey (IFLS) that the RAND Corporation did in 2000 and 2007-2008, respectively. The survey covers a representative sample of about 83 percent of the Indonesian population living in 13 of the 26 provinces in Indonesia; it collects detailed information on individual respondents, their families, their households, and the communities that they live. I use the individual- and household-level variables: businesses, assets, use of healthcare and health insurance, consumption, expenditure, housing characteristics, and demographics. While I get the dependent and independent variables from IFLS-4, I use

[45] See Sumarto and Bazzi (2011) or footnote no. 27 for the 14 asset indicators used in the proxy means test; see also Australian Agency for International Development (2011), Cotlear et al. (2015) and Grosh et al. (2008).

the data from IFLS-3 for the control variables to ensure that I use only past characteristics as control variables.[46]

The sample I use includes 6,197 firms in non-farm sector that are owned by 4,919 households (some households own more than one firm); majority of them are micro firms in the service industries.[47] About 75 percent of the firms are in the service industries, 12 percent in the manufacturing industries, and 2 percent in the agricultural industries, with almost all hire less than ten paid workers. In the service industries, restaurants, food sales, and non-food sales account for 70 percent of the firms; in the manufacturing industries, construction, food processing, and clothing are the main business activities; and in the agricultural industries, farming, forestry, and fishery are the key business type. I exclude firms that hire 50 or more paid workers, those owned by households that hold a health card in 2004 or earlier, lost *Askeskin* in 2006-2008, or enrolled in *Askeskin* in 2008. The final sample consists of 5,901 micro and small firms.[48,49]

I use two measures of firm performance (the dependent variable): total assets and net profits, which I get from the nonfarm business module (Book 2) of IFLS-4. Total assets include the values of all non-farm assets: land, building, vehicles, and other non-farm equipment. I construct the value of net profits from a question on the amount of net profits generated by a business in the previous year. For those respondents who did not know their net profits, I use total revenue less total expenses to replace the

[46] The data are available at http://www.rand.org/labor/FLS/IFLS/html. See Strauss et al. (2004), Strauss et al. (2009a), and Thomas et al. (2012) for more details.
[47] In this chapter, I exclude farm businesses because I want to focus on micro and small firms. Moreover, variables for firm characteristics, which I use as control variables, are different between nonfarm and farm businesses.
[48] In the first year of the *Askeskin* programme (2005), the JPS (*Jaring Pengaman Social*, Social Safety Net) health card was accepted to claim the insurance benefits.
[49] I follow the Kushnir et al (2010)'s definition on micro and small firms: micro firms: 1-9 employees; and small firms: 10-49 employees.

missing value in net profits, and I include only positive net profits.[50] I also use four alternative dependent variables in robustness checks: equipment assets, non-equipment assets, asset purchased, and assets sold. All the dependent variables are in Indonesian Rupiah and converted to logarithms; I add 1 to each of the variable before I take the logarithm.

I define the key variable of interest, *Askeskin* status, from a question in the health insurance module (Book 3B) of IFLS-4 on whether an individual the policyholder or primary beneficiary of *Askeskin*. *Askeskin* status is an indicator equals one if a household has at least one *Askeskin* recipients (or health card recipients) and zero if otherwise.[51] I also use other six health insurance, which are dummy variables, as control variables in all specifications: *PT Askes* (Insurance Schemes of Civil Servants), *Astek Jamsostek* (Labour Social Insurance), employer provided health insurance, employer provided clinic, private insurance, and saving-related insurance.

I use six measures of family hardships: deaths in the family in the previous 12 months in basic specifications; and deaths in the family in the previous two years, deaths in the family in the previous three years, outpatient care, inpatient care, and traffic accidents in robustness checks. I construct the dummy variables for deaths in the family from a question on whether a family member "moved out" of a household because of death in 2006, 2007 and 2008, using household roster (Book K) of IFLS-4. I define outpatient care, inpatient care, and traffic accidents from the questions in adult information book (Book 3B) of IFLS-4: outpatient care is an indicator equals one if a

[50] In the IFLS, respondents were first asked the amount of net profits, and only those who did not know the amount of their net profits were prompted the amount of total revenue and total expenses. Therefore, only very few respondents answer the questions on total revenue and total expenses. Due to the data limitation, I do not use total revenue and total expenses as the measure of firm performance.

[51] The targeting of *Askeskin* identified eligible households, but the membership of *Askeskin* was individual. See Harimurti et al. (2013).

family member visited a healthcare provider in the last four weeks and zero if otherwise; inpatient care is an indicator equals one if a family member visited an inpatient care in the past 12 months and zero if otherwise; and traffic accident is an indicator that takes the value of one if a family member had had a traffic accident and received treatment in the previous three years and zero if otherwise.

The household characteristics (control variables) I use are the quality of household dwelling, ownership of household assets, assistances received, and household consumption; the indicators are from the consumption module (Book 1) and the household characteristics module (Book 2 and Book K) of IFLS-3. The indicators for the quality of dwelling include whether a house has ceramic flooring, concrete roofing, masonry outer wall, electricity, piped water for drinking, its own toilet facilities, a proper garbage disposal system, and a proper sewage drain; the indicators equal one if a house has a facility and zero if otherwise. The indicators for household assets are the ownership of durable goods such as a refrigerator, an electric or gas stove, a television, a self-occupied house, other buildings, non-agricultural land, livestock, vehicles, household appliances, savings, receivables, and jewellery; the indicators equal one if a household owns an asset and zero if otherwise. The indicators for assistances that households received, which equal one if a household receives an assistance and zero if otherwise, include whether a household has ever purchased *sembako* (nine basic foods) or goods in a "cheap" market or "special market operation" at a cheaper price than at the public market, utilised a letter for the poor, received assistance in the form of food or other goods from the government, non-government organisations, and community, and whether a house is self-owned. Household consumption includes the

total expenditure on meat during the past week and on clothing during the past one year; the variables are in Indonesian Rupiah and converted to logarithms.[52]

The firm characteristics (control variables) I use are dummy variables or sets of dummies that include: whether the business a sole ownership, whether the operation of the business is fully outside home and partially outside home, urban location, the number of business, type of business, the year a business started, household members who own the business, owners outside the households who own the business, source of start-up capital, percentage of share owned, and the number of workers when the business started. The data for all the indicators are from nonfarm business module (Book 2) of IFLS-4, except for the number of business that is from IFLS-3.[53]

The owner characteristics, another set of control variables I use, are household heads' gender, marital status, and highest education; households' religion, ethnical groups, the average age of household members, the number of household members, and the number of female household members; whether household members can read and write in Indonesian language or other language; and whether household members had self-treatment.[54] The variables, except the average age of household members, are

[52] *Sembako (Sembilan Bahan Pokok)* refers to nine necessities that include rice, granulated sugar, cooking oil and butter, meat, chicken eggs, milk, corn, kerosene, and salt (based on the decision by Ministry of Industry and Trade, Indonesia, no. 115/mpp/kep/2/1998).

The letter for the poor *(Surat Keterangan Tidak Mampu)* is a certificate indicating a citizen is economically less capable, not capable, or poor.

[53] I note that good controls are those variables that have been fixed at the time *Askeskin* was determined, but I do not use the firm characteristics from IFLS-3 because of large sample attrition by over 2,000 observations, owing to unmatched firm identity between IFLS-3 and IFLS-4. Since the firm characteristics I use are unlikely to vary by *Askeskin* status, they are thus reliable control variables.

[54] The effects of *Askeskin* may be confounded by whether one had self-treatment. One of the reasons of low enrolment in *Askeskin* was most of the poor prefer self-treatment to health service (World Bank, 2008a).

dummy variables or sets of dummies. The data are from education module (Book 3A) and household roster (Book K) of IFLS-3.

Households' knowledge of the location of healthcare services (control variables) includes whether a household head knows the location of the nearest public and private hospitals, *Puskesmas*, private clinic, private physician, midwife, nurse, traditional birth attendant, traditional practitioner, pharmacy, *Posyandu*, and village post.[55] The control variables are indicators that equal one if a household knows the location of a health facility and zero if otherwise; the data are from knowledge of health and family planning service module (Book 1) of IFLS-3.

Table 3.1, which presents the summary statistics by *Askeskin* status, shows that, except for firm performance and households characteristics, *Askeskin* household firms and those owned by non-*Askeskin* household do not differ much (though many differences are statistically significant). Panel A shows that *Askeskin* household firms have statistically lower total assets and net profits of about Rp 10 million and Rp 4 million (about US$1,000 and US$425 in 2008), respectively, compared to non-*Askeskin* household firms; their equipment assets and non-equipment assets are also about Rp 5 million and Rp 5.5 million (about US$530 and US$580 in 2008) lower.

[55] *Puskesmas* stands for *Pusat Kesehatan Masyarakat*, Community Health Clinics. *Posyandu* is sub-community health clinic.

Table 3.1 Summary statistics

	Mean		
	With *Askeskin*	Without *Askeskin*	Difference (2)-(1)
	(1)	(2)	(3)
A. Dependent Variables			
Total assets	8.20	18.92	10.72***
	(70.07)	(76.12)	(3.09)
Net Profits	6.45	10.59	4.14***
	(23.22)	(29.11)	(1.17)
Equipment assets	2.61	7.83	5.22***
	(12.86)	(34.11)	(1.33)
Non-equipment assets	5.59	11.10	5.51**
	(63.70)	(62.67)	(2.57)
B. Family Hardships			
Deaths in the family	0.001	0.004	0.003
	(0.04)	(0.06)	(0.003)
Outpatient care	0.41	0.34	-0.06***
	(0.49)	(0.48)	(0.02)
Inpatient care	0.09	0.08	-0.01
	(0.29)	(0.28)	(0.01)
Traffic accidents	0.13	0.12	-0.00
	(0.33)	(0.33)	(0.01)
C. Household Characteristics			
Purchases goods at a cheaper price	0.58	0.34	-0.24***
	(0.49)	(0.48)	(0.02)
Receives community assistance	0.06	0.03	-0.03***
	(0.23)	(0.16)	(0.01)
Receives assistance from government	0.07	0.03	-0.04***
	(0.26)	(0.18)	(0.01)
House self-owned	0.81	0.82	0.01
	(0.39)	(0.38)	(0.02)
Has electricity	0.91	0.95	0.04***
	(0.29)	(0.22)	(0.01)
Has piped water for drinking	0.24	0.30	0.07***
	(0.42)	(0.46)	(0.02)
Has own toilet facilities	0.52	0.72	0.20***
	(0.50)	(0.45)	(0.02)
Disposes garbage in trash can	0.21	0.29	0.09***
	(0.40)	(0.46)	(0.02)
Uses letter for the poor	0.11	0.05	-0.06***
	(0.31)	(0.21)	(0.01)

Table 3.1 Summary statistics (continued)

	Mean		
	With *Askeskin* (1)	Without *Askeskin* (2)	Difference (2)-(1) (3)
C. Household Characteristics			
Drains sewage in drainage ditch	0.44	0.55	0.10***
	(0.50)	(0.50)	(0.02)
Owns a refrigerator	0.05	0.19	0.14***
	(0.21)	(0.39)	(0.02)
Owns an electric/gas stove	0.03	0.16	0.13***
	(0.18)	(0.37)	(0.01)
Owns a television	0.53	0.72	0.19***
	(0.50)	(0.45)	(0.02)
Floor made of ceramic	0.08	0.20	0.12***
	(0.28)	(0.40)	(0.02)
Wall made of masonry	0.55	0.72	0.17***
	(0.50)	(0.45)	(0.02)
Concrete roofing	0.68	0.66	-0.01
	(0.47)	(0.47)	(0.02)
Owns the land and self-occupied house	0.81	0.83	0.01
	(0.39)	(0.38)	(0.02)
Owns other house/building	0.07	0.14	0.06***
	(0.26)	(0.34)	(0.01)
Owns non-agricultural land	0.13	0.20	0.07***
	(0.34)	(0.40)	(0.02)
Owns livestock	0.03	0.03	0.00
	(0.17)	(0.17)	(0.01)
Owns vehicles	0.41	0.53	0.12***
	(0.49)	(0.50)	(0.02)
Owns household appliances	0.74	0.88	0.14***
	(0.44)	(0.33)	(0.01)
Has savings	0.23	0.35	0.12***
	(0.42)	(0.48)	(0.02)
Owns receivables	0.10	0.16	0.06***
	(0.30)	(0.36)	(0.01)
Owns jewellery	0.59	0.68	0.09***
	(0.49)	(0.47)	(0.02)
Expenditure on clothes	0.28	0.44	0.16***
	(0.42)	(0.74)	(0.03)
Expenditure on meat	0.01	0.02	0.01***
	(0.02)	(0.04)	(0.001)

Table 3.1 Summary statistics (continued)

	Mean		
	With *Askeskin* (1)	Without *Askeskin* (2)	Difference (2)-(1) (3)
D. Owns Other Insurance			
Health insurance for civil servants (*PT ASKES*)	0.05	0.11	0.05***
	(0.23)	(0.31)	(0.01)
Labour social insurance (*ASTEK Jamsostek*)	0.05	0.08	0.03**
	(0.22)	(0.27)	(0.01)
Employer provided health insurance	0.02	0.03	0.01*
	(0.13)	(0.17)	(0.01)
Employer provided clinic	0.01	0.02	0.01
	(0.10)	(0.14)	(0.01)
Private insurance	0.01	0.02	0.02***
	(0.09)	(0.16)	(0.01)
Saving-related insurance	0.00	0.00	0.00
	(0.00)	(0.06)	(0.00)
E. Firm Characteristics			
Number of business	0.84	0.94	0.10***
	(0.77)	(0.84)	(0.03)
Year business started	1997.60	1998.58	0.97**
	(10.63)	(9.78)	(0.41)
Number of workers	0.93	1.29	0.35***
	(1.66)	(2.39)	(0.09)
Percentage of share	98.85	98.27	-0.58
	(9.14)	(10.50)	(0.42)
Sole ownership	0.98	0.97	-0.01*
	(0.13)	(0.17)	(0.01)
Operation of business is all outside home	0.56	0.51	-0.04**
	(0.50)	(0.50)	(0.02)
Operation of business is partially outside home	0.25	0.24	-0.01
	(0.43)	(0.42)	(0.02)
Urban location	0.47	0.53	0.07***
	(0.50)	(0.50)	(0.02)
Start-up capital (savings)	0.42	0.52	0.10***
	(0.49)	(0.50)	(0.02)
Start-up capital (family members)	0.39	0.35	-0.04**
	(0.49)	(0.48)	(0.02)
Start-up capital (other owners)	0.01	0.02	0.01
	(0.11)	(0.13)	(0.01)

Table 3.1 Summary statistics (continued)

	Mean		
	With *Askeskin* (1)	Without *Askeskin* (2)	Difference (2)-(1) (3)
E. Firm Characteristics			
Start-up capital (banks)	0.02	0.03	0.01**
	(0.13)	(0.17)	(0.01)
F. Owner Characteristics			
Household size	6.30	6.13	-0.17
	(2.78)	(2.80)	(0.12)
Average age of household member	29.67	29.50	-0.17
	(11.57)	(9.87)	(0.41)
Male household head	0.84	0.86	0.02
	(0.36)	(0.35)	(0.01)
Household head is married	0.82	0.84	0.01
	(0.38)	(0.37)	(0.02)
Number of female household members	1.61	1.56	-0.05
	(1.88)	(1.89)	(0.08)
Religion: Islam	0.94	0.89	-0.06***
	(0.23)	(0.32)	(0.01)
High school education	0.12	0.19	0.08***
	(0.32)	(0.39)	(0.02)
Can read	0.93	0.97	0.04***
	(0.26)	(0.17)	(0.01)
Can write	0.92	0.97	0.05***
	(0.27)	(0.18)	(0.01)
G. Knowledge of the location of health care services			
Knows the location of a public hospital	0.75	0.79	0.04**
	(0.43)	(0.41)	(0.02)
Knows the location of a private hospital	0.49	0.55	0.07***
	(0.50)	(0.50)	(0.02)
Knows the location of *Puskesmas*	0.94	0.94	-0.00
	(0.23)	(0.24)	(0.01)
Knows the location of a private clinic	0.53	0.58	0.05**
	(0.50)	(0.49)	(0.02)
Knows the location of a private physician	0.79	0.78	-0.00
	(0.41)	(0.41)	(0.02)
Knows the location of a midwife	0.37	0.34	-0.03*
	(0.48)	(0.47)	(0.02)
Knows the location of a nurse	0.69	0.58	-0.11***
	(0.46)	(0.49)	(0.02)

Table 3.1 Summary statistics (continued)

	Mean		
	With *Askeskin* (1)	Without *Askeskin* (2)	Difference (2)-(1) (3)
G. Knowledge of the location of health care services			
Knows the location of a traditional birth attendant	0.28	0.26	-0.02
	(0.45)	(0.44)	(0.02)
Knows the location of a traditional practitioner	0.61	0.67	0.06***
	(0.49)	(0.47)	(0.02)
Knows the location of a pharmacy	0.82	0.79	-0.03*
	(0.39)	(0.41)	(0.02)
Knows the location of *Posyandu*	0.23	0.24	0.01
	(0.42)	(0.43)	(0.02)
Number of observations	672	5229	5901

Notes: The numbers are means. The numbers in parentheses in columns 1 and 2 are standard deviations; the numbers in parentheses in column 3 are standard errors. The dependent variables in Panel A and expenditures on clothes and meat in Panel B are in millions of Indonesian Rupiah. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Panel B, which presents the type of family hardships, shows that the proportion of household that experienced family hardships, except for outpatient care, is similar between *Askeskin* households and non-*Askeskin* households. *Askeskin* households are more likely to have outpatient care, but the likelihood of experiencing deaths in the family, inpatient care, and traffic accidents is similar between the two groups of households.

Panel C shows that *Askeskin* insured households are more likely to receive assistance and less likely to own durable goods and household assets. They are more likely to purchase goods in "cheap markets" at a cheaper price, receive community and government assistances, and use the letter for the poor. They are less likely to have electricity, piped water for drinking, own toilet facilities, proper garbage disposal and

sewage system, a refrigerator, an electric or gas stove, a television, wall made of masonry, and ceramic flooring at home; they are less likely to own household assets such as a house or building (in addition to a self-occupied house), non-agricultural land, vehicles, household appliances, savings, receivables, and jewellery; and they have lower expenditures on meat and clothing. The differences in these variables are statistically significant at one percent level. However, the proportion of owing a house, land and self-occupied house, livestock, household furniture and utensils for *Askeskin* and non-*Askeskin* households are similar, as are whether the house has concrete roofing.

Non-*Askeskin* households, as Panel D shows, are more likely to have other insurance. For example, they are statistically more likely to own health insurance for civil servants, labour social insurance, employer provided health insurance, and private insurance, though the differences between the two groups of households are small. However, they are similar in terms of their little and no access to private insurance and saving-related insurance, respectively.

Panel E shows that *Askeskin* household firms and non-*Askeskin* household firms share similar characteristics, though many differences are statistically significant. These two groups of firms, on average, employ one worker, and almost all are a sole ownership, half are operated fully outside home and in urban areas. Their owners typically have only one firm; 40 percent of the owners use the money of family members to start their business and less than five percent borrow from banks. These differences are small but statistically significant. The owners of these two groups of firms differ in two things: *Askeskin* households started their firm in 1997, about a year earlier than non-*Askeskin* households did; they are ten percent more likely to use savings as their start-up capital. However, the two groups of firms are not statistically

different in terms of percentage of share and operation of business is partially outside home.

In Panel F, the mean values show owner characteristics do not differ much between *Askeskin* households and non-*Askeskin* households, but some of their differences are statistically significant. The two groups of owners share a number of similarities: 90 percent of them are Muslim (though the mean difference is statistically significant), they are 29 years old, mostly are male, and married; they have six household members and one female household member. However, the proportion of owners who are able to read and write in the Indonesian language and other language is statistically lower for the owners of *Askeskin* households, as is their average completion of high school education.

The two groups of households, as Panel G shows, are quite similar in their knowledge of the location of healthcare services, though many mean differences are statistically significant. Over 90 percent of these households know the location of *Puskesmas* and 80 percent know the location of a public hospital, a private physician and a pharmacy, while less than half of the households know the location of a midwife and *Posyandu*. However, *Askeskin* households are more likely to know the location of a nurse, but not a private hospital or clinic and a traditional practitioner.

The sample suggests that, except for firm performance and owners' household characteristics, the two groups of firms are economically similar in many respects, though many mean differences are statistically significant. The variation in firm performance, therefore, may be the result of the differences in these variables, instead of *Askeskin* status alone. By including the observed characteristics and the district fixed effects in the regression (as I discuss in Section 3.5.1), the two groups of firms become

more comparable as the estimates of the control variables pick up the variations in firm growth that are not the effect of *Askeskin*.

3.5 Results

3.5.1 Basic Results

Table 3.2 reports the basic results for the regressions of firms' total assets or net profits on *Askeskin* and family hardships, which I define as having deaths in the family in the previous year. Columns in each panel are specifications of the effects of *Askeskin* and family hardships, with and without control variables. I control for district fixed effects and other insurance held by the households in column 1; in the other columns, I add household characteristics (column 2), firm characteristics (column 3), owner characteristics and knowledge of the location of health facilities (column 4) as control variables. Column 4 is my most preferred specifications because they include good control variables available in the IFLS, which make them the most likely to satisfy the conditional independence assumptions.

The estimates in Panel A of Table 3.2 show little evidence that *Askeskin* may cushion the adverse effects of deaths in the family in the previous year on firms' total assets. Column 1 shows, in a regression that controls only district fixed effects and other insurance held by the households, *Askeskin* household firms cope better with the deaths in the family (the estimate of the interaction term is positive and statistically significant). I get similar estimates when I also control for household-, firm-, and owner characteristics, as well as knowledge of the location of health facilities (in columns 2, 3 and 4, respectively), though those in the third and the fourth columns are statistically insignificant. The estimate in column 4 does not show evidence that *Askeskin* reduces

possible adverse effects of family hardships on the firms' total assets (the estimate of the interaction term is positive and large but statistically insignificant). Deaths in the family are associated with 91 percent (the sum of the estimates of deaths in the family and the interaction term) higher total assets for *Askeskin* households, but none of the estimates is statistically significant. Similarly, the sum of the estimates of *Askeskin* and the interaction term suggests that *Askeskin* status correlates with 1.63 times higher total assets if the owners experienced deaths in the family in the previous year.

Panel B, in which I use net profits as the dependent variable, shows some evidence that *Askeskin* reduces the effects of deaths in the family in the previous year on net profits. Columns 1 shows that, in a regression with district fixed effects and other insurance held by the households as control variables, *Askeskin* household firms cope better with family hardships (the estimate of the interaction term is large, positive and statistically significant). It remains statistically significant even after I control for household-, firm- and owner characteristics, as well as knowledge of the location of health facilities (columns 2-4); in the most complete specification, the estimate of the interaction term is large, 1.45; it is statistically significant at ten percent level.

In sum, I find some evidence that owners of micro and small firms may be better able to cope with deaths in the family in the previous year if their households are insured. In the regressions that control for all available observed characteristics, I find *Askeskin* reduces possible adverse effects of deaths in the family in the previous year on net profits but not total assets. These results support literature that finds social health insurance effective in providing financial risk protection (see, e.g., Levine et al., 2015; Wagstaff and Yu, 2007; Nguyen and Wang, 2013; Wagstaff, 2010).

Table 3.2 The effects of *Askeskin* on total assets and net profits

Dependent variable (in logarithm)		(1)	(2)	(3)	(4)
A. Total assets					
Askeskin	(1)	-1.05***	-0.62***	-0.46**	-0.47**
		(0.23)	(0.22)	(0.21)	(0.23)
Deaths in the family	(2)	-0.94	-0.86	-0.98	-1.19
		(1.28)	(1.37)	(1.37)	(1.41)
Deaths × *Askeskin*	(3)	4.68***	3.55***	0.38	2.10
		(1.29)	(1.53)	(1.63)	(1.78)
Observations		5,851	5,783	5,649	5,519
Adjusted-R^2		0.05	0.07	0.18	0.19
B. Net profits					
Askeskin	(4)	-0.40***	-0.23**	-0.22**	-0.28**
		(0.11)	(0.12)	(0.10)	(0.10)
Deaths in the family	(5)	-0.27	-0.01	-0.09	-0.04
		(0.47)	(0.47)	(0.37)	(0.41)
Deaths × *Askeskin*	(6)	2.07***	1.56***	1.11*	1.45*
		(0.49)	(0.59)	(0.67)	(0.78)
Observations		5,851	5,783	5,649	5,519
Adjusted-R^2		0.07	0.07	0.16	0.16
Control variables:					
Household characteristics		.	✓	✓	✓
Firm characteristics		.	.	✓	✓
Owner characteristics; knowledge of health facilities		.	.	.	✓

Notes: The numbers in each column are the estimates of OLS regressions of total assets or net profits on *Askeskin*, deaths in the family in the previous year, and the interaction between *Askeskin* and deaths in the family, without (column 1) and with control variables (columns 2-4). All regressions include district dummies and the dummies for other insurance held by the households. The sample excludes two groups of individuals: (i) those who lost *Askeskin* in 2006, 2007, or 2008; and (ii) those who enrolled in *Askeskin* in 2008. Deaths in the family equals one if at least one family member died in the previous year and zero if otherwise. The numbers in parentheses are robust standard errors, clustered by districts. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

We should cautiously interpret these estimates because the evidence is statistically weak; moreover, the regressions may fail to satisfy the conditional

independence assumption. The estimates of *Askeskin* in both panels are negative and statistically significant, which suggests, among households that did not experience family hardships, *Askeskin* households have smaller firms. The magnitudes of the estimates are large, more than 0.4 in the total assets regressions and more than 0.2 in the net profits ones. The estimates of family hardships in Panel A are large and negative but they are statistically insignificant, which means, among non-*Askeskin* households, family hardships correlate with smaller firms; the estimates of deaths in the family in the previous year in Panel B are smaller but also statistically insignificant.

3.5.2 Use of Alternative Measures of Family Hardships

I examine whether the results are robust to the use of alternative measures of family hardships: deaths in the family in the past couple of years and sickness in the family. I use deaths in the family that happened in the previous two or three years to incorporate family hardships happened in earlier periods.[56] I define three dummy variables for sickness in the family: (i) whether a household had at least one family members who had outpatient care in the previous month, (ii) whether a household had at least one family members who had inpatient care (hospitalisation) in the previous year, and (iii) whether a household had at least one family members who experienced a traffic accident and received treatment in the previous three years.

Table 3.3, which presents the regressions of firms' total assets on *Askeskin*, other measures of family hardships and the interaction terms, shows little evidence that *Askeskin* household firms cope better with family hardships. In Panel A, I find no

[56] For the specifications of deaths in the family in the previous two years and the previous three years, I drop the households that received *Askeskin* for the first time in 2007 and 2008, and those who lost *Askeskin* in 2006, 2007 and 2008, respectively.

evidence that *Askeskin* reduces the adverse effects of deaths in the family in the previous two years on firms' total assets. In column 4, the sum of the three estimates show that, comparing to non-*Askeskin* household firms that did not experience deaths in the family in the previous two years (the benchmark category), the family hardship is correlated with 48 percent higher total assets for *Askeskin* household firms, but the estimate of the interaction term is statistically insignificant. In Panel B, in which I use deaths in the family in the previous three years as the measure of family hardships, I get similar results; the estimates of the interaction term are in fact negative but none of them is statistically significant.

In Panel C, however, I find evidence that *Askeskin* insured households cope better with the adverse effect of outpatient care. The effect is large and positive; the estimate of the interaction term is statistically significant even after I control for all available observed characteristics; the sum of the estimates of outpatient care and the interaction term suggests that total assets of firms whose owners had the need of outpatient care are 37 percent higher if the owners or their households are *Askeskin* recipients. The sum of the estimates of *Askeskin* and the interaction suggest that total assets of *Askeskin* household firms are 12 percent higher if their owners had the need of outpatient care. The estimates of *Askeskin* show that, among firms whose owners did not experience family hardships, *Askeskin* household firms have smaller total assets (the estimates are negative and statistically significant). In the regression that includes all control variables, the negative and statistically significant estimate of outpatient care suggests that, among firms owned by non-*Askeskin* households, the hardship reduces total assets of the firms by 55 percent.

Table 3.3 Other measures of family hardships and total assets as the dependent variable

Dependent variable: Total assets (in logarithm)					
		(1)	(2)	(3)	(4)
A. Deaths in the family in the previous two years					
Askeskin	(1)	-0.86***	-0.43*	-0.41*	-0.41
		(0.24)	(0.24)	(0.24)	(0.25)
Deaths in the family	(2)	0.14	0.14	0.07	0.19
		(0.50)	(0.50)	(0.47)	(0.47)
Deaths × *Askeskin*	(3)	0.75	1.06	0.63	0.70
		(1.32)	(1.22)	(1.07)	(1.10)
Observations		5,723	5,659	5,530	5,406
B. Deaths in the family in the previous three years					
Askeskin	(4)	-0.80***	-0.38	-0.32	-0.30
		(0.27)	(0.26)	(0.27)	(0.28)
Deaths in the family	(5)	0.29	0.34	0.22	0.35
		(0.33)	(0.32)	(0.31)	(0.32)
Deaths × *Askeskin*	(6)	-0.01	0.12	-0.39	-0.56
		(0.11)	(1.05)	(1.01)	(1.08)
Observations		5,644	5,580	5,452	5,329
C. Outpatient care					
Askeskin	(7)	-1.38***	-0.90***	-0.77***	-0.80***
		(0.29)	(0.27)	(0.27)	(0.29)
Outpatient care	(8)	-0.18	-0.25	-0.46***	-0.55***
		(0.16)	(0.16)	(0.16)	(0.16)
Outpatient care x *Askeskin*	(9)	0.84**	0.73*	0.82**	0.92**
		(0.40)	(0.41)	(0.39)	(0.41)
Observations		5,849	5,781	5,647	5,517
D. Inpatient care					
Askeskin	(10)	-1.14***	-0.69***	-0.54***	-0.55**
		(0.24)	(0.23)	(0.22)	(0.23)
Inpatient care	(11)	-0.06	-0.13	-0.18	-0.30
		(0.34)	(0.33)	(0.31)	(0.32)
Inpatient care x *Askeskin*	(12)	0.96	0.84	0.92	1.02
		(0.71)	(0.70)	(0.64)	(0.67)
Observations		5,851	5,783	5,649	5,519

Table 3.3 Other measures of family hardships and total assets as the dependent variable (continued)

Dependent variable: Total assets (in logarithm)					
		(1)	(2)	(3)	(4)
E. Traffic accidents					
Askeskin	(13)	-1.01***	-0.57**	-0.40*	-0.40*
		(0.24)	(0.23)	(0.22)	(0.24)
Traffic accident	(14)	0.25	0.15	0.05	0.12
		(0.25)	(0.25)	(0.24)	(0.23)
Traffic acc x *Askeskin*	(15)	-0.30	-0.35	-0.42	-0.47
		(0.65)	(0.65)	(0.56)	(0.60)
Observations		5,851	5,783	5,649	5,519
Control variables:					
Household characteristics		.	✓	✓	✓
Firm characteristics		.	.	✓	✓
Owner characteristics; knowledge of health facilities		.	.	.	✓

Notes: The numbers in each column are the estimates of OLS regressions of total assets on *Askeskin*, a measure of family hardships, and the interaction between *Askeskin* and family hardships, without (column 1) and with control variables (columns 2-4). All regressions include district dummies and the dummies for other insurance held the by households. The sample excludes two groups of individuals: (i) those who lost *Askeskin* in 2006, 2007, or 2008; and (ii) those who enrolled in *Askeskin* in 2008. In Panel A, deaths in the family equal one if at least one family member died in the previous two years and zero if otherwise. The sample also excludes those who enrolled in *Askeskin* in 2007. In Panel B, deaths in the family equal one if at least one family member died in the previous three years and zero if otherwise. The sample also excludes those who enrolled in *Askeskin* in 2006-2007. In Panel C, outpatient care equals one if a household had at least one family member had outpatient care in the previous month and zero if otherwise. In Panel D, inpatient care equals one if a household had at least one family member hospitalised in the previous year and zero if otherwise. In Panel E, traffic accidents equal one if a household had at least one family member had a traffic accident and received treatment in the previous three years and zero if otherwise. The adjusted-R^2 in columns 1, 2, 3, and 4 are 0.05, 0.07, 0.18, and 0.19, respectively. The numbers in parentheses are robust standard errors, clustered by districts. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Panel D, in which I define family hardships using inpatient care, shows no evidence that *Askeskin* protects firms against inpatient care need of the owners. None of the estimates of the interaction term is statistically significant although the estimates are large and positive. Likewise, the estimates of inpatient care are statistically

insignificant, as indicated by their large standard errors. The estimates of *Askeskin* show, among firms owned by households that did not experience family hardships, *Askeskin* household firms have smaller total assets. In column 4, the sum of the three estimates suggests that inpatient care need of the owners and *Askeskin* jointly correlate with 17 percent higher total assets, but I fail to reject the null hypothesis of the effect of inpatient care does not differ by *Askeskin* status.

In Panel E, the results show no evidence that *Askeskin* helps firms cope with the effects from traffic accidents experienced by owners (the estimates of the interaction term are negative but statistically insignificant). The estimates of *Askeskin* are negative and statistically significant like those in Panels C and D; the estimates of traffic accidents are statistically insignificant.

Table 3.4, which uses net profits as the dependent variable, shows evidence that *Askeskin* reduces possible adverse effects of outpatient care and traffic accidents, but not those of other measures of family hardships. In Panels A-B, I use deaths in the family in the previous two and three years, respectively, to define family hardships, and I do not find the effect of deaths in the family in the previous two or three years changes by *Askeskin* status; the estimates of the interaction terms are positive but statistically insignificant after I control for all available characteristics: experiencing deaths in the previous two years and three years, respectively, correlate with 52 percent and 38 percent higher net profits if owners are *Askeskin* households. I do not find *Askeskin* and deaths in the family matter either in Panel A; however, the estimate of *Askeskin* is statistically significant at ten percent level in Panel B in the estimation that includes all available control variables.

Table 3.4 Other measures of family hardships and net profits as the dependent variable

Dependent variable: Net profits (in logarithm)					
		(1)	(2)	(3)	(4)
A. Deaths in the family in the previous two years					
Askeskin	(1)	-0.30**	-0.12	-0.15	-0.18
		(0.12)	(0.13)	(0.12)	(0.12)
Deaths in the family	(2)	-0.01	0.01	-0.12	-0.08
		(0.27)	(0.27)	(0.25)	(0.26)
Deaths × *Askeskin*	(3)	0.39	0.53	0.71*	0.60
		(0.47)	(0.44)	(0.38)	(0.44)
Observations		5,723	5,659	5,530	5,406
B. Deaths in the family in the previous three years					
Askeskin	(4)	-0.36***	-0.19	-0.19	-0.23*
		(0.14)	(0.15)	(0.13)	(0.13)
Deaths in the family	(5)	-0.14	-0.08	-0.08	-0.09
		(0.17)	(0.17)	(0.16)	(0.17)
Deaths × *Askeskin*	(6)	0.56	0.60*	0.49	0.47
		(0.35)	(0.32)	(0.30)	(0.36)
Observations		5,644	5,580	5,452	5,329
C. Outpatient care					
Askeskin	(7)	-0.57***	-0.39**	-0.41***	-0.45***
		(0.16)	(0.17)	(0.16)	(0.16)
Outpatient care	(8)	-0.13	-0.15*	-0.18**	-0.18**
		(0.09)	(0.09)	(0.08)	(0.08)
Outpatient care x *Askeskin*	(9)	0.44**	0.41*	0.48**	0.44**
		(0.22)	(0.23)	(0.20)	(0.20)
Observations		5,849	5,781	5,647	5,517
D. Inpatient care					
Askeskin	(10)	-0.41***	-0.24*	-0.22**	-0.27**
		(0.12)	(0.12)	(0.11)	(0.11)
Inpatient care	(11)	0.06	0.04	0.02	0.02
		(0.14)	(0.14)	(0.15)	(0.16)
Inpatient care x *Askeskin*	(12)	0.06	0.08	0.00	-0.09
		(0.37)	(0.38)	(0.38)	(0.40)
Observations		5,851	5,783	5,649	5,519

Table 3.4 Other measures of family hardships and net profits as the dependent variable (continued)

Dependent variable: Net profits (in logarithm)					
		(1)	(2)	(3)	(4)
E. Traffic accidents					
Askeskin	(13)	-0.45***	-0.28**	-0.27**	-0.34***
		(0.12)	(0.13)	(0.11)	(0.11)
Traffic accident	(14)	0.06	0.04	-0.02	0.03
		(0.13)	(0.13)	(0.12)	(0.12)
Traffic acc x *Askeskin*	(15)	0.37	0.38	0.41*	0.44*
		(0.26)	(0.26)	(0.25)	(0.25)
Observations		5,851	5,783	5,649	5,519
Control variables:					
Household characteristics		.	✓	✓	✓
Firm characteristics		.	.	✓	✓
Owner characteristics; knowledge of health facilities		.	.	.	✓

Notes: The numbers in each column are the estimates of OLS regressions of net profits on *Askeskin*, a measure of family hardships, and the interaction between *Askeskin* and family hardships, without (column 1) and with control variables (columns 2-4). All regressions include district dummies and the dummies for other insurance held by the households. The sample excludes two groups of individuals: (i) those who lost *Askeskin* in 2006, 2007, or 2008; and (ii) those who enrolled in *Askeskin* in 2008. In Panel A, deaths in the family equal one if at least one family member died in the previous two years and zero if otherwise. The sample also excludes those who enrolled in *Askeskin* in 2007. In Panel B, deaths in the family equal one if at least one family member died in the previous three years and zero otherwise. The sample also excludes those who enrolled in *Askeskin* in 2006-2007. In Panel C, outpatient care equals one if a household had at least one family member had outpatient care in the previous month and zero if otherwise. In Panel D, inpatient care equals one if a household had at least one family member hospitalised in the previous year and zero if otherwise. In Panel E, traffic accidents equal one if a household had at least one family member had a traffic accident and received treatment in the previous three years and zero if otherwise. The adjusted-R^2 in columns 1, 2, 3, and 4 are 0.06, 0.07, 0.16, and 0.16, respectively. The numbers in parentheses are robust standard errors, clustered by districts. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Panel C, which uses outpatient care to define family hardships, shows a decrease in the adverse effects of outpatient care, by about 44 percent among *Askeskin* household firms. The estimate of the interaction term is positive and statistically significant in the regression that I control for all available observed characteristics. The estimate of *Askeskin* suggests that, among households that did not experience family hardships,

Askeskin household firms have smaller net profits. In the regression in which I control for all available characteristics, the estimate of outpatient care shows, among firms owned by non-*Askeskin* households, outpatient care reduces net profits by 18 percent (the estimate is positive and statistically significant).

In Panel D, in which I use inpatient care to define family hardships, shows no evidence that *Askeskin* helps firms withstand the family hardship (the estimate of the interaction term is negative in the last column but statistically insignificant). The estimates of *Askeskin* are negative and statistically significant, implying that, among firms owned by households that did not experience the hardship, *Askeskin* household firms have smaller net profits. I do not find inpatient care matters for the firms' net profits (its estimates are positive but statistically insignificant).

Panel E, which reports the effects of *Askeskin* and traffic accidents, shows some evidence that *Askeskin* reduces possible adverse effects of traffic accidents experienced by the owners on net profits in all the regressions. The estimates of the interaction term are large, positive and statistically significant at ten percent level in the most preferred estimation (column 4): net profits of *Askeskin* household firms are 13 percent (the sum of the three estimates) higher than those of firms owned by non-*Askeskin* households that did not experience the hardship (the benchmark category). I find, among households that did not experience traffic accidents, *Askeskin* household firms have smaller net profits; the estimate of *Askeskin* is negative and statistically significant. The estimates of traffic accidents are statistically insignificant, indicating no evidence that the hardship affects net profits.

3.5.3 Use of Alternative Measures of Firm Performance

Table 3.5 Other measures of firm performance

Dependent variable (in logarithm)		(1)	(2)	(3)	(4)
A. Equipment assets					
Askeskin	(1)	-0.76***	-0.42**	-0.25	-0.25
		(0.22)	(0.23)	(0.22)	(0.23)
Deaths in the family	(2)	-0.14	0.02	-0.20	-0.07
		(1.12)	(1.19)	(1.17)	(1.19)
Deaths × *Askeskin*	(3)	3.89***	2.52*	-1.34	-0.61
		(1.13)	(1.37)	(1.52)	(1.68)
B. Non-equipment assets					
Askeskin	(4)	-1.52***	-0.89***	-0.70**	-0.67**
		(0.27)	(0.28)	(0.28)	(0.28)
Deaths in the family	(5)	0.21	-0.51	-0.34	-1.24
		(1.50)	(1.54)	(1.50)	(1.48)
Deaths × *Askeskin*	(6)	-1.43	-0.08	-3.99*	-3.06
		(1.53)	(1.95)	(2.32)	(2.43)
C. Assets purchased					
Askeskin	(7)	-0.48*	-0.42	-0.17	-0.17
		(0.28)	(0.29)	(0.31)	(0.31)
Deaths in the family	(8)	0.27	0.55	1.29	1.39
		(1.45)	(1.59)	(1.86)	(1.93)
Deaths × *Askeskin*	(9)	-1.37	-2.01	-3.33	-2.86
		(1.50)	(1.86)	(2.27)	(2.40)
D. Assets sold					
Askeskin	(10)	-0.04	0.02	0.02	0.03
		(0.13)	(0.14)	(0.15)	(0.16)
Deaths in the family	(11)	-0.34**	-0.31	-0.24	-0.19
		(0.17)	(0.20)	(0.21)	(0.25)
Deaths × *Askeskin*	(12)	0.47*	0.08	0.20	0.55
		(0.26)	(0.50)	(0.61)	(0.69)
Observations		5,851	5,783	5,649	5,519
Control variables:					
Household characteristics		.	✓	✓	✓
Firm characteristics		.	.	✓	✓
Owner characteristics; knowledge of health facilities		.	.	.	✓

Notes: The numbers in each column are the estimates of OLS regressions of the measures of firm performance on *Askeskin*, deaths in the family in the previous year, and the interaction between *Askeskin* and deaths in the family, without (column 1) and with control variables (columns 2-4). All regressions include district dummies and the dummies for other insurance held by the households. The sample excludes two groups of individuals: (i) those who lost *Askeskin* in 2006, 2007, or 2008; and (ii) those who enrolled in *Askeskin* in 2008. Deaths in the family equal one if at least one family member died in the previous year and zero if otherwise. The numbers in parentheses are robust standard errors, clustered by districts. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3.5, which uses stocks of equipment and non-equipment assets and purchases and sales of assets as the dependent variable, shows no evidence that *Askeskin* protects micro and small firms against deaths in the family in the previous year. None of the estimates of the interaction term is statistically significant in the regressions that include all control variables. I find, among households that did not experience deaths in the family in the previous year, *Askeskin* household firms have less non-equipment assets; the estimates of *Askeskin* in Panel B are negative and statistically significant. I do not find *Askeskin* affects firms' equipment assets (Panel A) and stock of assets (Panels C and D). I also do not find the evidence that deaths in the family in the previous year matter for non-*Askeskin* households' firms.

3.5.4 Regressions by Subsample

The following tables present the regressions by subsample: Table 3.6 uses urban sample, Table 3.7 the sample of firms that hire fewer than ten workers, and Table 3.8 the sample of firms whose total assets are below Rp 50 million.[57]

Table 3.6, which presents the results of urban sample, shows no evidence that *Askeskin* helps owners cope with deaths in the family in the previous year. In Panel A, I do not find *Askeskin* reduces the adverse effects of deaths in the family in the previous year on total assets (the estimates of the interaction term are positive but statistically insignificant). The estimates of *Askeskin* show, among households that did not experience deaths in the family in the previous year, *Askeskin* household firms have smaller total assets, but the estimates become smaller and statistically insignificant once

[57] I do not show the regressions of rural sample, firms that hire ten or more workers, and firms whose total assets are Rp 50 million or above because the estimates of the interaction terms are not available due to small sample size.

I control for all observed characteristics. I find similar results in Panel B: I do not find *Askeskin* protects firms' net profits; I also do not find *Askeskin* and deaths in the family in the previous year affect net profits.

Table 3.6 Urban sample

Dependent variable (in logarithm)		(1)	(2)	(3)	(4)
A. Total assets					
Askeskin	(1)	-1.17***	-0.70**	-0.66*	-0.59
		(0.35)	(0.35)	(0.34)	(0.39)
Deaths in the family	(2)	-1.02	-0.68	-0.63	-1.27
		(1.54)	(1.69)	(1.82)	(1.94)
Deaths × *Askeskin*	(3)	4.54***	3.36*	-0.53	0.72
		(1.53)	(1.85)	(1.97)	(2.23)
Observations		3,072	3,038	2,980	2,910
Adjusted-R^2		0.05	0.07	0.20	0.21
B. Net profits					
Askeskin	(4)	-0.29**	-0.08	-0.06	-0.13
		(0.15)	(0.16)	(0.13)	(0.14)
Deaths in the family	(5)	-0.42	-0.13	-0.09	0.03
		(0.70)	(0.68)	(0.51)	(0.67)
Deaths × *Askeskin*	(6)	2.10***	1.53*	1.03	1.49
		(0.71)	(0.79)	(0.91)	(1.14)
Observations		3,045	3,012	2,955	2,885
Adjusted-R^2		0.06	0.07	0.15	0.15
Control variables:					
Household characteristics		.	✓	✓	✓
Firm characteristics		.	.	✓	✓
Owner characteristics; knowledge of health facilities		.	.	.	✓

Notes: The numbers in each column are the estimates of OLS regressions of total assets or net profits on *Askeskin*, deaths in the family in the previous year, and the interaction between *Askeskin* and deaths in the family, without (column 1) and with control variables (columns 2-4). All regressions include district dummies and the dummies for other insurance held by the households. The sample excludes two groups of individuals: (i) those who lost *Askeskin* in 2006, 2007, or 2008; and (ii) those who enrolled in *Askeskin* in 2008. Deaths in the family equal one if at least one family member died in the previous year and zero if otherwise. The numbers in parentheses are robust standard errors, clustered by districts. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3.7 Using micro firms (fewer than ten workers)

Dependent variable (in logarithm)		(1)	(2)	(3)	(4)
A. Total assets					
Askeskin	(1)	-1.04***	-0.62***	-0.45**	-0.45*
		(0.22)	(0.22)	(0.22)	(0.23)
Deaths in the family	(2)	-0.91	-0.85	-0.93	-1.12
		(1.28)	(1.37)	(1.37)	(1.42)
Deaths × *Askeskin*	(3)	4.65***	3.59**	0.30	2.05
		(1.29)	(1.53)	(1.63)	(1.78)
B. Net profits					
Askeskin	(4)	-0.39***	-0.24**	-0.22**	-0.28***
		(0.11)	(0.12)	(0.10)	(0.11)
Deaths in the family	(5)	-0.25	0.00	-0.04	0.00
		(0.46)	(0.46)	(0.36)	(0.41)
Deaths × *Askeskin*	(6)	2.02***	1.51***	0.96	1.32*
		(0.47)	(0.58)	(0.66)	(0.77)
Observations		5,781	5,713	5,579	5,450
Control variables:					
Household characteristics		.	✓	✓	✓
Firm characteristics		.	.	✓	✓
Owner characteristics; knowledge of health facilities		.	.	.	✓

Notes: The numbers in each column are the estimates of OLS regressions of total assets or net profits on *Askeskin*, deaths in the family in the previous year, and the interaction between *Askeskin* and deaths in the family, without (column 1) and with control variables (columns 2-4). All regressions include district dummies and the dummies for other insurance held by the households. The sample excludes two groups of individuals: (i) those who lost *Askeskin* in 2006, 2007, or 2008; and (ii) those who enrolled in *Askeskin* in 2008. Deaths in the family equal one if at least one family member died in the previous year and zero if otherwise. The numbers in parentheses are robust standard errors, clustered by districts. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3.8 Using firms whose total assets are below Rp 50 million

Dependent variable (in logarithm)		(1)	(2)	(3)	(4)
A. Total assets					
Askeskin	(1)	-0.83***	-0.54**	-0.38*	-0.37
		(0.22)	(0.22)	(0.22)	(0.23)
Deaths in the family	(2)	-0.99	-1.13	-0.89	-1.17
		(1.32)	(1.37)	(1.44)	(1.53)
Deaths × *Askeskin*	(3)	5.21***	3.80**	0.60	2.04
		(1.33)	(1.52)	(1.70)	(1.92)
Observations		5,420	5,359	5,235	5,112
Adjusted-R^2		0.04	0.05	0.15	0.16
B. Net profits					
Askeskin	(4)	-0.35***	-0.23*	-0.23**	-0.27**
		(0.11)	(0.12)	(0.10)	(0.11)
Deaths in the family	(5)	-0.40	-0.17	-0.24	-0.24
		(0.43)	(0.44)	(0.33)	(0.37)
Deaths × *Askeskin*	(6)	2.29***	1.49***	0.98*	1.30*
		(0.45)	(0.57)	(0.55)	(0.68)
Observations		5,420	5,359	5,235	5,112
Adjusted-R^2		0.05	0.05	0.13	0.13
Control variables:					
Household characteristics		.	✓	✓	✓
Firm characteristics		.	.	✓	✓
Owner characteristics; knowledge of health facilities		.	.	.	✓

Notes: The numbers in each column are the estimates of OLS regressions of total assets or net profits on *Askeskin*, deaths in the family in the previous year, and the interaction between *Askeskin* and deaths in the family, without (column 1) and with control variables (columns 2-4). All regressions include district dummies and the dummies for other insurance held by the households. The sample excludes two groups of individuals: (i) those who lost *Askeskin* in 2006, 2007, or 2008; and (ii) those who enrolled in *Askeskin* in 2008. Deaths in the family equal one if at least one family member died in the previous year and zero if otherwise. The numbers in parentheses are robust standard errors, clustered by districts. The asterisks ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

In Table 3.7, in which I include only micro firms that hire fewer than ten workers, I find evidence that *Askeskin* household firms have higher net profits but not

total assets. In Panel A, I do not find *Askeskin* protects firms' total assets against deaths in family in the previous year experienced by owners. The estimate of the interaction term in the regression that includes all control variables is positive but statistically insignificant. The estimates of *Askeskin* show, among firms owned by households that did not experience the family hardship, *Askeskin* household firms have smaller total assets. I do not find deaths in family in the previous year affect firms' total assets (the estimates are negative but statistically insignificant).

However, I find, in Panel B, some evidence that *Askeskin* reduces the adverse effects of deaths in the family in the previous year on net profits. In the most preferred estimation (column 4), the estimate of the interaction term is positive, large, and statistically significant: the net profits of *Askeskin* household firms are about twice as much compared to firms owned by non-*Askeskin* households that did not experience the family hardship. The estimate of *Askeskin* is negative and statistically significant, implying that, among households that did not experience the family hardship, *Askeskin* household firms have lower net profits. I do not find deaths in the family in the previous year matter for non-*Askeskin* households' firm; the estimate of the family hardship is statistically insignificant.

Table 3.8, which includes only firms whose total assets are below Rp 50 million, shows some evidence that *Askeskin* protects firms' net profits but not total assets against deaths in the family in the previous year. Panel A shows, in a regression that controls for all available observed characteristics, no evidence that the relationship between total assets and deaths in the family in the previous year changes as owners get *Askeskin* (the estimate of the interaction term is positive though statistically insignificant). I do not find *Askeskin* and the family hardship affect total assets either.

In Panel B, however, I find some evidence that *Askeskin* reduces the adverse effects of deaths in the family in the previous year on net profits. The sum of the three estimates in column 4 shows that net profits for firms owned by *Askeskin* households that experienced deaths in the family are 79 percent higher. The estimate of *Askeskin* is negative and statistically significant, suggesting that net profits are lower among *Askeskin* household firms whose owners did not experience deaths in the family in the previous year. I do not find deaths in the family in the previous year matter for net profits of non-*Askeskin* household firms; the estimate is negative though statistically insignificant.

To summarise, the results by subsample are similar to the basic results. I find some evidence that *Askeskin* protects firms' net profits against deaths in the family in the previous year, particularly for micro firms that hire fewer than ten workers and those firms whose total assets are less than Rp 50 million. Among households that did not experience family hardships, *Askeskin* household firms that are micro have smaller total assets and net profits; however, I do not find *Askeskin* matters for micro and small firms in urban areas. I do not find, among firms owned by non-*Askeskin* households, deaths in the family in the previous year affect the performance of firms in urban areas and micro firms whose workers are fewer than ten or total assets are below Rp 50 million.

3.6 Conclusion and Discussion

Askeskin seems to partially help micro and small firms in Indonesia recover from the owners' experience of family hardships: it absorbs some adverse effects of recent deaths in the family (in the previous year) and traffic accidents on net profits but not on

total assets. It also reduces some adverse effects of owners having outpatient care on total assets and net profits: with *Askeskin*, total assets and net profits, respectively, are 44 and 92 percent higher among the firms whose owners suffering the family hardship. It may help owners withstand other types of hardships (the magnitude of most estimates of the interaction terms are large), but the estimates are statistically insignificant. Analyses by firm size and urban are similar: *Askeskin* may help micro and small firms recover from recent deaths in the family, particularly net profits—the estimates of the interaction term are large but some are statistically insignificant.

The evidence that *Askeskin* partially reduces the adverse effects of family hardships on firm performance is in line with the empirical literature of internal finance. Internal finance growth theory suggests that, with limited access to external finance, small firms' growth is sensitive to the availability of internal finance; and several papers highlight that public policies can help small firms grow by obtaining external finance or increasing productivity (Audretsch and Elston, 2002; Beck et al., 2005; 2006; 2008; Guariglia et al., 2011). The *Askeskin* programme could work in two ways. One, *Askeskin* can reduce the financial burden incurred by family hardships, which, in turn, can help owners retain internal finance to grow their firm. Many papers find evidence that social health insurance reduces healthcare spending and the needs of costly coping strategies (see, e.g., Amponsah, 2015; Liu, 2013; Wagstaff and Yu, 2007; Wagstaff and Prahan, 2006). Two, being insured can improve human capital and productivity of owners and their household members. The literature on social health insurance finds health insurance programmes improve people's health outcomes. Some examples are Nguyen and Wang (2013), Wagstaff and Prahan (2006), and Wang et al. (2009).

The findings that family hardships (i.e., outpatient care) reduce total assets and net profits among firms owned by uninsured households are in line with the literature of

family hardships. Sickness or health shocks can reduce the income of micro and small firms through the trade-off between catastrophic health expenditures (Axel, 2016) and reduction in households' productivity (Isoto et al., 2016) and household heads' labour hour worked (Nguyet and Mangyo, 2010). In contrast to Parinduri (2014)'s the findings on micro and small firms in Indonesia, I find sickness in the family (i.e., outpatient care) reduces total assets and net profits, but I do not find deaths in the family matter for firms' growth. One reason is that perhaps the households are able to adjust their labour supply following the loss of a household member (Dhanaraj, 2014; Fadlon and Nielson, 2014; Liu, 2013) or health shocks are more likely to induce sale of assets to pay treatment costs (Yilma et al., 2014). Another possible reason is because I use different measures of family hardships.

Askeskin seems to reduce total assets and net profits among micro and small firms whose households did not experience family hardships. It is possible that recipients of social health insurance are more likely to seek care even though they do not need to. Some studies argue that a more generous insurance scheme may encourage people to use healthcare services and lure them to more expensive care, which can increase the risk of high out-of-pocket expenditures; moreover, healthcare providers may try to increase out-of-pocket payments by the insured by inducing demand for uncovered services or by engaging in extra-billing (Sparrow et al. 2013; Wagstaff et al., 2009; Wagstaff and Lindelow, 2008). It may also because I have not completely controlled for differences between *Askeskin*- and non-*Askeskin* recipients.

The findings imply that social health insurance, through speeding the recovery process, may improve financial viability of micro and small firms, which many programmes such as microcredit and microinsurance have been focusing on for poverty alleviation in developing countries. Given its wide coverage and outreach, social health

insurance can stimulate the growth of micro and small firms, which contributes to job creation and economic growth. Expansion of social health insurance programmes, therefore, can yield not only a healthier population, but create some spillover benefits as well.

We can see some of the findings in this chapter as a potential benefit of social health insurance: it empowers owners of micro and small firms. However, for policy implications of my results, we need to consider several limitations. One, my analysis relies on cross-sectional data, which remains vulnerable to heterogeneity of unobserved factors that may affect total assets and net profits, whether a person enrols in *Askeskin*, and whether she experienced a family hardship. I do control for all available variables in the data and examine robustness of the estimates, but limitations remain: I may not fully overcome the selection bias because some characteristics are unobservable or unavailable. Two, I only measure the short-term effect of *Askeskin* from 2006 to 2008. Initial implementation of *Askeskin* experienced various shortcomings, which may affect the selection of right target group for the insurance. Besides, because the Indonesian government is reforming the *Askeskin* programme and rolling it out to other target groups, its impact may differ from those I found in this chapter, so future work can examine its effects as it evolves. Three, I do not control for supply-side factors such as quality of public healthcare, which may affect the decision of recipients to use *Askeskin*, and I cannot measure the extent to which the supply-side factors contributes to the variation in firm performance.

These caveats nonetheless suggest a number of ways forward. First, better identification methods may allow for a more refined analysis of social health insurance as the source of reported growth of micro and small firms. However, because many developing countries have recently integrated public and private insurance schemes

under one system, future research should consider how to separate the effects of being a social health insurance recipient from the effects of a large-scale substitution from private to public insurance (Anderson et al., 2012). Second, supply-side interventions, improved quality of healthcare, and better geographic access to healthcare facilities are factors that the literature sheds little light on; if data are available, future work should take into account these factors for impact evaluations of social health insurance on micro and small firms.

Chapter 4

Essay 3: Rising Wages and Mechanisation of Small Farms in Indonesia

4.1 Introduction

Small farms are a predominant feature in Asian agriculture: Asia accounts for 90 percent of over 500 million farms smaller than two hectares in the world; China and India have the largest share, followed by Bangladesh and Indonesia (Rapsomanikis, 2015; Hazell et al., 2007; Lowder et al., 2016; Nagayets, 2005).[58] Investing in agriculture, which affects many small farms, has been on economic development agenda in many developing countries since the success of the green revolution in large part of Asia (Rosegrant and Hazell, 2000). Small farms play a significant role in producing a large share of the world food supply and generating jobs for the rural poor, which help to reduce the price of staple food, alleviate rural poverty and increase rural living standards (Montalvo and Ravallion, 2010; Ravallion and Chen, 2007; Suryahadi et al., 2009; Wiggins et al., 2010; World Bank, 2008c).[59]

However, some predict that the prospects of small farms may be deteriorating and the sector may soon disappear in the process of economic development. As economies grow and diversify, average farm size decreases as a result of growing

[58] Smallholder farms often include family farms, and, without clear definitions, the literature of smallholder farming uses the two terms interchangeably. Lowder et al. (2016) argue that small and family farms are different, and their paper is the first in the literature that considers different agricultural holdings and documents representative trends and patterns in average farm size and farmland distribution worldwide.

[59] See also Christiaensen et al. (2011), Dethier and Effenberger (2012), and Loayza and Raddatz (2006) for cross-country analysis of the composition of growth for poverty alleviation; and Valdés and Foster (2010) for econometric evidence of the role of agriculture in pro-poor growth.

population size and non-agricultural sector, and farm workers migrate out of agriculture for better opportunities, which eventually decrease farms' comparative advantage when labour becomes scarce and costly (Binswanger-Mkhize, 2012; Otsuka, 2013; Otsuka et al., 2016). Besides, the rise of supermarkets, lower commodity prices, liberalised trade, environmental change, and changing policy ideas also create mounting difficulties and costs of accessing inputs and markets to smallholders (Boselie et al., 2003; Hazell et al., 2010; Lowder et al., 2016; Pingali, 2007; Wiggins et al., 2010). All these threats may drive small farms out of business if smallholders fail to adapt to the changing economic environment. Since small farms remain dominating in most Asian countries, it is essential to know what factors determine the efficiency and the viability of small farms, which could shed some light on devising policy to alleviate poverty and promote inclusive growth.

In this chapter, I focus on smallholders' decision to mechanise to cope with rising wages. In the context of structural transformation, we would expect wages to rise as economies grow; higher wages may induce greater adoption of labour-saving farm operations. Specifically, I study whether rising real wages induce mechanisation in small farms (2 hectares or smaller) in Indonesia. I answer two research questions: (i) Do rising real wages induce mechanisation of small farms? and (ii) If so, does farm size matter? To answer the first question, I examine the effects of three types of wages: real minimum wages as a measure of overall labour input costs; real agricultural wages as direct labour cost; and real non-agricultural wages as opportunity cost of hiring family labour or the non-farm income (a source of finance). For the second question, I examine whether farm size as a constraint for small farms to mechanise when real wages increase.

Theoretical literature suggests that farmers mechanise to save labour if hiring workers become costly (Binswanger, 1986; Funk, 2002; Hayami and Ruttan, 1971; Hicks, 1932); empirical literature seems to support the hypothesis but focus primarily on large holdings. For example, Otsuka (2013) and his co-authors claim that mechanisation only pays off to large farms through economies of scale: the per unit of return from the investment in mechanisation is higher for large-scale production; therefore, increasing farm size is required for farm mechanisation (see, e.g., Otsuka et al., 2013; 2016; Wang et al., 2016; Yamauchi, 2016). The literature on small farms remains scant; only a few studies show that small farms mechanise through outsourcing some stages of production to machine rental service providers (Yang et al., 2013; Zhang et al., 2017), but with little focus on the effects of real wages.[60] Moreover, whether small farms need a bigger land for effective mechanisation has remained a debate in the literature (Dawe, 2005; Deininger and Byerlee, 2012).

I use two rounds of the Indonesian Family Life Survey (IFLS), IFLS-4 and IFLS-5, which took place in 2007-2008 and 2014-2015, respectively. The surveys include farm- and community-level information, which I use to construct the key variables: (i) mechanisation at farm level (the dependent variable)—the values of tractors, vehicles, farm equipment, and irrigation systems; and (ii) monthly wages for agricultural- and non-agricultural sectors at province level (the independent variables). I also use the data from Statistics Indonesia (BPS) for monthly minimum wages at province level.

[60] To my best knowledge, only two papers that I am aware of focus on small farms: (i) Takahashi and Otsuka (2009) on the effects of non-farm income on the use of tractors and threshers and on the employment of hired labour in rice farming; and (ii) Wang et al. (2016) on the effects of relative price of machines to agricultural labour on the use of machines. Both papers study China.

I find some evidence that rising real wages induce mechanisation of small farms though it depends on the measure of real wages and forms of mechanisation. I find that higher real minimum wages encourage the use of tractors, and that higher real agricultural wages induce higher use of vehicles. For example, the amount invested in tractors and vehicles increases by 0.72 and 1.48 percent, respectively, in response to one percent rise in the wages. I also find relatively large farms use more tractors as real wages (all types) increase; they also invest more in vehicles when farm labour become more costly. By contrast, relatively small farms invest more in irrigation systems in response to higher real wages and more in farm equipment when real agricultural wages increase.

This chapter contributes to the literature in two ways. One, I contribute to the scant literature on mechanisation of small farms by examining the effects of real wages and farm size on the use of labour-saving technologies by small farms. I find some evidence that rising real wages induce mechanisation of small farms, and that small farm size may not constrain mechanisation. The finding may shed some light on the debate as to whether small farms are to get big or get out as countries develop (Collier and Dercon, 2013; Otsuka et al., 2016; Rigg et al., 2016). Prior studies predict that if small farms remain predominant, Asian countries could lose their comparative advantage in agriculture and become major importers of grains. They argue that if wage rates continue to rise, the countries will need to have their small farms mechanised and expanded at the same time to realise scale economies (Otsuka, 2013; Otsuka et al., 2013; 2016). However, due to their archipelagic geo-location and land scarcity, it seems that countries like Indonesia and the Philippines might have most of their farms remain small, which makes adoption of large scale mechanisation difficult (FAO, 2015). My findings show that small farms may not need to get big as farm size seems to matter

only for some forms of mechanisation (i.e., the use of tractors and vehicles). Moreover, some studies argue that institutional innovation such as machine rental and service markets can help overcome the constraint of small farm size (Yang et al., 2013; Zhang et al., 2017).

Two, I study Indonesia, a developing country whose share of small farms is large (the third largest in Asia) and land endowments vary across islands, which complements the papers on other Asian countries like Cambodia, China, and Thailand whose histories, land endowment, patterns of land ownership, and agricultural policy differ from Indonesia's (see, e.g., Eliste and Zorya, 2015; Isvilanonda et al., 2001; Takahashi and Otsuka, 2009; Yang et al., 2013). Although all countries will experience agricultural mechanisation as structural transformation continues, the pace and pattern of this change may be different over time in different contexts, and all countries may not follow same path of agricultural mechanisation.

The chapter proceeds as follows: Section 4.2 describes the background of small farms, wage growth and mechanisation in Indonesia; section 4.3 presents the literature review; section 4.4 describes the data and empirical strategy; section 4.5 discusses the effect of rising real wages on mechanisation; and section 4.6 concludes.

4.2 Small Farms, Wage Growth and Mechanisation in Indonesia

4.2.1 Agriculture and Small Farms in Indonesia

In Indonesia, agriculture remains a large sector and serves as a pillar of the economy. Despite its decreasing share of GDP, the sector accounts for 13.5 percent of GDP and 33.5 percent of total employment (the second largest after service sector), and the

country is the largest global producer of palm oil and a major exporter of rubber, copra, cocoa, and coffee (FAO, 2017).[61]

Of the nation's total land areas (around 150 million hectares), about 35 percent are agricultural land; of about 22 million holdings, more than 85 percent are smallholders whose farm land is less than 2 hectares, with an average plot size of 0.5 hectares (FAO, 2018). Smallholders tend to focus on horticultural commodities and growing staples, including rice, corn and cassava, as well as cash crops, though they increasingly account for a dominant share of other exports such as palm oil and rubber. Lowland and upland cropping are the two most common farming systems that smallholders practice, while the perennial crop farming system (e.g., rubber, coconut, palm oil, coffee, cocoa, and tea) is mainly used by larger estates to grow favourable income crops (FAO, 2018; Oxford Business Group, 2018).

However, smallholders' income is low and one-fifth of them live in poverty: Small farms earn only US$573 per year (at 2009 constant price), which is twice as much lower than bigger farms. On-farm activities, which are the most important source of livelihood, contribute only about 47 percent to smallholders' annual income, and they need to rely on non-farm sources, which account for 30 percent of their annual income. Small farms' productivity tends to be relatively low because the threat of climate change and farmers use little modern tools or improved seed varieties (FAO, 2018).

[61] See also Syuaib (2016) for more information on agriculture in Indonesia.

4.2.2 Wage Growth in Indonesia

The average national wages in Indonesia has increased continuously since 1997, mainly due to annual increments of the country's minimum wages. In 1997, the average monthly national wages stood at Rp 135,000 (US$46.40, current value); by 2016 the wages had increased to about Rp 2 million (US$144.80, current value), a growth rate of 13.8 percent (Figure 4.1). These wage increases have been achieved predominantly through minimum wage fixing mechanism in the country (ILO, 2015).

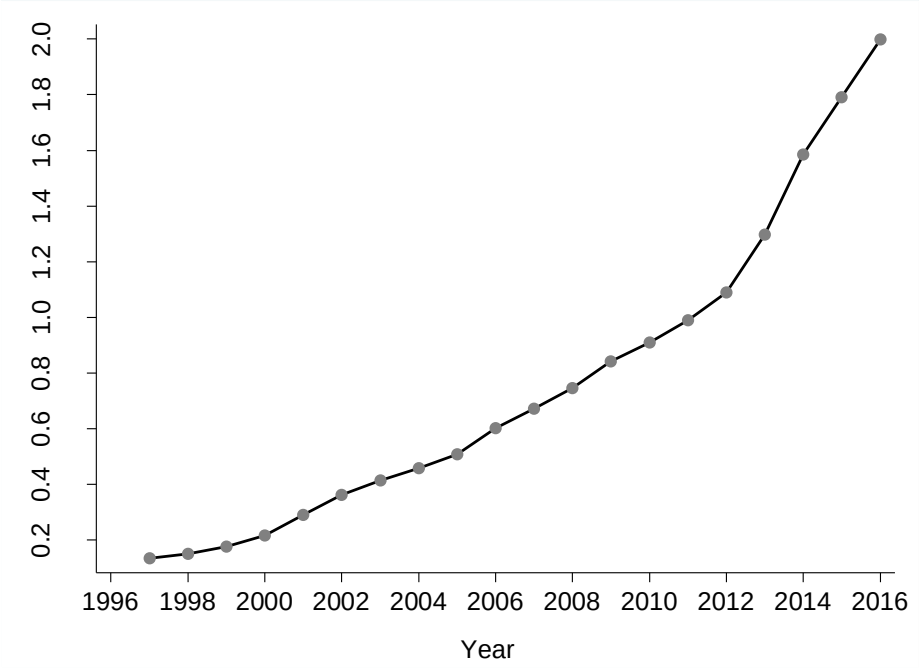


Figure 4.1 Average monthly national wages in Indonesia, 1997-2016.
Source: Author's calculation from Statistics Indonesia (2018)'s data.

Indonesia has a unique minimum wage system: there is no national level of minimum wages; instead, each province or district sets its own minimum wages annually; even sectoral level minimum wages exist in many parts throughout the country. As a primary mechanism to improve wages and working conditions for workers, a board that involves workers, employers and the government (province or

district) revise minimum wage rates annually, by taking into account the amount needed for workers to achieve a "minimum decent standard of living" or *kebutuhan hidup layak* (KHL) that included 60 items in the assessment list. In October 2015, the government adopted a formula based approach that adjusted minimum wages annually by the total of the percentage increase in real national GDP and the national inflation rate in the previous year (Allen, 2016; ILO, 2015).

However, because minimum wages can be established by provinces and districts, as well as by sectors and occupations within provinces or districts, disparities have emerged and widened wage gaps between agriculture and manufacturing sector. Between 2011 and 2015, for example, real agricultural- and construction sector wages grew by 12 percent while real manufacturing sector wages grew by 19 percent. Meanwhile, the growth of minimum wages has been outpacing the growth of average wages in 2011-2014: minimum wages increase twice as much the rise in average wages (24 percent) (Allen, 2016; ILO, 2015). Nevertheless, workers in informal sector, in particular, earned well below the regulated minimum wages, owing to high non-compliance rate of the policy (close to 40 percent in 2008 to 2013) and loose policy enforcement (Allen, 2016).

4.2.3 Mechanisation of Small Farms in Indonesia

Agricultural mechanisation in Indonesia was started in 1950s and can be divided into four stages: comparatively large scale machines such as tractors and water pumps were introduced for the first time in the first stage (1950-1960); small machines in the second stage (1960-1970) and were further expanded in the following stage (1970-1980); and, in the last stage (after 1980), under the cooperation between Japan and Indonesia,

several machines such as tillers, reapers, multi-crop threshers, and dryers, were designed for Indonesia (Suzuki, 1990).

The development of agricultural mechanisation in Indonesia is still focusing on tractors, water pumps, mechanical rice threshers, and rice mills, which are mainly for rice cultivation. Although farm mechanisation has been applied in some areas such as parts of Java, Sumatera and Sulawesi, the application is limited to the use of hand tractors for land preparation, or threshers and rice milling units for post-harvest handling. The use of four-wheel tractor, power sprayer, cultivator, or other machinery is merely found in bigger estates (Syuaib, 2016). As of 2010, rice milling and pest and disease control were fully mechanised, but only 50 percent of irrigation used water pumps and about 40 percent of tillage activities used hand tractors. Traditional methods were used widely in threshing and drying activities, while limited or no machines were used in planting, weeding, and harvesting (Ministry of Agriculture, 2013a; 2013b).

Irrigation systems play an important role in Indonesia's agricultural development. The systems were developed as early as more than two thousand years ago, started with community irrigation systems, followed by modern irrigation systems in the middle of the nineteenth century. After the Second World War, Indonesia introduced the first phase long-term development, *Pembangunan Jangka Panjang I*, which spanned for 25 years (1969-1993) and contained five *Repelita* (*Rencana Pembangunan Lima Tahun*, five-year development programme) that focused on agricultural development. At the time, about 1.44 million hectares were provided with new irrigation systems and 3.36 million hectares of existing irrigation systems were either rehabilitated or upgraded through special maintenance. The second 25-year development period (1994-2019) started in April 1993 with *Repelita VI*, but the development slowed down, and greater emphasis was placed on sustaining self-

sufficiency in rice and on the operation and maintenance of water resources infrastructure (FAO, 2011).

The irrigation potential of Indonesia is about 10.9 million hectares, and the major crops under full control irrigation are paddy, maize, groundnuts, and soybeans. Full control irrigation areas cover 68 percent of total water managed areas, comprising technical, semi-technical, and simple irrigation, while non-equipped cultivated wetlands cover 32 percent. The areas served by technical, semi-technical, and simple irrigation systems are 4.8 million, 1.3 million, and 0.6 million hectares, respectively (FAO, 2011).[62]

However, the performance of the large-scale irrigation schemes has been unsatisfying: 40-50 percent of all irrigation systems nationwide are in disrepair, which limit the growth in agriculture. Farmers often receive poor water service delivery due to bureaucratic institutional setup and rigid technical design. The former has led to insufficient funding, inadequate operation and maintenance, and system deterioration, which often leading to the need for successive rehabilitation; the latter has made service delivery inflexible and incapable to respond to changes in demand by farmers. Moreover, the growth rate of new irrigation system development is slowing down as government budgets are largely targeted toward major crop subsidy programmes for fertiliser and seeds (FAO, 2011; Sumaryanto, 2014).

[62] Technical irrigation is an irrigation system in which distribution of water can be fully controlled from the source to the field; semi-technical irrigation systems are characterised by permanent canals and few control or measure devices; simple irrigation systems are characterised by few permanent control or distribution structures and may be managed by farmers.

4.3 Literature Review

4.3.1 Theory of Induced Innovation

The theory of induced innovation, which Hicks (1932) introduces as a macroeconomic hypothesis, puts forward that technical changes in agriculture are induced by changes in demand for products and factor prices. Specifically, economic growth stimulates the demand for agricultural products and changes relative factor prices: factors such as labour that are inelastic in supply and slower in growth become relatively more expensive while those factors with elastic supply become relatively cheaper. These changes in factor prices then induce technical innovation among profit-maximising farmers to seek for less costly alternatives.

In a microeconomic context, Hayami and Ruttan (1971)'s induced-development model extends the inducement hypothesis to apply to public and private institutional changes that interact with induced responses of farmers.[63] Technical changes take place in five ways. One, similar to Hick's hypothesis, changes in factor and product prices induce farmers to substitute low-cost inputs for high-cost inputs, high-value agricultural products for low-value products, and more productive techniques for traditional or less productive ones. Two, changes in the relative factor prices influence the direction of innovations in private sector. Three, farmers demand public agencies to develop new technologies in response to shifts in relative prices; all sorts of factors may motivate public agencies' response: scientists may be motivated by, for example, economic logic and a drive for professional achievement and recognition; and administrators by the ballot box and farm association. Four, resource endowment, changes in resources' supplies and demands, and changes in product demand induce institutional changes for

[63] See Sahota (1973)'s book review on the summary of the theory.

productive use of inputs through advances in technology. Five, disequilibrium on the markets and imbalance within agriculture and across sectors induce more efficient resource allocation, innovation, and development. The model concludes that resource endowment and economic change induce both technical and institutional changes through an interaction among farmers, public agencies, and private entrepreneurs.

Binswanger (1986) provides a detailed comparative historical review and draws several generalisations on the pattern and speed of mechanisation (or induced innovation): One, mechanisation happens more rapidly if the demand for agricultural products is elastic in the export markets, which induces fast expansion of areas planted and agricultural output. Two, farmers tend to mechanise when labour is scarce relative to land. For example, rising non-agricultural demand for labour can induce farm mechanisation when labour is moving rapidly off the land; mechanisation is less profitable when labour is more abundant and farms are smaller. Three, higher capital and energy costs reduce the speed of mechanisation as all forms of agricultural investment become less profitable; the negative effect is larger if labour is cheap. Four, larger farms are where mechanisation usually starts, but farm size has much less influence on the size of machines if rental markets are easy to establish. Five, higher agricultural wages are likely to induce mechanisation of control-intensive operations; by contrast, power-intensive processing and pumping operations are always the first to be mechanised and can be profitable even at low wages. Six, mechanisation is less profitable in low-wage countries; the higher the control intensity of operation, the higher must labour costs be to warrant mechanisation. Seven, mechanisation does not depend directly on government intervention as private firms can respond rapidly once economic conditions have produced effective demand for machineries.

4.3.2 Wages, Farm Size, and Mechanisation

Early empirical works find that rising wages induce rapid pace of technical innovations. Brown and Philips (1986) find, in the 19th century American canning, creation of managerial initiative and market forces stimulate profit-maximising firms to mechanise. First, skilled workers get high pay and have high degree of control over the production process, which constrain the firms' managerial decision. Therefore, the firms use more labour saving machinery to reduce the social power of skilled workers. Second, unreliable seasonal supplies of unskilled workers stimulate firms to develop labour-saving devices to perform unskilled tasks.

More recent studies also seem to confirm substitution of machines for costly labour. For instance, Christiaensen (2012) finds, in China, accelerated decline in agricultural labour-land ratios, along with active government support through machinery subsidies, induce rapid introduction of large- and medium-sized tractors. Wang et al. (2016) also get similar findings in China: a rapid increase in real agricultural wages, in contrast to a relatively stable real machine prices, induces widespread use of machines on small farms; the effects are strong in the production of wheat, rapeseeds, and soybean. Eliste and Zorya (2015) conclude that labour saving and time saving are the two reasons that drive mechanisation in rice cultivation in Cambodia, but high costs of agricultural equipment constrain low-income farmers to adopt mechanisation. Isvilanonda et al. (2001) find, in Thailand, higher labour wages induce rice farmers to use four-wheel tractors and threshers, while intensification of rice cropping and low interest rate stimulate widespread use of power tillers. Takahashi and Otsuka (2009) find higher non-farm income induces small rice farmers in the Philippines to buy tractors but not threshers, due to the development of efficient rental

markets for the latter. The farmers also tend to hire labour to substitute family workers who join the non-farm sector.

Several papers highlight the growing advantage of large farms for mechanisation to take place. Otsuka (2013) and Otsuka et al. (2016), for example, argue that Asian countries are likely to suffer loss of comparative advantage on agricultural products and food shortage if smallholder farming is predominant. As wage rates increase rapidly, to reap the benefits of scale economies, the optimal farm size is likely to increase through land transfers from small farmers to big ones. Otsuka et al. (2013) find, in a sample of 53 countries over the period 1980-2007, rising agricultural wages induce the substitution of labour by machines in agriculture, but small farm size constrains the inducement process. Yamauchi (2016) gets similar findings in Indonesia: instead of through machine investment, relatively large farmers substitute labour by machines through machine rental and service providers. Wang et al. (2016) find, in China, growth in agricultural wages and migration rate induce higher demand for machine services, and the effect is larger among relatively large farms. Besides, rising real non-agricultural wages encourage farmers to expand their self-cultivated land. And with the development of machine rental markets, wage growth induces little private machine investment. However, Deininger and Byerlee (2012) argue that farm size revolution needs well-defined property rights and a clear, transparent, and enforceable regulatory framework, provision of public goods, and undistorted factor prices. Moreover, farms in Asian countries will never be as large as those in developed countries—such as North America, Australia, and New Zealand—and the benefit of large farm size may work for only a tiny minority (FAO, 2015).

Other studies argue that, without land expansion, it is possible for small farms to deploy the benefits of mechanisation in a different way. The early work by Akinola

(1987) and Olmstead and Rhode (1995) show that small farms can be mechanised through machine rental service by governments or private providers. Francks (1996) and Oshiro (1985) suggest that machines such as power tillers can be designed to match the needs of small farms. During the postwar period in Japan, for example, a vast majority of rice cultivations are in small units but almost completely mechanised. Farm households at the time combine small-scale farming with other sources of income by sending one or more of their members to other employment opportunities. Smallholder friendly machines are therefore innovated to meet the demands of these farm households.

Some recent studies find that small farms mechanise rapidly through renting machines and outsourcing the most power-intensive stages of production. The emergence of migratory specialised mechanisation service providers helps overcome the constraint of small farm size, and agricultural production can be as divisible as industrial production (Yang et al., 2013; Zhang et al., 2017). Ji et al. (2012) suggest that machinery service markets substitute the need of farmers to own a machine, and a negative relationship between off-farm employment and ownership of machine may imply the subsitution effects of rental markets.[64] Dawe (2005) finds, in Thailand, that the use of harvesting machines in rice cultivation grows rapidly for all farm sizes, including small farms; nearly all the adoption of machines is through private rental markets. The high adoption rate is also perhaps due to good infrastructure such as roads and irrigation.

[64] Su et al. (2015) find that off-farm employment reduces the current value of agricultural fixed assets for households in China. The role of machine rental markets, as Ji et al. (2012) highlight, may help to explain the negative relationship.

The literature on migration is also related to the topic of mechanisation, but it discusses primarily on how migration affects farm households' investment in capital inputs and technologies through households' non-farm income or remittances.[65] Non-farm income can relax credit constraints to finance the investment in farm inputs, technologies and capital, which can potentially improve farm productivity (Adams, 1998; Gebregziabher et al., 2012; Taylor and López-Feldman, 2007; Zhang et al., 2016);[66] however, non-farm participation can also draw resources away from farm, which reduces farm productivity (Nasir and Hundie, 2014). Several papers find the positive effects of non-farm income on machine investment and technology adoption, which partly compensate the negative effects of losing family labour on farm productivity (Li et al, 2013; Rozelle et al., 1999; Taylor et al., 2003; Wang et al., 2011), but Pfeiffer et al. (2009) find otherwise.

The effects of non-farm income on machine investment and farm productivity may differ by the nature of farm activities. Kilic et al. (2009) find subsistence farmers do not invest in farm inputs and choose to move out from crop production, while commercial farmers spend more on livestock to improve farm productivity. Maharjan et al. (2012) find inflow of remittances increases the number of hired farm labour, but the farm households neither move from subsistence farming towards more profitable commercial farming nor invest in fertiliser.

[65] This line of literature is built on Stark and Bloom (1985)'s New Economics of Labour Migration, a framework that stresses the complexity of migration as an institution (family decision), the interrelationship between migration's determinants and impacts, and migrants as members of rural households. The determinants include household capital constraints, risk, and community-level variables; the potential impacts include positive effects of remittances on family production and investment decisions and negative impacts of losing family labour to migration.

[66] See also Chiodi et al. (2012); Savadogo et al. (1994); and Stampini and Davis (2009).

The relationship between real wages and mechanisation may also depend on types of mechanisation, institutional environment, and who controls farm and non-farm activities within the households. Pingali (2007) finds that an increase in real wages induces rice farmers to mechanise control-intensive operations, while the intensification of farming systems induces mechanisation of power-intensive operations. The author also suggests that government policies, such as those that enhance rural infrastructure, are necessary to encourage rice farmers to invest in machines and technologies and to reduce the costs to machine rental markets. Reardon et al. (1994) suggest that non-farm income is a key substitute to borrowed capital as well as collateral for the access to credit when credit markets do not function, particularly in rural areas. The timing and nature of non-farm income flow relative to requirements in farming, and the intra- and inter-household distribution and control of non-farm income also matter. Mendola (2008) finds households that engage in costly high-return migration (i.e., international migration) are more likely to use farming technology, while poor households that fall on low net-return migration (i.e., domestic migration) do not invest to improve farm productivity.

4.4 Empirical Strategy and Data

4.4.1 Empirical Strategy

I use potential outcome framework to study the causal effects of real wages on mechanisation of small farms.[67] To investigate the effects of real wages on farm mechanisation, I use fixed effects model as follows:

[67] See Section 3.4.1 in Chapter 3 for potential outcome framework.

$$y_{ijt} = \alpha_{ij} + \gamma_t + \beta wage_{jt} + \delta X_{ijt} + \varepsilon_{ijt} \quad (4.1)$$

where y_{ijt} is the logarithm of the value of machines and farm equipment owned by farm household *i* in province *j* in year *t*; $wage_{jt}$ is the logarithm of the real wages in province *j* in year *t*; X_{ijt} is a vector of control variables that include household-, farm-, and village characteristics; the terms α_{ij} and γ_t capture farm fixed effects and year fixed effects, respectively and ε_{ijt} is the idiosyncratic error term. I cluster the standard errors at province level. I include the control variables to capture time varying factors that may affect mechanisation and real wages. The farm fixed effects term, α_{ij}, controls for all time-invariant farm-specific factors that may affect mechanisation and wages. For example, knowledge and skill of workers on farming and machines may matter for how much they earn and whether they can adapt to new technologies, but these factors are unobservable. The year fixed effects term, γ_t, picks up time trends of mechanisation or wages such as economic shocks and policies that affect mechanisation and wages in a specific time period.[68]

The coefficient of interest in equation 4.1, β, is the effects of real wages on the value of machines and farm equipment or the extent of mechanisation that small farms go through. The hypothesis is that if an increase in real wages induces smallholders to invest more in machines and farm equipment, β would be positive.

I also use an interaction term $land_{ij2007} \times wage_{jt}$ to examine whether the effects of real wages vary by initial farm size in 2007 at household level. Otsuka, Liu, and Yamauchi (2013; 2016) suggest a positive interaction between wage rise and farm

[68] According to FAO (2018), agricultural mechanisation refers to the process of improving farm labour productivity through the use of agricultural machinery, implements and tools. It involves the provision and use of all forms of power sources and mechanical assistance to agriculture, from simple hand tools, to animal draught power, and to mechanical power technologies.

size, implying relatively large farms invest more in mechanisation when wage rates increase, and the estimate of the interaction term would be positive.

4.4.2 Data and Variables

The data on small farms are from the fourth and the fifth waves of the Indonesian Family Life Survey (IFLS-4 and IFLS-5) conducted by the RAND Corporation in 2007-2008 and 2014-2015, respectively.[69] The surveys represent about 83 percent of the Indonesian population living in 13 of 26 provinces in Indonesia. The datasets include household- and community-level data such as farm business and farm assets owned by the households, household characteristics, wages, employment, and village facilities. To have only small farms (and micro farms) in the sample, I exclude farming households whose self-cultivated and owned lands are larger than two hectares.[70] The final sample has about 3,300 small farms.

I include four farm assets owned by farm households in the past 12 months as the measure of the extent of mechanisation that farms do (the dependent variable): tractors, vehicles (bicycles, motorbikes, car or truck, and water vehicle), farm equipment (farming machines, generators, etc.), and irrigation systems (pump, tube well, etc.); the variables are from the farm business module (Book 2) of the IFLS.[71] All the dependent variables are in Indonesian Rupiah (at 2012 provincial constant prices) and converted to logarithms.

[69] See Strauss (2009a; 2009b; 2016) for more details. The datasets are available at https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/ifls5.html
[70] I follow Nagayets (2005)' definition on small farms. In the IFLS, 95 percent of the farms are two hectares or smaller.
[71] I do not use net purchase of farm assets as the measure of mechanisation because data is unavailable in the IFLS.

For the key variables of interest, I consider three measures of province level real wages: (i) monthly minimum wages as the measure of overall labour input costs that accounts for costs of farm labour, alternative sources of income that farmers can earn from working in non-agricultural sector, and opportunity costs of family members engaging in farming activities, (ii) monthly agricultural wages the farm labour costs, and (iii) monthly non-agricultural wages the opportunity costs or an alternative source of income, which enter equation 4.1 separately to measure the effects of wages on farm mechanisation. I construct the agricultural- and non-agricultural wages by first taking the average wages at household level and then the average at province level in 2007 and 2008 (the data are from the employment module of Book 3A of the IFLS). I exclude the wages for family workers, government servants, and the self-employed to make sure I examine only the effects of real wages for hired workers. As for provincial monthly government mandated minimum wages, the data are from *Badan Pusat Statistik* (*BPS,* Statistic Indonesia). All the wages are in Indonesian Rupiah (at 2012 provincial constant prices) and converted to logarithms.[72]

I use two measures of farm size, namely the sizes of owned and self-cultivated land, in the specifications that include an interaction term. Since land size and real wages may be correlated, I use land size in 2007 in the estimations to reduce the likelihood of endogeneity bias. Both variables are measured in hectares and from the farm business module (Book 2) in IFLS-4.

The control variables I consider are household-, farm-, and village characteristics. For household characteristics, I use the gender of household head, average age and average years of schooling of household members, and average

[72] The data are available at https://www.bps.go.id/subject/19/upah--buruh.html#subjekViewTab4.

number of household members and female members; all variables include only members aged 20-55 at the survey period.[73] The farm characteristics include types of farm products, the number of plots and dummy variables for whether a farm experienced crop loss within the past 12 months due a drought, a flood, a pestilence, or a disease. Village characteristics are dummy variables that indicate whether a village has cement roads and paved roads and whether a village experienced flood, earthquake, landslide, volcano eruption, tsunami, drought, forest fire, and fire in the previous five years.[74]

Table 4.1 presents the summary statistics. Panel A shows that, on average, farmers invest more in vehicles, about Rp 1 million (about US$104 in 2012), followed by tractors (Rp 0.27 million or US$28 in 2012), farm equipment (Rp 0.15 million or US$15.60 in 2012), and irrigation systems (Rp 0.13 million or US$13.5 in 2012). Panel B shows that the average real monthly minimum wages are Rp 0.96 million (about US$98.39 in 2012); workers in non-agricultural sector earn about Rp 2.95 million monthly (about US$309 in 2012), which are about a double as much as the monthly wages for farm workers. Panel C, which presents the average farm size in 2007, shows that each farm household owns and cultivates 0.3 hectares of farmland.

Panel D shows that the households are small and most household heads are male. Of members aged 20-55, each household has an average of three members and only one female member. The average age of the members is 36 years old and the average schooling is seven years. As for farm characteristics in Panel E, each household owns about one and a half plots of land and about 48 percent of the households are rice

[73] I follow the age group suggested in Yamauchi (2016).
[74] The data for household, farm, and village characteristics are from Book 3A (household survey), Book 2 (household survey), and Book 1A (community survey), respectively.

farmers. About seven percent of the small farms experienced crop loss in the previous 12 months due to dry seasons and pestilence, and one and two percent due to flood and disease, respectively.

Table 4.1 Summary Statistics

Variable	N	Mean	SD	Min.	Max.
A. Mechanisation					
Tractors	6633	0.27	(2.33)	0	117.60
Vehicles	6633	1.05	(6.26)	0	315.90
Farm equipment	6633	0.15	(3.04)	0	226.40
Irrigation systems	6633	0.13	(1.78)	0	133.20
B. Monthly wages (at province level)					
Real agricultural wages	6113	1.63	(0.96)	0.47	3.95
Real non-agricultural wages	6555	2.95	(0.90)	1.58	6.24
Real minimum wages	6633	0.96	(0.29)	0.59	2.15
C. Farm size (in 2007)					
Total land owned	6507	0.29	(0.50)	0	2
Total self-cultivated land	6529	0.33	(0.50)	0	2
D. Household characteristics (20-55 years old)					
Average age	6320	36.19	(6.59)	20	55
Average years of education	6333	8.10	(3.27)	0	20
Household size	6320	2.74	(1.36)	1	17
Male household head	6632	0.88	(0.33)	0	1
Number of female members	6320	0.82	(1.01)	0	11
E. Farm characteristics					
Number of plots	6633	1.44	(1.84)	0	40
Rice farming	6644	0.48	(0.50)	0	1
Crop loss due to a drought	6633	0.07	(0.26)	0	1
Crop loss due to a flood	6633	0.01	(0.11)	0	1
Crop loss due to a pestilence	6633	0.07	(0.26)	0	1
Crop loss due to diseases	6633	0.02	(0.15)	0	1
F. Village characteristics and shocks experienced by villages					
Cement roads	6633	0.69	(0.46)	0	1
Paved roads	6633	0.09	(0.29)	0	1
Experienced a flood	6614	0.19	(0.39)	0	1
Experienced an earthquake	6614	0.12	(0.32)	0	1
Experienced a landslide	6614	0.11	(0.32)	0	1
Experienced a volcano eruption	6614	0.03	(0.18)	0	1
Experienced a tsunami	6614	0.01	(0.09)	0	1
Experienced a drought	6614	0.15	(0.36)	0	1
Experienced a forest fire	6614	0.03	(0.18)	0	1
Experienced a fire	6614	0.05	(0.21)	0	1

Notes: The variables in Panels A-B are in millions of Indonesian Rupiah, at 2012 provincial constant price. The variables in Panel C and Panels E-F (except number of plots) are in hectares and proportion, respectively.

Panel F shows that most villages, about 70 percent, have cement roads but only ten percent have paved roads. In the previous five years of the sample period, about 20 and 15 percent of the villages had flood and drought, respectively; ten percent experienced earthquake and landslide, and about five percent had volcano eruption, forest fire, and fire.

4.5 Results

I discuss three sets of results: (i) the effects of real wages on mechanisation; (ii) the effects of real wages by farm size; and (iii) regressions by subsample.

4.5.1 Basic Results

Table 4.2 presents the fixed effects regression of real wages on mechanisation, with or without the control variables. Real wages are monthly minimum wages, agricultural- and non-agricultural wages (I estimate each separately in equation 4.1) whereas mechanisation is the total value of tractors, vehicles, farm equipment, and irrigation systems owned by farm households. Columns 1 and 2 are specifications that include farm- and year fixed effects, without and with control variables, respectively.

The results suggest that higher level of real agricultural wages induce smallholders to mechanise, but I find no evidence that minimum wages and non-agricultural wages matter. In column 1, the estimate of real agricultural wages is positive and statistically significant: As the real agricultural wages increase by one percent, the average value of mechanisation increases by 1.27 percent. The estimates of real minimum wages and real non-agricultural wages show that higher wages correlate

with lower mechanisation, but the estimates are statistically insignificant. In column 2 that controls for household-, farm-, and village characteristics, the results are similar: farmers' investment in mechanisation increases by 1.41 percent to a percentage increase in real agricultural wages; the estimate is statistically significant. However, I do not find evidence of higher real minimum wages and non-agricultural wages stimulate mechanisation; the estimates of the effects of both wages remain negative and statistically insignificant.

Table 4.2 The effects of real wages on mechanisation

Independent variables (in logarithm)		Mechanisation (in logarithm)	
		(1)	(2)
Real minimum wages	(1)	-2.22	-2.55
		(2.29)	(2.52)
Real agricultural wages	(2)	1.27**	1.41**
		(0.55)	(0.54)
Real non-agricultural wages	(3)	-0.69	-0.90
		(1.20)	(1.07)
Control variables			✓
Observations		6,633	6,302

Notes: The numbers in each column are the estimates from a separate fixed effects regression of mechanisation on real wages, without or with control variables, in columns 1 and 2, respectively. Mechanisation is farmers' total investment in tractor, vehicles, farm equipment, and irrigation systems. All specifications include the year dummy. The control variables are: (i) household characteristics (age 20-55)—average age, average years of schooling, number of female members, household size, and male household head; (ii) farm characteristics—number of plots, types of farm product, and the indicators for whether a farm experienced crop loss due to drought, flood, pestilence, or diseases; and (iii) village characteristics—the indicators for whether a village has cement roads and paved roads; whether a village experienced flood, earthquake, landslide, volcano eruption, tsunami, drought, forest fire, and fire in the previous five years. The sample includes only smallholders whose self-cultivated and land owned are two ha or smaller. Robust standard errors are in parentheses, clustered by province. The asterisk ** indicates statistical significance at 5%.

Table 4.3 reports the results by type of mechanisation. The specifications in columns 1, 3, 5 and 7 include farm- and year fixed effects; columns 2, 4, 6 and 8 control for household-, farm- and village characteristics.

Table 4.3 The effects of real wages by type of mechanisation

Independent variables (in logarithm)		Mechanisation (in logarithm)							
		Tractors		Vehicles		Farm equipment		Irrigation systems	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Real minimum wages	(1)	0.59**	0.72***	-3.23	-3.46	-0.62	-0.37	0.64	0.71
		(0.21)	(0.25)	(2.83)	(3.00)	(0.56)	(0.50)	(0.78)	(0.87)
Real agricultural wages	(2)	0.05	0.10	1.43**	1.48**	-0.17	-0.22	0.09	0.18
		(0.10)	(0.05)	(0.58)	(0.58)	(0.14)	(0.16)	(0.21)	(0.18)
Real non-agricultural wages	(3)	0.32**	0.27	-0.40	-0.46	0.27	0.06	-0.05	-0.12
		(0.13)	(0.10)	(1.29)	(1.05)	(0.18)	(0.23)	(0.37)	(0.28)
Control variables			✓		✓		✓		✓
Observations		6,633	6,302	6,633	6,302	6,633	6,302	6,633	6,302

Notes: The numbers in each column are the estimates from a separate fixed effects regression of mechanisation on real wages, without or with control variables. All specifications include the year dummy. The control variables are: (i) household characteristics (age 20-55)—average age, average years of schooling, number of female members, household size, and male household head; (ii) farm characteristics—number of plots, types of farm product, and the indicators for whether a farm experienced crop loss due to drought, flood, pestilence, or diseases; and (iii) village characteristics—the indicators for whether a village has cement roads and paved roads; whether a village experienced flood, earthquake, landslide, volcano eruption, tsunami, drought, forest fire, and fire in the previous five years. The sample includes only smallholders whose self-cultivated and land owned are two ha or smaller. Robust standard errors are in parentheses, clustered by province. The asterisks *** and ** indicate statistical significance at 1% and 5%, respectively.

The results show some evidence that higher real wages induce greater uses of tractors and vehicles, but little evidence that farmers invest more in farm equipment and irrigation systems. Column 1, which uses tractors as the measure of mechanisation, shows farmers use more tractors in response to higher real minimum wages; the statistically significant estimate shows that when real minimum wages increase by one percent, the value invested in tractors goes up by 0.59 percent. I also find evidence that higher real non-agricultural wages induce the use of tractors: farmers invest 0.32 percent more in tractors when real non-agricultural wages increase by one percent; the estimate is statistically significant. However, I do not find evidence that real wages in agricultural sector affect the use of tractors; the estimate is small and statistically insignificant. In column 2, I control for household-, farm-, and village characteristics, the estimate of real minimum wages remains positive and statistically significant, showing a percentage increase in real minimum wages induces 0.72 percent higher investment in tractors. By contrast, the estimates of real wages in agricultural and non-agricultural sectors are statistically insignificant.

The estimates in columns 3-4 show that farmers invest more in vehicles when real agricultural wages increase but not when other real wages change. The estimate of real agricultural wages is positive and statistically significant: one percent increase in real non-agricultural wages induces 1.43 percent higher investment in vehicles (column 3); the estimate remains positive and statistically significant even after I control for household-, farm- and village characteristics. However, I do not find real minimum wages and real non-agricultural wages matter; the estimates are negative and statistically insignificant.

The results in columns 5 and 6 show no evidence of any impacts of all three wages on farm equipment. None of the estimates is statistically significant; the

estimates of real minimum wages and real agricultural wages are negative while the estimate of real non-agricultural wages is positive. One percent increase in real minimum wages and real agricultural wages correlates with 0.37 and 0.22 percent lower investment in farm equipment, respectively. By contrast, one percent increase in real non-agricultural wages correlates with farmers invest 0.06 percent more in farm equipment.

Similarly, columns 7 and 8 show no evidence that higher real wages influence small farms' investment in irrigation system. The estimates of the three wages are statistically insignificant. The results show that one percent increase in real minimum wages and real agricultural wages, respectively, correlates with farmers invest 0.71 and 0.18 percent more in irrigation system; however, a percentage increase in non-agricultural wages correlates with 0.12 percent lower investment in irrigation systems.

In sum, I find some evidence that higher real wages induce mechanisation: farmers invest more in tractors and vehicles, respectively, when real minimum wages and real agricultural wages rise. The estimates of real minimum wages and real agricultural wages are positive for irrigation systems too, but they are statistically insignificant. The findings on the impact of real minimum wages and real agricultural wages are in line with the induced innovation hypothesis that higher labour costs induce farmers to use machines to substitute for labour (Binswanger, 1986; Hossain, 2001; Wang, Yamauchi, and Huang, 2016).

4.5.2 The Effects of Real Wages and Landholdings on Mechanisation

Table 4.4 reports the results for the fixed effects estimations that include the interaction between real wages and farm size in 2007 to allow the effects of real wages to differ by

the initial level of household land. Columns 1 and 2 use the size of owned land and self-cultivated land, respectively, in the interaction term.

Table 4.4 shows no evidence that the wage impact differs by farm size: None of the estimates of the interaction terms in columns 1-2 is statistically significant, implying neither the size of owned land nor the size of self-cultivated land a constraint for small farms to mechanise. Similar to that in Table 4.2 (regressions without an interaction term), the estimates of real agricultural wages are statistically significant, suggesting 1.4 percent increase in mechanisation to a percentage increase in agricultural wages. As for real minimum wages and real non-agricultural wages, their estimates remain statistically insignificant, showing little evidence that farmers switch to labour-saving alternatives in response to the rise of the real wages.

The findings on no variation of wage impact by farm size are in line with the literature that finds land size constraints may be alleviated through the development of machine rental and services markets. Without the need of land expansion, farmers can outsource some stages of production to private service providers (Yang et al., 2013; Zhang et al., 2017). Besides, Francks (1996) and Oshiro (1985) suggest that machines, such as power tillers, can be designed to meet the needs of smallholders. Farm size becomes less of a constraint in land scarce countries (e.g., Japan) where smallholder friendly machines are innovated and widely adopted for rice cultivation.

Table 4.4 The effects of real wages and farm size (in 2007) on mechanisation

Independent variables (in logarithm)		Mechanisation (in logarithm)	
		(1)	(2)
A. Real minimum wages			
Real minimum wages	(1)	-2.83	-2.62
		(2.80)	(2.54)
Real minimum wages × land (2007)	(2)	0.60	0.15
		(1.24)	(1.00)
B. Real agricultural wages			
Real agricultural wages	(3)	1.40**	1.36*
		(0.54)	(0.57)
Real agricultural wages × land (2007)	(4)	0.02	0.17
		(0.27)	(0.38)
C. Real non-agricultural wages			
Real non-agricultural wages	(5)	-1.20	-1.36
		(1.13)	(0.95)
Real non-agricultural wages × land (2007)	(6)	0.69	0.98
		(0.83)	(0.79)
The size of owned land (2007)		✓	
The size of self-cultivated land (2007)			✓
Control variables		✓	✓
Observations		6,289	6,289

Notes: The numbers in each column are the estimates from a separate fixed effects regression of mechanisation on real wages, farm size (2007), and the interaction term. Mechanisation is farmers' total investment in tractor, vehicles, farm equipment, and irrigation systems. All specifications include the year dummy. The control variables are: (i) household characteristics (age 20-55)—average age, average years of schooling, number of female members, household size, and male household head; (ii) farm characteristics—number of plots, types of farm product, and the indicators for whether a farm experienced crop loss due to drought, flood, pestilence, or diseases; and (iii) village characteristics—the indicators for whether a village has cement roads and paved roads; whether a village experienced flood, earthquake, landslide, volcano eruption, tsunami, drought, forest fire, and fire in the previous five years. The sample includes only smallholders whose self-cultivated and land owned are two ha or smaller. Robust standard errors are in parentheses, clustered by province. The asterisks ** and * indicate statistical significance at 5% and 10%, respectively.

Table 4.5 The effects of real wages and farm size (in 2007) by type of mechanisation

Independent variables (in logarithm)		Mechanisation (in logarithm)							
		Tractors		Vehicles		Farm equipment		Irrigation systems	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Real minimum wages									
Real minimum wages	(1)	0.44	0.51	-4.27	-4.27	-0.18	-0.34	0.98	0.79
		(0.30)	(0.33)	(3.19)	(3.00)	(0.52)	(0.57)	(0.90)	(0.84)
Real minimum wages × land (2007)	(2)	0.58*	0.42	1.72	1.59	-0.41	-0.07	-0.58**	-0.15
		(0.33)	(0.40)	(1.25)	(1.08)	(0.29)	(0.34)	(0.25)	(0.41)
B. Real agricultural wages									
Real agricultural wages	(3)	0.04	0.06	1.34**	1.28**	-0.14	-0.16	0.26	0.21
		(0.06)	(0.06)	(0.56)	(0.57)	(0.14)	(0.17)	(0.17)	(0.15)
Real agricultural wages × land (2007)	(4)	0.24**	0.16	0.57*	0.80**	-0.30**	-0.22*	-0.30**	-0.12
		(0.11)	(0.10)	(0.32)	(0.31)	(0.13)	(0.12)	(0.13)	(0.26)
C. Real non-agricultural wages									
Real non-agricultural wages	(5)	0.02	0.04	-0.79	-0.98	0.11	-0.07	-0.04	-0.17
		(0.10)	(0.13)	(1.20)	(1.06)	(0.25)	(0.26)	(0.32)	(0.32)
Real non-agricultural wages × land (2007)	(6)	0.57**	0.48	0.77	1.10	-0.11	0.27	-0.30**	0.11
		(0.22)	(0.29)	(0.92)	(0.79)	(0.22)	(0.24)	(0.13)	(0.39)
The size of owned land (2007)		✓		✓		✓		✓	
The size of self-cultivated land (2007)			✓		✓		✓		✓
Control variables		✓	✓	✓	✓	✓	✓	✓	✓
Observations		6,289	6,289	6,289	6,289	6,289	6,289	6,289	6,289

Notes: The numbers in each column are the estimates from a separate fixed effects regression of mechanisation on real wages, farm size (2007), and the interaction term. All specifications include the year dummy. The control variables are: (i) household characteristics (age 20-55)—average age, average years of schooling, number of female members, household size, and male household head; (ii) farm characteristics—number of plots, types of farm product, and the indicators for whether a farm experienced crop loss due to drought, flood, pestilence, or diseases; and (iii) village characteristics—the indicators for whether a village has cement roads and paved roads; whether a village experienced flood, earthquake, landslide, volcano eruption, tsunami, drought, forest fire, and fire in the previous five years. The sample includes only smallholders whose self-cultivated and land owned are two hectares or smaller. Robust standard errors are in parentheses, clustered by province. The asterisks ** and * indicate statistical significance at 5% and 10%, respectively.

Table 4.5, which presents the specifications of the effects of real wages and initial farm size by type of mechanisation, shows some evidence that relatively large landholders invest more in tractors and vehicles but less in farm equipment and irrigation systems in response to higher real wages. In column 1, in which I use tractors as the measure of mechanisation, shows evidence that the wage impact is larger for relatively large owned land; the estimate of the interaction term is positive and statistically significant. However, column 2 shows no evidence that the size of self-cultivated land changes the wage impact on the use of tractors; the estimates of the interaction terms are positive but none is statistically significant. I do not find evidence that real wages affect the use of tractors.

Columns 3 and 4, which use vehicles as a measure of mechanisation, show evidence that the size of land matters for the effect of real agricultural wages on the use of vehicle but not for the effect of other wages. The estimates of the interaction term in row 4 of columns 3 and 4 are positive and statistically significant, which suggest that farmers whose owned land and self-cultivated land are larger invest more in vehicle to cope with higher real agricultural wages. I also find evidence that, regardless of land size, higher real agricultural wages induce greater use of vehicle; the estimate of the variable is positive and statistically significant. However, I do not find evidence that the effects of real minimum wages and real non-agricultural wages differ by land size; the estimates of the interaction terms are positive though statistically insignificant. I also do not find evidence of the two wages affect farmers' investment in vehicles; their estimates are negative and statistically insignificant.

Columns 5 and 6, which study the impact of real wages and land size on the use of farm equipment, show some evidence that farm size matters. The estimates of the interaction terms in row 4 of the two columns show that relatively small farms invest

more in farm equipment when farm workers become more costly; the estimates are positive and statistically significant. However, I do not find evidence that the effects of other wages vary by land size; the estimates of the interaction term of real minimum wages and real non-agricultural wages are statistically insignificant. The estimates of all three real wages are also statistically insignificant.

Columns 7 and 8, which use irrigation systems as a measure of mechanisation, show some evidence of relatively small farms invest more in irrigation systems, but no evidence that the size of self-cultivated land matters. In column 7, the estimates of the interaction terms between three real wages and the size of owned land are statistically significant; the negative estimates suggest relatively small farms invest more in irrigation systems as real wages go up. However, in column 8, I do not find the wage impact varies by the size of self-cultivated land; the estimates of the interaction terms are statistically insignificant. I also do not find evidence that, regardless of land size, the three real wages affect farmers' use of irrigation systems.

Overall, I find farmers whose owned land is relatively large invest more in tractors and vehicles while those whose self-cultivated land is relatively large invest more in vehicle when real agricultural wages increase; relatively large owned land also have higher use of tractors for higher real minimum wages and real non-agricultural wages. By contrast, relatively small farms invest more in farm equipment when farm labour wages increase and more in irrigation system when all three real wages go up. The finding on relatively large farms invest more in tractors to cope with higher real wages may suggest that the fixed costs of tractors are high, particularly for large tractors, and, therefore, mechanisation only pays off in relatively large farms through economies of scale (Otsuka, 2013; Otsuka et al., 2016). On the other hand, relatively large farms invest less in irrigation systems as labour costs increase perhaps because

farmers incur high maintenance costs for larger irrigated areas. For example, about 40-50 percent of all irrigation systems in Indonesia are in disrepair, and the average operation and maintenance cost is US$390 (at 2006 price) per hectare annually (FAO, 2011). Given their average crop production value of US$6 per day, investing less in irrigation systems to cope with higher labour costs could be a better option.

4.5.3 Subsample: Mechanisation for Rice Farming

This section discusses the effects of real wages on mechanisation of rice cultivation. Rice is most important food crops in Indonesia and 30 percent of total cultivated land are used for rice farming, by approximately 77 percent of total farmers in the country under smallholdings. Rice production is heavily concentrated in Java islands and Sumatera, with Java islands account for 60 percent of total production (USDA, 2012). About 48 percent of smallholders in the analytical sample in this chapter are rice farmers (see Table 4.1).

Table 4.6 is the specification of various measures of mechanisation on real wages. The odd columns and the even columns are specifications that include farm- and year fixed effects, without and with control variables, respectively. Table 4.7 shows the specification that adds the interaction between real wages and farm size; the odd columns and the even columns, respectively, use the size of owned land and self-cultivated land in the interaction terms.

Table 4.6 shows some evidence of higher real wages induce mechanisation of rice production. In column 1, the estimate of real minimum wages is positive but statistically insignificant; however, after I control for household-, farm-, and village characteristics (in column 2), the estimate is statistically significant, which suggests that

rice farmers invest 1.44 percent more in tractors to cope with a percentage increase in real minimum wages. However, I do not find evidence that real agricultural- and non-agricultural wages induce rice farmers invest in tractors; the variables are positively correlated with tractors though the estimates are statistically insignificant.

The results in columns 3-4, which use vehicles as a measure of mechanisation, show no evidence that real wages affect rice farmers' investment in vehicles. None of the estimates of real minimum wages, real agricultural wages, and real non-agricultural wages is statistically significant, even after I control for all available characteristics.

In columns 5-6, in which I examine the effects of real wages on the use of farm equipment, I find evidence that higher real agricultural wages discourage the use of farm equipment, but no evidence that other real wages matter. In the specification that controls for all available characteristics (column 6), only the estimate of real agricultural wages is statistically significant; the negative estimate shows a percentage increase in real agricultural wages reduces rice farmers' investment in farm equipment by 0.53 percent.

The estimates in column 7-8, which use irrigation systems the dependent variable, show no evidence that higher real wages induce rice farmers to invest in irrigation systems. None of the estimates of real wages is statistically significant, even in the specification that controls for all available characteristics.

Table 4.6 The effects of real wages by type of mechanisation for rice farming

Independent variables (in logarithm)		Mechanisation (in logarithm)							
		Tractors		Vehicles		Farm equipment		Irrigation systems	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Real minimum wages	(1)	0.85	1.44*	0.20	0.50	-1.11	-1.05	1.27	1.76
		(0.62)	(0.75)	(3.70)	(3.89)	(0.94)	(1.19)	(1.16)	(1.21)
Real agricultural wages	(2)	-0.41*	0.22	1.03	0.91	-0.43***	-0.53*	-0.18	-0.05
		(0.20)	(0.14)	(1.68)	(0.66)	(0.13)	(0.25)	(0.28)	(0.16)
Real non-agricultural wages	(3)	0.10	0.10	-1.40	-0.90	-0.07	-0.04	-0.61	-0.42
		(0.25)	(0.32)	(0.87)	(0.93)	(0.26)	(0.26)	(0.40)	(0.51)
Control variables			✓		✓		✓		✓
Observations		3,168	3,023	3,168	3,023	3,168	3,023	3,168	3,023

Notes: The numbers in each column are the estimates from a separate fixed effects regression of mechanisation on real wages, without or with control variables. All specifications include the year dummy. The control variables are: (i) household characteristics (age 20-55)—average age, average years of schooling, number of female members, household size, and male household head; (ii) farm characteristics—number of plots, types of farm product, and the indicators for whether a farm experienced crop loss due to drought, flood, pestilence, or diseases; and (iii) village characteristics—the indicators for whether a village has cement roads and paved roads; whether a village experienced flood, earthquake, landslide, volcano eruption, tsunami, drought, forest fire, and fire in the previous five years. The sample includes only smallholders whose self-cultivated and land owned are two hectares or smaller. Robust standard errors are in parentheses, clustered by province. The asterisks *** and * indicate statistical significance at 1% and 10%, respectively.

Table 4.7 The effects of real wages and farm size (in 2007) for rice farming

Independent variables (in logarithm)		Mechanisation (in logarithm)							
		Tractors		Vehicles		Farm equipment		Irrigation systems	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Real minimum wages									
Real minimum wages	(1)	0.29	0.51	-0.10	-0.85	-0.94	-1.12	1.22	1.16
		(0.70)	(1.04)	(4.04)	(4.05)	(1.23)	(1.24)	(1.26)	(1.20)
Real minimum wages × land (2007)	(2)	2.83*	1.48	1.48	2.16	-0.26	0.12	1.34**	0.18
		(1.40)	(1.53)	(2.61)	(1.89)	(0.63)	(0.56)	(0.76)	(0.23)
B. Real agricultural wages									
Real agricultural wages	(3)	-0.03	0.10	0.55	0.27	-0.48*	-0.46	-0.13	-0.15
		(1.19)	(0.25)	(0.59)	(0.61)	(0.26)	(0.27)	(0.17)	(0.16)
Real agricultural wages × land (2007)	(4)	0.71*	0.22	1.02**	1.18***	-0.14	-0.13	0.23	0.18
		(0.37)	(0.37)	(0.47)	(0.31)	(0.09)	(0.10)	(0.36)	(0.23)
C. Real non-agricultural wages									
Real non-agricultural wages	(5)	-0.23	-0.04	-1.39	-1.85*	0.12	0.12	-0.53	-0.51
		(0.37)	(0.41)	(1.04)	(1.00)	(0.31)	(0.30)	(0.63)	(0.59)
Real non-agricultural wages × land (2007)	(6)	0.66	0.24	0.97	1.70	-0.32	-0.30	0.23	0.17
		(0.68)	(0.61)	(1.22)	(1.01)	(0.35)	(0.33)	(0.58)	(0.48)
The size of owned land (2007)		✓		✓		✓		✓	
The size of self-cultivated land (2007)			✓		✓		✓		✓
Control variables		✓	✓	✓	✓	✓	✓	✓	✓
Observations		3,023	3,023	3,023	3,023	3,023	3,023	3,023	3,023

Notes: The numbers in each column are the estimates from a separate fixed effects regression of mechanisation on real wages, farm size (2007), and the interaction term. Columns in odd numbers and in even numbers use the size of land owned and the size of self-cultivated land, respectively, in the interaction term. All specifications include the year dummy. The control variables are: (i) household characteristics (age 20-55)—average age, average years of schooling, number of female members, household size, and male household head; (ii) farm characteristics—number of plots, types of farm product, and the indicators for whether a farm experienced crop loss due to drought, flood, pestilence, or diseases; and (iii) village characteristics—the indicators for whether a village has cement roads and paved roads; whether a village experienced flood, earthquake, landslide, volcano eruption, tsunami, drought, forest fire, and fire in the previous five years. The sample includes only smallholders whose self-cultivated and land owned are two hectares or smaller. Robust standard errors are in parentheses, clustered by province. The asterisks ** and * indicate statistical significance at 5% and 10%, respectively.

The results on higher real wages induce little mechanisation are different from Dawe (2005)'s finding in Thailand that rice cultivation widely uses harvesting machines, which nearly all are through private rental markets. One possible explanation is that rice cultivation in Indonesia remains highly labour intensive due to protection of the sector. To achieve rice self-sufficiency and poverty alleviation goals in the country, the government imposes price support and import control of rice to keep domestic rice price high, which, in turn, results in misperception of high marginal value product of labour; therefore, mechanisation becomes relatively less profitable and rice farmers are less likely to switch to labour-saving operations even real wages increase. A similar trend is also observed in the Philippines whose rice sector is highly protected (FAO, 2011). Another reason is that high adoption rate of machines in rice cultivation in Thailand could be attributed to good infrastructure such as roads and irrigation (Dawe, 2005). By contrast, high degradation of irrigation systems in Indonesia may limit mechanisation in rice production among small farmers (FAO, 2011; Sumaryanto, 2014).

Table 4.7 shows some evidence that relatively large rice farmers invest more in tractors, vehicles, and irrigation systems in response to rising real wages. In column 1, the estimates of the interaction term are positive and statistically significant for real minimum wages and agricultural wages, which suggest that relatively large rice farmers invest more in tractors when the real wages increase. As for real non-agricultural wages, the estimate of the interaction term is positive but as large as its standard error. In column 2, which uses self-cultivated land in the interaction term, show no evidence that the wage impacts on rice farmers' investment in tractors differ by land size; the estimates of the interaction terms are positive but statistically insignificant. However, I do not find, regardless of land size, higher real wages induce greater adoption of

tractors among rice farmers; the estimates of all three variables are statistically insignificant.

In columns 3-4, I find evidence that rice farmers who have relatively large owned land and self-cultivated land invest more in vehicles when real agricultural wages increase; the estimates of the interaction terms are positive and statistically significant. However, I fail to reject the null hypothesis of the wage impact on vehicles does not differ by land size for real minimum wages and real non-agricultural wages; the estimates of the interaction terms for the two are positive but statistically insignificant. I also do not find evidence of real wages affect rice farmers' decision on investing in vehicle except for, in row 5 of column 4, real non-agricultural wages whose estimate is negative and statistically significant.

Columns 5-6, which use farm equipment as the measure of mechanisation, show no evidence that land size changes the wage impact on farm equipment. Most estimates of the interaction terms are in fact negative but statistically insignificant. I also find little evidence that, regardless of land size, real wages affect rice farmers' adoption of farm equipment, except for the estimate of real agricultural wages in row 3 of column 5 that is negative and statistically significant.

Columns 7-8 show some evidence of the wage impact on rice farmers' investment in irrigation systems differs by land size. Although the estimates of all interaction terms are positive, only the one for real minimum wages is statistically significant, which suggests rice farmers whose owned land is relatively large invest more in irrigation system to cope with higher real minimum wages. I do not find evidence of, regardless of land size, rice farmers invest more in irrigation systems in

response to higher real wages; none of the estimates of real wages is statistically significant.

4.6 Conclusion and Discussion

Rising real wages seem to induce some forms of mechanisation of small farms: farmers' total investment in mechanisation increases when real agricultural wages rise; they invest more in tractors and vehicles, respectively, in response to an increase in real minimum wages and real agricultural wages. However, an increase in real wages—in both agricultural and non-agricultural sectors—does not seem to induce higher use of farm equipment and irrigation systems. Initial farm size seems to partially matter for the inducement process: rising real wages (all three types) induce higher use of tractors in relatively large farms, but higher use of irrigation systems in relatively small farms. In addition, the effect of real agricultural wages seems to be larger for relatively large farms on the use of vehicles and relatively small farms on farm equipment.

The finding on small farms use more tractors and vehicles, respectively, when real minimum wages and real agricultural wages increase are in line with the hypothesis of induced mechanisation. Wang et al. (2016) find a similar trend in China that relative expensive farm labour and stable machine prices drive a rapid introduction of machines and the use of machine services in Chinese agriculture. However, it is also possible that the positive estimates of real minimum wages explain the effects of non-farm income on tractor use; that is, higher non-farm income may imply higher opportunity costs of hiring workers on farms, which induce farmers to substitute tractors for workers. Moreover, higher non-farm income can be an additional income source for farmers, in which they can use to invest in tractors.

The above findings seem to partially support my main hypothesis that rising real wages induce smallholders to substitute expensive labour by machines, which may imply developing countries whose smallholder farming is predominant may support the development of small farms. For example, machine subsidies or targeted cash transfers to smallholders can compensate for poorly functioning credit markets and encourage adoption of labour-saving technology on small farms. The subsidies or cash transfers can be a one-time or temporary aid that helps smallholders without distorting the market price of machines. Moreover, machine subsidies and cash transfers are more effective and socially beneficial than input subsidies for fertiliser and pesticide, which consume a substantial government budget and tend to benefit larger and richer farmers who use more inputs (FAO, 2015). In Indonesia, for example, fertiliser subsidies allow smallholders to buy government-supported fertiliser at around 50-75 percent of the market price, and the support programme accounts for around half of the country's agriculture budget. However, annual rice yields have barely risen because farmers over-apply fertiliser, which can lead to degradation of soil (FAO, 2015; 2017).

Caveats remain in this chapter. One, my findings only offer a snapshot of mechanisation on small farms when real wages increase. I use real values of farm assets a smallholder owns as the measure of mechanisation, which shows the type and the extent of mechanisation. However, the real value of a machine would not account for the intensity of use, which is a better measure of the level of mechanisation. In addition, due to data limitation, my study does not account for the importance of rental markets in the mechanisation process; if good data are available, future work can examine the impact of intensity of mechanisation and rental markets.[75]

[75] Very few papers consider the role of rental markets, and the data available cover small samples (see Wang et al., 2016; Yamauchi, 2016; Yang et al., 2013).

Two, I may not fully control for all factors that influence the pattern and speed of mechanisation. My analysis relies on the exogeneity of provincial real wages and the control for time varying factors that correlate with real wages and mechanisation. However, I do not include factors such as labour migration and relative input price because these factors may not be a good control variable. Future work can employ a more rigorous empirical strategy to overcome the endogeneity problem.

Three, while wages are indeed a key driver of mechanisation, other factors may also make a difference. My analysis includes only farm size to observe how the process of mechanisation changes when wages increase. Binswanger (1986) suggests a list of other variables, including relative scarcities of capital and labour, relative input price, labour-land ratio, elasticity of demand of export markets, energy costs, type of machine, a country's proportion of labour force in agriculture, non-agricultural employment, labour migration, education and so forth. Future work can take into account these factors to better understand and predict how rapid mechanisation will occur.

Four, social factors may also matter. For example, labour displacement effects of mechanisation may put policymakers in dilemmas of whether to promote mechanisation. On efficiency grounds, mechanisation is clearly warranted; on equity grounds, its introduction may be harmful, particularly to socially disadvantaged groups such as women workers. The speed of mechanisation may be slower if these social factors affect farmers' or governments' decision to adopt mechanisation. Agricultural policy in Indonesia on rice price support is an example that distorted market price delays the process of mechanisation in rice cultivation. Future research can shed some light on the importance of these social factors.

Chapter 5

Concluding Remarks

This thesis sheds light on factors that explain the potential of micro and small firms to grow. I examine how social health insurance, education and rising real wages (as economy grows) affect micro and small firms in Indonesia. The findings in this thesis provide insights regarding how social health insurance protects micro and small firms against adverse effects of family hardships that their owners experienced, whether education improves firm performance and entrepreneurs' earnings, and whether small farmers use labour-saving technology when real wages increase in the process of economic transformation.

I get three pieces of main findings. One, in the first essay, I find education does not seem to improve firm performance though it increases entrepreneurs' earnings. The findings on education has no impact on total assets and net profits of micro and small firms could be because of the entrepreneurs that I study are those who start a firm out of necessity, perhaps they could not find a job, rather than out of opportunity (Block and Wagner, 2010; Fossen and Büttner, 2013). Another reason could be that the firms operate in informal sector, which requires no complex skills or high education qualification (Dasgupta, 2013). However, I find better educated entrepreneurs earn more, which is in line with human capital theory and signalling theory that posit education increases earnings through improving individuals' knowledge and cognitive skills (Becker, 1962; Mincer, 1974; Schultz, 1961; Spence, 1973).

Two, in the second essay, I find *Askeskin*, the social health insurance in Indonesia, partially cushions the adverse effects of family hardships that owners experienced on micro and small firms. Among others, *Askeskin* seems to reduce the

negative effects of deaths in the family in the previous year, outpatient care, and traffic accidents on firm performance, but I do not find *Askeskin* changes the effects of deaths in the family in a longer term and those of inpatient care. The results on *Askeskin* protects firm performance against family hardships are in line with the literature on social health insurance that finds insured households incur less medical expenditure and less costly coping strategy (Amponsah, 2015; Liu, 2013; Wagstaff and Yu, 2007; Wagstaff and Prahan, 2006). The findings also support the internal finance theory of growth that posits a positive impact of internal funds on small firms' growth (Carpenter and Petersen, 2002a). However, I find, among households that did not experience family hardships, *Askeskin* households' firms have smaller total assets and net profits. The estimates of *Askeskin* are negative and statistically significant maybe because I have not fully controlled the differences between *Askeskin* and non-*Askeskin* households. Outpatient care seems to be the only family hardship that matters among firms owned by non-*Askeskin* households, other types of family hardship have no impact on firm performance.

Three, in the third essay, I find rising real wages induce some forms of mechanisation on small farms. For example, higher real minimum real wages seem to encourage the use of tractors; higher real agricultural wages induce higher use of vehicles. The results of rising real wages induce farmers to invest more in tractors and vehicles support the theory of induced innovation: farmers substitute relatively costly labour inputs by capital inputs (Isvilanonda et al., 2001; Wang et al., 2016). However, I do not find any evidence of real non-agricultural wages matter.

These results have several implications. One, these results are related to several literature, including education, entrepreneurship, social health insurance, internal finance, family hardships, small farms, and labour economics. The first essay

complements the literature on education and entrepreneurship by exploiting the RD design that accounts for endogeneity problem of education. A large literature in labour economics has employed rigorous strategies to measure the effects of exogenous variation in education, but very few have done so in the stream of entrepreneurship. The second essay links the literature on social health insurance and internal finance: it evaluates the role of social health insurance as an external source that protects internal funds of micro and small firms against shocks experienced by owners. Only a handful of papers have studied the indirect effects of social health insurance, and none has casted light on whether it affects the growth of micro and small firms. The third essay complements the scant literature on mechanisation of small farms in developing countries and answers the question on whether land size affects the wage impact on mechanisation.

Two, the results identify the directions to explore more contexts in studying what determines the growth of micro and small firms in developing countries. In the first essay, the results suggest that entrepreneurs can be heterogeneous in terms of their motivation to start a business, which may explain why the effects of education on firm performance differ. In the second essay, the findings show some evidence that social health insurance empowers owners of micro and small firms to withstand shocks. There has been very little evidence on the process of enterprise recovery following a shock in developing countries (de Mel et al., 2011). Studying various sources of finance would allow us to assess the importance of finance in the recovery process and firm growth. In the third essay, the results show rising real wages induce mechanisation of small farms, which contribute a piece to the puzzle on what spurs small farms to adopt technologies. Predicting how rapidly mechanisation will occur is important for agricultural development in developing countries whose small farms are predominant.

Three, these results suggest some research issues that require data sets with more information on observable characteristics for micro and small firms and their owners. For example, regression-control strategy and fixed effects models, in which I use in the second and the third essays, respectively, rely on the assumptions that I control for all relevant variables that may affect the outcome variables and the key variables of interest. Good data sets and better empirical strategies will greatly reduce the endogeneity problem. Much more empirical investigation is needed for a deeper understanding of the mechanisms how social policies can strengthen the potential of micro and small firms to grow.

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APPENDIX A1

Main Econometric Challenges for Returns to Education

A good estimation of returns to education accounts for three main problems: unobserved heterogeneity, endogeneity of education and sample selection bias. Griliches (1977) suggests that the effect of education is causal if the differentials in earnings between education groups reflect the true differences in productivity, rather than unobserved inherent ability differences that correlate with education and earnings. If the unobserved abilities increase schooling and earnings, but are being omitted from the earnings function, upward bias occurs. To deal with "ability bias" or unobserved heterogeneity, using proxies to approximate the unobserved abilities is one of the methods. Many education studies use IQ score, AFQT, or similar test score as an explicit measure for unobserved abilities (see, e.g., Cascio and Lewis, 2005).[76] Nevertheless, this strategy may not account for the endogeneity of education.

Setting up a randomised experiment, one of the three solutions that Harmon and Walker (1995) and van der Sluis and van Praag (2004) suggest, helps to ensure individuals are divided into homogenous groups for comparison and eliminate endogeneity problem.[77] Both groups of individuals are similar on all characteristics (both observed and unobserved), and the differences in earnings are the pure effect of variation in education. Therefore, unobserved heterogeity and endogeneity are expected to be absent. Despite the significant advantages of randomised experiments, the strategy is costly in terms of time and money.

[76] AFQT stands for Armed Forces Qualifying Test.
[77] See also Ashenfelter, Harmon and Oosterbeek (1999) and van der Sluis, van Praag and Witteloostuijn (2004) for the explanation of the three strategies.

The second strategy is comparing the earnings of identical twins or siblings by their education. Ashenfelter and Krueger (1994) argue that since twins share the exact same genetic endowment, family background, ability, and motivation, the variation in education is exogenous. The presumption of equal unobserved characteristics (such as ability), however, may not fully explain the source of differences in education within twin pairs. Moreover, twin strategy is sensitive to measurement errors and has small sample size, which may not be representative of the overall population, and the results of twin studies may be more applicable to twins than to other people (Behrman and Rosenzweig, 1999; Neumark, 1999).

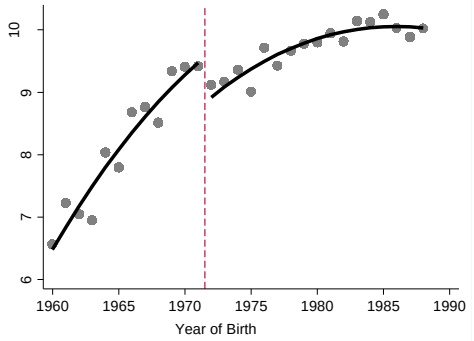
The other strategy is using an instrumental variable as the exogenous influences for variation in schooling decisions. The instrumental variable is an observable covariate that correlates with education but is independent of the residual or unobserved characteristics (such as ability) in the earnings function. In this way, the variation in education is assumed to be exogenous, which is the result solely from differences in the instrument. The empirical studies in labour economics find, in most cases, instrumental variables approach gives larger rates of return to education than that of OLS (see, e.g., Angrist and Krueger, 1991; 1992; Harmon and Walker, 1995). This method, however, relies highly on the availability and quality of the instrument (Card, 1999; Dickson and Harmon, 2011).[78]

[78] For econometric modelling about instrumental variables approach in the specification of Mincer's human capital theory, see Heckman and Urzua (2009); application of instrumental variables approach for treatment effects, see Heckman and Vytlacil (2005).

APPENDIX A2

Results for Chapter 2: Using a Full Sample for the Effects of the Longer School Year on Education

Panel A. Years of schooling



Panel B. Completed senior high school

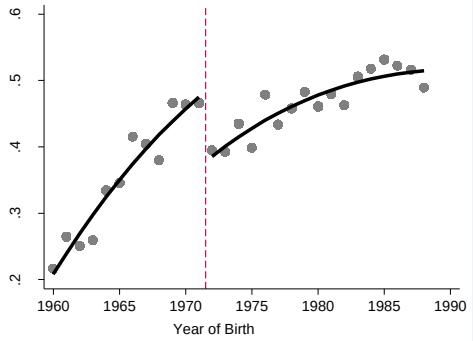


Figure A2.1 The effects of the longer school year on education.

Notes: Scatter points represent the averages, with fitted values based on regression models in the trend lines. The vertical dash lines represent the 1972 threshold.

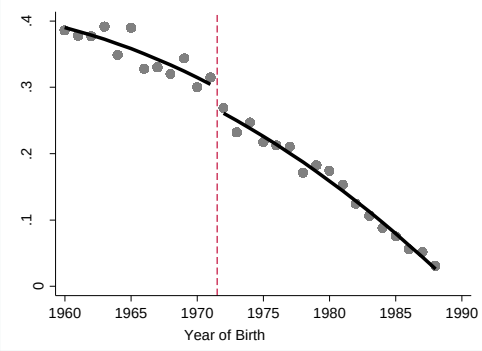


Figure A2.2 The effects of the longer school year on the proportion of entrepreneurs.

Notes: Scatter points represent the averages, with fitted values based on regression models in the trend lines. The vertical dash line represents the 1972 threshold.

APPENDIX A3

Results for Chapter 2: Cluster the Standard Errors at District Level

Table A3.1 First-stage, reduced-form, and second-stage regressions

		(1)	(2)	(3)
A. First stage regression				
Using year of birth to define the longer school year				
1960-1971 cohorts	(1)	1.07***	1.07***	1.06***
		(0.01)	(0.01)	(0.01)
Adjusted R^2		0.66	0.66	0.68
Number of observations		5,949	5,949	5,949
Using year of entry to define the longer school year				
1960-1971 cohorts	(2)	0.77***	0.77***	0.77***
		(0.03)	(0.03)	(0.03)
Adjusted R^2		0.53	0.53	0.56
Number of observations		5,666	5,666	5,666
B. Reduced-form regression				
Years of schooling				
1960-1971 cohorts	(3)	0.91***	0.91***	0.67***
		(0.25)	(0.25)	(0.24)
Completed senior high school				
1960-1971 cohorts	(4)	0.12***	0.12***	0.10***
		(0.03)	(0.03)	(0.03)
C. Second-stage regression				
Years of schooling				
Longer school year	(5)	0.92***	0.75***	0.56***
		(0.18)	(0.23)	(0.21)
Completed senior high school				
Longer school year	(6)	0.11***	0.09***	0.09***
		(0.02)	(0.03)	(0.03)
Control variables				
Year of birth cubic polynomial		✓	✓	✓
Age cubic polynomial			✓	✓
Male, ethnicity, urban and district fixed effects				✓

Notes: Panel A presents the estimates from the regressions of *longer school year* on *older cohorts* and a set of control variables. In row 1, the longer school year equals one if an entrepreneur was born in 1971 or earlier and was still in school in 1978 and zero otherwise; in row 2, the longer school year equals one if an entrepreneur was enrolled in primary school in 1978 or earlier and did not drop out of school in 1978 and zero otherwise. Panel B presents the reduced-form estimate of the longer school year (a regression of educational outcome on *older cohorts* and a set of control variables). Panel C presents the corresponding 2SLS estimates (a regression of educational outcome on estimated longer school year obtained in the first-stage regression). The number of observations in panels B and C is 5,945. The numbers in parentheses are robust standard errors, clustered by district. The asterisk *** indicates statistical significance at 1%.

Table A3.2 The effects of education on firm performance

Dependent variable (in logarithm)		Reduced-form	The effects of		
			longer school year	years of schooling	completing senior high school
		(1)	(2)	(3)	(4)
A. Growth of firms					
Total assets	(1)	0.23	0.19	0.32	2.30
		(0.28)	(0.26)	(0.41)	(2.87)
Net profits	(2)	-0.08	-0.06	-0.13	-0.90
		(0.25)	(0.23)	(0.33)	(2.35)
B. Stock of assets					
Assets purchased	(3)	0.29	0.21	0.41	2.88
		(0.34)	(0.31)	(0.54)	(3.81)
Assets sold	(4)	-0.02	-0.01	-0.03	-0.20
		(0.22)	(0.21)	(0.35)	(2.47)
C. Capital investment					
Equipment assets	(5)	0.03	0.01	0.02	0.15
		(0.29)	(0.27)	(0.42)	(2.96)
Non-equipment assets	(6)	0.19	0.15	0.26	1.85
		(0.53)	(0.50)	(0.71)	(5.01)

Notes: The number in each cell in column 1 is the estimate of *older cohorts* from a regression of firms' performance on *older cohorts*. Column 2 reports the corresponding 2SLS estimates. Columns 3-4 present the equation-by-equation 2SLS estimates of the effects of years of schooling or completing senior high school on firm performance. All regressions control for year of birth cubic polynomial, age cubic polynomial, gender (1 if male), ethnicity (dummies), urban (1 if urban), and district fixed effects. The numbers of observations in columns 1-2 and columns 3-4 are 5,949 and 5,945, respectively. The numbers in parentheses are standard errors.

Table A3.3 The effects of education on entrepreneurs' earnings

Dependent variable (in logarithm)		Reduced-form	The effects of longer school year	The effects of years of schooling	The effects of completing senior high school
		(1)	(2)	(3)	(4)
A. Income from all businesses					
Hourly earnings	(1)	0.23***	0.22***	0.33**	2.41**
		(0.09)	(0.08)	(0.13)	(0.95)
Monthly earnings	(2)	0.30***	0.28***	0.42***	3.47***
		(0.08)	(0.07)	(0.15)	(1.33)
Annual earnings	(3)	0.29***	0.27***	0.40***	2.94***
		(0.09)	(0.09)	(0.14)	(1.06)
B. Income from farm businesses					
Hourly earnings	(4)	0.09	0.09	0.16	1.26
		(0.14)	(0.12)	(0.24)	(1.84)
Monthly earnings	(5)	0.13	0.15	0.24	2.55
		(0.13)	(0.12)	(0.29)	(3.45)
Annual earnings	(6)	0.09	0.11	0.16	1.23
		(0.12)	(0.10)	(0.23)	(1.72)
C. Income from non-farm businesses					
Hourly earnings	(7)	0.26***	0.23***	0.35**	2.60**
		(0.11)	(0.10)	(0.16)	(1.25)
Monthly earnings	(8)	0.37***	0.33***	0.50**	3.93**
		(0.09)	(0.08)	(0.20)	(1.67)
Annual earnings	(9)	0.33***	0.29***	0.46**	3.42**
		(0.12)	(0.11)	(0.20)	(1.52)

Notes: The number in each cell in column 1 is the estimate of *older cohorts* from a regression of entrepreneurs' earnings on *older cohorts*. Column 2 reports the corresponding 2SLS estimates. Columns 3-4 present the equation-by-equation 2SLS estimates of the effects of years of schooling or completing senior high school on entrepreneurs' earnings. All regressions control for year of birth cubic polynomial, age cubic polynomial, gender (1 if male), ethnicity (dummies), urban (1 if urban), and district fixed effects. The number of observations is about 5,400 in rows 1 and 3; 5,070 in row 2; 1,900 in rows 4 and 6; 1,600 in row 5; and 3,500 in rows 7-9. The numbers in parentheses are standard errors. The asterisks *** and ** indicate statistical significance at 1% and 5%, respectively.

Table A3.4 The effects of education by industry

Dependent variable		Reduced-form	The effects of longer school year	The effects of years of schooling	The effects of completing senior high school
		(1)	(2)	(3)	(4)
A. Farm business					
Total assets	(1)	0.17	0.11	0.28	1.82
		(0.29)	(0.26)	(0.46)	(2.97)
Total asset sold	(2)	0.23	0.23	0.36	2.36
		(0.52)	(0.49)	(0.82)	(5.32)
Total asset purchased	(3)	0.02	0.04	0.05	0.32
		(0.48)	(0.43)	(0.81)	(5.29)
Net profits	(4)	-0.50	0.05	-0.82	-5.33
		(0.55)	(0.04)	(0.93)	(5.66)
Rental income from farm assets	(5)	0.09	0.09	0.15	0.95
		(0.49)	(0.42)	(0.76)	(4.92)
Legal ownership of land	(6)	0.01	0.01	0.01	0.05
		(0.06)	(0.05)	(0.04)	(0.34)
Number of plots	(7)	0.01	0.00	0.00	0.04
		(0.05)	(0.05)	(0.04)	(0.35)
Size of land	(8)	-0.11**	-0.10**	-0.08	-0.69
		(0.05)	(0.04)	(0.06)	(0.46)
B. Non-farm business					
Total assets	(9)	0.20	0.18	0.24	1.92
		(0.41)	(0.37)	(0.55)	(4.34)
Total asset purchased	(10)	0.53	0.41	0.69	5.46
		(0.47)	(0.41)	(0.72)	(5.72)
Total asset sold	(11)	-0.05	-0.06	-0.07	-0.54
		(0.21)	(0.19)	(0.33)	(2.59)
Net profits	(12)	0.19	0.18	0.27	2.12
		(0.17)	(0.15)	(0.28)	(2.19)
Sole entrepreneurship	(13)	-0.02	-0.02	-0.02	-0.19
		(0.02)	(0.01)	(0.02)	(0.18)
Percentage of share	(14)	-1.32	-1.21	-1.82	-14.35
		(0.97)	(0.86)	(1.46)	(11.55)
Number of paid workers	(15)	0.02	0.02	0.02	0.18
		(0.05)	(0.04)	(0.06)	(0.45)
Number of unpaid family workers	(16)	0.00	-0.01	0.00	-0.03
		(0.04)	(0.04)	(0.05)	(0.40)

Table A3.4 The effects of education by industry (continued)

Dependent variable		Reduced-form	The effects of		
			longer school year	years of schooling	completing senior high school
		(1)	(2)	(3)	(4)
D. Non-farm business					
Access to formal credits	(17)	0.01	0.01	0.01	0.09
		(0.02)	(0.01)	(0.02)	(0.20)

Notes: The number in each cell in column 1 is the estimate of *older cohorts* from a regression of firm performance on *older cohorts* and a set of control variables. Column 2 reports the corresponding 2SLS estimate. Columns 3 and 4 present the equation-by-equation 2SLS estimates of the effects of years of schooling or completing senior high school on firm performance. All variables are measured in logarithm, except ownership of land, legal ownership of land, sole ownership, percentage of share, access to formal credits. All regressions control for year of birth cubic polynomial, age cubic polynomial, gender (1 if male), ethnicity (dummies), urban (1 if urban), and district fixed effects. The number of observations is about 2,250-2,300 in rows 1-5, 1,500 in rows 6-8, and 3,600-3,700 in rows 9-17. The numbers in parentheses are standard errors.

Table A3.5 Continuity of control variables at the threshold

Dependent variable		(1)	(2)
Age	(1)	-0.26***	-0.34***
		(0.02)	(0.02)
Male	(2)	-0.03	-0.04
		(0.02)	(0.03)
Javanese	(3)	-0.01	-0.02
		(0.02)	(0.03)
Urban areas	(4)	0.03	0.03
		(0.02)	(0.03)
Variable used to define longer school year			
Year of birth		✓	
Year of entry			✓

Notes: The number in each cell is the 2SLS estimate of the longer school year (a regression of a control variable on estimated longer school year obtained in the first-stage regression). Each regression includes the year of birth cubic polynomial. The numbers of observations in columns 1 and 2 are 5,949 and 5,666, respectively. The numbers in parentheses are robust standard errors, clustered by district. The asterisks *** and * indicate statistical significance at 1% and 10%, respectively.

APPENDIX B

Whether Availability of Internal Funds Defines Financial Constraints

The degree a firm depends on its internal funds can be an indicator of whether the firm is financially constrained; the literature defines it in two ways. The first group of literature, pioneered by Fazzari et al. (1988), considers low dividend payout ratios associated with high sensitivity of investment to cash flow (internal funds) evidences financing constraints. In the case that firms use no external funds, the firms' investment is sensitive to the availability of internal funds, and the effects are particularly pronounced for small and young firms (see, e.g., Carpenter et al., 1994; Carpenter and Petersen, 2002b; Oliner and Rudebush, 1992).[79] The second group of literature follows Kaplan and Zingales (1997) who argue that low dividend payout ratios may not always imply financing constraints; instead, it is low liquidity that defines the constraints.[80] A firm that distributes low dividend can be financially unconstrained: large firms, for example, are internally fund abundant (highly liquid), but may choose to pay low dividend and invest the internal fund for prosperous opportunities. Their investments are sensitive to the cash flow perhaps because they are flexible enough in timing their investment and adjusting transitory shocks in demand and cyclical variation in profits. These firms have low dividend payout ratios associated with high sensitivity of investment to cash flow (in which Fazzari et al. (1988) define as financing constraint), but they are not financially constrained. Small firms' investment, on the other hand, can

[79] They study the relationship between investment and cash flow (internal funds), while controlling for investment opportunities using Tobin's Q. The specification treats internal and external funds symmetrically.

[80] They classify firms as "likely constrained" if firms do not have access to more funds than needed to finance their investment; as "never constrained" if firms have access to more funds than needed to finance their investment activities. This study follows Euler equation that uses cash flow to proxy investment opportunities. See Schiantarelli (1996) and Hubbard (1998) for more discussions on this topic.

be less sensitive to internal finance if intense competition within the industry forces them to raise more costly external funds for investment. The low sensitivity of investment to internal funds may not imply these small firms are financially unconstrained (Cleary, 1999; Kadapakkam et al., 1998).

Whether the availability of internal funds reflects the financial status of a firm depends on the variable used to define financial constraints. Moyen (2004) explains that the two streams of financial constraint literature could converge despite of their contradictory conclusions. For example, firms with abundant internal funds are more likely to invest and distribute low dividend to shareholders. They can be classified as either financially unconstrained (with high liquidity) or constrained (with low-dividend ratios). On the other hand, Guariglia (2008) argues that low-dividend ratios can be seen as a proxy of the degree of external financing constraints. Low-dividend signals unfavourable prospect, which makes it difficult for firms (smaller and younger firms in particular) to raise external funds. Low-dividend ratios therefore describe external financing constraints, instead of internal financing constraints.[81]

[81] Kaplan and Zingales (1997) argue that low-dividend ratios imply internal financial constraints because they do not take into account the effects of external finance (such as debt financing) on investment. Their specification may therefore magnify the investment-cash flow sensitivity of unconstrained firms.

APPENDIX C

TABLE C1 LIST OF VARIABLES FOR ESSAY 1

Essay 1 Education and Entrepreneurial Success: Micro and Small Firms in Indonesia		
Variable	Unit	Description
Dependent Variables: Firm Performance		
Total assets	Indonesian Rupiah	Total value of land, building, four-wheel motor vehicles, other vehicles, and other equipment a household owns for non-farm business
Net profits	Indonesian Rupiah	Net profits generated by the non-farm business during the previous 12 months
Equipment assets	Indonesian Rupiah	Total value of four-wheel vehicles, other vehicles, and other equipment a household owns for non-farm business
Non-equipment assets	Indonesian Rupiah	Total value of land and building a household owns for non-farm business
Assets purchased	Indonesian Rupiah	Total assets used in non-farm business purchased in the previous 12 months
Assets sold	Indonesian Rupiah	Total assets used in non-farm business sold in the previous 12 months
Total revenue	Indonesian Rupiah	Total revenue from non-farm business in the previous 12 months (*Note: Not all respondents answered the question on total revenue. Only those who did not know the value of net profits were asked the value of total revenue.*)
Total expenses	Indonesian Rupiah	Total expenses spent for non-farm business in the previous 12 months (*Note: Not all respondents answered the question on total expenses. Only those who did not know the value of net profits were asked the value of total expenses.*)
Rental income from farm assets	Indonesian Rupiah	Total income from the rent/lease/profit sharing of farm assets in the past 12 months
Legal ownership of land		An indicator equals one if household has a legal document for land and zero otherwise

Essay 1 Education and Entrepreneurial Success: Micro and Small Firms in Indonesia		
Variable	Unit	Description
Dependent Variables: Firm Performance		
Number of plots		Number of plots of farmland
Size of land	Hectare	
Sole ownership		An indicator equals one if a business is solely owned and zero if otherwise
Percentage of share	Percentage	Percentage of share of the business owned by the household
Number of paid workers		
Number of unpaid workers		
Dependent Variables: Entrepreneurs' earnings		
Hourly earnings	Indonesian Rupiah	Sum of gross salary (or wages) and bonuses in the *previous year* from primary and additional jobs divided by total number of hours and weeks an entrepreneur work per year
Monthly earnings	Indonesian Rupiah	Sum of gross salary (or wages) and bonuses in the *previous month* from primary and additional jobs
Annual earnings	Indonesian Rupiah	Sum of gross salary (or wages) and bonuses in the *previous year* from primary and additional jobs
Dependent Variables: Educational Outcomes		
Years of schooling		Total years of schooling
Completion of senior high school		An indicator equals one if completed senior high school and zero if otherwise
Assignment Variable		
Year of birth		
Year of entry		Year of entry to primary school
Instrumental Variable		
Older cohorts		An indicator equals one if an entrepreneur was born in 1971 or earlier and zero if otherwise

Essay 1 Education and Entrepreneurial Success: Micro and Small Firms in Indonesia		
Variable	Unit	Description
Treatment Status		
Longer school year		An indicator equals one if an entrepreneur was born in 1971 or earlier and did not drop out of school in 1978 and zero if otherwise
Control Variables		
Age		Age of an entrepreneur
Gender		An indicator equals one if male and zero if otherwise
Javanese		An indicator equals one if an entrepreneur is Javanese and zero if otherwise
Urban areas		An indicator equals one if an entrepreneur lives in urban areas and zero if otherwise

APPENDIX C

TABLE C2 LIST OF VARIABLES FOR ESSAY 2

Essay 2 Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia		
Variable	Unit	Description
Dependent Variables		
Total assets	Indonesian Rupiah	Total value of land, building, four-wheel motor vehicles, other vehicles, and other equipment a household owns for non-farm business
Net profits	Indonesian Rupiah	Net profits generated by the non-farm business during the previous 12 months
Equipment assets	Indonesian Rupiah	Total value of four-wheel vehicles, other vehicles, and other equipment a household owns for non-farm business
Non-equipment assets	Indonesian Rupiah	Total value of land and building a household owns for non-farm business
Assets purchased	Indonesian Rupiah	Total assets used in non-farm business purchased in the previous 12 months
Assets sold	Indonesian Rupiah	Total assets used in non-farm business sold in the previous 12 months
Total revenue	Indonesian Rupiah	Total revenue from non-farm business in the previous 12 months (*Note: Not all respondents answered the question on total revenue. Only those who did not know the value of net profits were asked the value of total revenue.*)
Total expenses	Indonesian Rupiah	Total expenses spent for non-farm business in the previous 12 months (*Note: Not all respondents answered the question on total expenses. Only those who did not know the value of net profits were asked the value of total expenses.*)
Independent Variables		
Askeskin		An indicator equals one if an owner has a family member the policyholder/primary beneficiary of *Askeskin* or health card and zero if otherwise

Essay 2 Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia		
Variable	Unit	Description
Independent Variables		
Deaths in the family in the previous 12 months		An indicator equals one if an owner experienced deaths of family members in the previous 12 months and zero if otherwise
Deaths in the family in the previous two years		An indicator equals one if an owner experienced deaths of family members in the previous two years and zero if otherwise
Deaths in the family in the previous three years		An indicator equals one if an owner experienced deaths of family members in the previous three years and zero if otherwise
Outpatient care		An indicator equals one if a family member visited a healthcare provider in the last four weeks and zero if otherwise
Inpatient care		An indicator equals one if a family member visited an inpatient care in the past 12 months and zero if otherwise
Traffic accidents		An indicator equals one if a family member had had a traffic accident and received treatment in the previous three years and zero if otherwise
Control Variables: Other Insurance Held by Households		
PT Askes (Health Insurance)		An indicator equals one if an owner has a family member the policyholder/primary beneficiary of *PT Askes* and zero if otherwise
Astek Jamsostek (Labour Insurance)		An indicator equals one if an owner has a family member the policyholder/primary beneficiary of *Astek Jamsostek* and zero if otherwise
Employer provided health insurance/benefits		An indicator equals one if an owner has a family member the policyholder/primary beneficiary of health insurance and zero if otherwise
Employer provided health clinic		An indicator equals one if an owner has a family member gets the benefit and zero otherwise
Private insurance		An indicator equals one if an owner has a family member the policyholder/primary beneficiary of private health insurance and zero if otherwise

Essay 2 Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia		
Variable	Unit	Description
Control Variables: Other Insurance Held by Households		
Saving related insurance		An indicator equals one if an owner has a family member the policyholder/primary beneficiary of saving related insurance and zero if otherwise
Control Variables: Household Characteristics		
Ceramic flooring		An indicator equals one if a household has ceramic flooring for their house and zero if otherwise
Concrete roofing		An indicator equals one if a household has concrete roof for their house and zero if otherwise
Masonry outer wall		An indicator equals one if a household has masonry outer wall for their house and zero if otherwise
Electricity		An indicator equals one if a household has the access to electricity at home and zero if otherwise
Piped water for drinking		An indicator equals one if a household has piped water for drinking and zero if otherwise
Own toilet facilities		An indicator equals one if a household has own toilet facilities and zero if otherwise
Garbage disposal system		An indicator equals one if a household has proper garbage disposal system and zero if otherwise
Sewage drainage		An indicator equals one if a household has proper sewage drainage system and zero if otherwise
Refrigerator		An indicator equals one if a household has a refrigerator and zero if otherwise
Stove		An indicator equals one if a household has an electric or gas stove and zero if otherwise
Television		An indicator equals one if a household has a television and zero if otherwise

Essay 2 Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia		
Variable	Unit	Description
Control Variables: Household Characteristics		
Self-occupied house		An indicator equals one if a household has a self-occupied house and zero if otherwise
Other buildings		An indicator equals one if a household owns a building other than self-occupied house and zero if otherwise
Non-agricultural land		An indicator equals one if a household owns non-agricultural land and zero if otherwise
Livestock		An indicator equals one if a household owns livestock and zero if otherwise
Vehicles		An indicator equals one if a household owns a vehicle and zero if otherwise
Household appliances		An indicator equals one if a household has household appliances and zero if otherwise
Savings		An indicator equals one if a household has savings and zero if otherwise
Receivables		An indicator equals one if a household has receivables and zero if otherwise
Jewellery		An indicator equals one if a household has jewellery and zero if otherwise
Buy products at a cheaper price		An indicator equals one if a household has ever purchased *sembako* (nine basic foods) or goods in a "cheap" market or "special market operation" at a cheaper price than at the public market and zero if otherwise
Poverty Letter		An indicator equals one if a household has a poverty letter and zero if otherwise
Government assistance		An indicator equals one if a household received assistance in the form of food or other goods from the government and zero if otherwise
Non-government assistance		An indicator equals one if a household received assistance in the form of food or other goods from the non-government organisations and zero if otherwise
Community assistance		An indicator equals one if a household received assistance in the form of food or other goods from the community and zero if otherwise

Essay 2 Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia		
Variable	Unit	Description
Control Variables: Household Characteristics		
Expenditure on meat	Indonesian Rupiah	Total expenditure on meat during the past four weeks
Expenditure on clothes	Indonesian Rupiah	Total expenditure on clothes during the past four weeks
Control Variables: Firm Characteristics		
Sole ownership		An indicator equals one if a business is solely owned and zero if otherwise
Business operation is outside home		An indicator equals one if a business operation is fully outside home and zero if otherwise
Business operation is partially outside home		An indicator equals one if a business operation is partially outside home and zero if otherwise
Urban location		An indicator equals one if a business is located in urban areas and zero if otherwise
Number of business		
Type of business		A set of dummy variables for 35 types of business
The year a business started		A set of dummy variables for the year a business started
Source of start-up capital		A set of dummy variables for five sources of start-up capital
Percentage of share owned	Percentage	
Number of workers		Number of workers when the business started
Control Variables: Owner Characteristics		
Male household head		An indicator equals one if male household head and zero if otherwise
Marital status		An indicator equals one if married and zero if otherwise
Highest education		A set of dummy variables for highest level of education
Religion		A set of dummy variables for religion
Ethnics		A set of dummy variables for ethnics
Average age		Average age of household members

Essay 2 Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia		
Variable	Unit	Description
Control Variables: Owner Characteristics		
Number of household members		
Number of female household members		
Can read		An indicator equals one if household members can read in Indonesian language or other language and zero if otherwise
Can write		An indicator equals one if household members can write in Indonesian language or other language and zero if otherwise
Self-treatment		An indicator equals one if household members have self-treatment and zero if otherwise
Control Variables: Knowledge of the Location of Healthcare Facilities		
Location: Public hospital		An indicator equals one if a household knows the location of the nearest public hospital and zero if otherwise
Location: Private hospital		An indicator equals one if a household knows the location of the nearest private hospital and zero if otherwise
Location: *Puskesmas*		An indicator equals one if a household knows the location of the nearest *Puskesmas* and zero if otherwise
Location: Private clinic		An indicator equals one if a household knows the location of the nearest private clinic and zero if otherwise
Location: Private physician		An indicator equals one if a household knows the location of the nearest private physician and zero if otherwise
Location: Midwife		An indicator equals one if a household knows the location of the nearest midwife and zero if otherwise
Location: Nurse		An indicator equals one if a household knows the location of the nearest nurse and zero if otherwise
Location: Traditional birth attendant		An indicator equals one if a household knows the location of the nearest traditional birth attendant and zero if otherwise

Essay 2 Does Social Health Insurance Help Owners of Micro and Small Firms Cope with Family Hardships? Evidence from Indonesia		
Variable	Unit	Description
Control Variables: Knowledge of the Location of Healthcare Facilities		
Location: Traditional practitioner		An indicator equals one if a household knows the location of the nearest traditional practitioner and zero if otherwise
Location: Pharmacy		An indicator equals one if a household knows the location of the nearest pharmacy and zero if otherwise
Location: *Posyandu*		An indicator equals one if a household knows the location of the nearest *Posyandu* and zero if otherwise
Location: Village post		An indicator equals one if a household knows the location of the nearest village post and zero if otherwise

APPENDIX C

TABLE C3 LIST OF VARIABLES FOR ESSAY 3

Essay 3 Rising Wages and Mechanisation of Small Farms in Indonesia		
Variable	Unit	Description
Dependent Variables: Firm Performance		
Tractors	Indonesian Rupiah	Total value of tractors used on farm
Vehicles	Indonesian Rupiah	Total value of bicycles, motorbikes, car, or truck, and water vehicle
Farm equipment	Indonesian Rupiah	Total value of farming machines, generators, etc.
Irrigation system	Indonesian Rupiah	Total value of pump, tube well, etc.
Independent Variables		
Monthly agricultural wages	Indonesian Rupiah	Real average provincial agricultural wages (at 2012 provincial constant price)
Monthly non-agricultural wages	Indonesian Rupiah	Real average provincial non-agricultural wages (at 2012 provincial constant price)
Monthly minimum wages	Indonesian Rupiah	Real minimum wages (at 2012 provincial constant price)
Land size owned	Hectare	Total size of farmland owned
Self-cultivated land	Hectare	Total size of self-cultivated land
Control Variables: Household Characteristics		
Gender of household head		An indicator equals one if male and zero if otherwise
Average age of household members		Average age of household members aged 20-55
Average number of household members		Average number of household members aged 20-55
Average number of female household members		Average number of female household members aged 20-55

Essay 3 Rising Wages and Mechanisation of Small Farms in Indonesia		
Variable	Unit	Description
Control Variables: Farm characteristics		
Type of farm products		A set of dummy variables for type of farm products
Crop loss: drought		An indicator equals one if a farm experienced crop loss due to a drought in the past 12 months and zero if otherwise
Crop loss: flood		An indicator equals one if a farm experienced crop loss due to a flood in the past 12 months and zero if otherwise
Crop loss: pestilence		An indicator equals one if a farm experienced crop loss due to a pestilence in the past 12 months and zero if otherwise
Crop loss: disease		An indicator equals one if a farm experienced crop loss due to a disease in the past 12 months and zero if otherwise
Control Variables: Village Characteristics		
Cement roads		An indicator equals one if a village has cement roads and zero if otherwise
Paved roads		An indicator equals one if a village has paved roads and zero if otherwise
Disaster: flood		An indicator equals one if a village experienced a flood in the previous five years
Disaster: earthquake		An indicator equals one if a village experienced an earthquake in the previous five years
Disaster: landslide		An indicator equals one if a village experienced a landslide in the previous five years
Disaster: volcano eruption		An indicator equals one if a village experienced a volcano eruption in the previous five years
Disaster: tsunami		An indicator equals one if a village experienced a tsunami in the previous five years
Disaster: drought		An indicator equals one if a village experienced a drought in the previous five years

Essay 3 Rising Wages and Mechanisation of Small Farms in Indonesia		
Variable	Unit	Description
Control Variables: Village Characteristics		
Disaster: forest fire		An indicator equals one if a village experienced a forest fire in the previous five years
Disaster: fire		An indicator equals one if a village experienced a fire in the previous five years