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Intergenerational Mobility of Earnings and Income among Sons and Daughters in Vietnam

by

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Abstract

In this thesis, I investigate intergenerational mobility of earnings and income among sons and daughters in Vietnam. In particular, my objective is to estimate intergenerational elasticity (IGE) of sons' and daughters' individual earnings, individual income, and family income with respective to father's individual earnings. The two-sample two-stage least squares (TS2SLS) estimation is employed to achieve the research objective using two primary samples of father-son pairs and father-daughter pairs from Vietnam Household Living Standard Surveys (VHLSS) of 2012 and one secondary sample from Vietnam Living Standard Surveys (VLSS) of 1997-98. My results show that the baseline IGE estimates of Vietnamese sons are 0.361, 0.394 and 0.567 for individual earnings, individual income, and family income, respectively. For Vietnamese daughters, the baseline IGE estimates are 0.284, 0.333 and 0.522 for individual earnings, individual income, and family income, respectively. These IGE estimates explicitly reveal that Vietnam has the intermediate degrees of individual earnings and individual income mobility, and the low degree of family income mobility cross generations for both sons and daughters by the international comparison.

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Chapter 1
INTRODUCTION

Inequality has increasingly been viewed as a stylized problem facing a modern state in the twenty-first century (Piketty, 2014a, 2014b, 2015). As social scientists and policy-makers have paid considerable attention to inequality, they have placed prominence to the equality of opportunity in addition to how socio-economic outcomes are equally distributed among social classes (Corak, 2013; Krueger, 2012). The extent to which a child's socio-economic status in the current generation is determined by his or her parents' socio-economic outcome in the previous generation probably gives in-depth understanding of the degree of opportunity equality (Corak, 2013). This has been a very important motivation for extensive academic investigations of intergenerational mobility that has been witnessed over last three decades (Black and Devereux, 2011; Solon, 1999).

Intergenerational mobility provides an exploration of the relationship between the parents' socio-economic status and that of their children as adults. This research topic has been investigated both by sociologist and economists (Blanden, 2013; Torche, 2015). The main difference in the approach to intergenerational mobility between sociologists and economists is how they define a measure of socio-economic status or outcome.

From sociologists' perspective, a proxy for socio-economic status is usually related to social class or social status. Among them, occupation is predominantly chosen as a main indicator for socio-economic status in sociology (Hout, 1988; Mazumder and Acosta, 2015).[1]

On the other hand, when economists explore economic mobility across generations, they place a lot of emphasis on earnings and income as key indicators of socio-economic outcome or socio-economic success (Black and Devereux, 2011; Solon, 1999).[2] In this study, from an economic perspective, I examine the persistence of economic outcomes between fathers and offspring, including both sons and daughters as adults, in Vietnam. For the measurement of economic outcomes, due to the limitation of data, individual earnings is chosen as fathers' economic outcome. There are three different measures of economic status for sons and daughters as adults, including individual earnings, individual income, and family income.

Vietnam has been characterized by increasing inequality aligned along to recent impressive economic growth, and the expansion of education that are typical characteristics of a transition economy (Haughton, 2001). Extensive research on economic inequality has been carried out in Vietnam (Adger, 1999; Nguyen *et al.*, 2007; van de Walle and Gunewardena, 2001). However, most studies of economic inequality primarily focus only how economic outcome is distributed among social classes, or social groups at a specific year or period within one generation. Such inequality measuring using cross-sectional data, therefore, cannot reveal the transmission of inequality from generation to generation as

[1] In addition to occupation, education can be used as socio-economic status in intergenerational social mobility studies (Bauer and Riphahn, 2009; Binder and Woodruff, 2002; OECD, 2003).

[2] Other measures of economic status used in the literature include wealth (Asadullah, 2012; Charles and Hurst, 2003) and consumption expenditure (Aughinbaugh, 2000; Charles *et al.*, 2014; Waldkirch *et al.*, 2004).

well as the degree of opportunity equality in Vietnam. Studies of intergenerational mobility probably overcome this shortcoming. Within this context, Vietnam becomes an important case to investigate intergenerational mobility.

Research on intergenerational mobility in Vietnam is almost nonexistent. The paper from Emran and Shilpi (2011) is currently so far the only original paper of intergenerational mobility in Vietnam. However, Emran and Shilpi (2011) focus on intergenerational mobility of occupation from sociologists' view rather than from economists' perspective. There has been no empirical evidence on intergenerational economic mobility in Vietnam. Hence, this study significantly fulfills the gap.

From the existing literature in economics, previous research studies in this topic have predominantly been carried out in Northern American and European countries such as the United States (Chetty *et al.*, 2014a, 2014b; Solon, 1992; Zimmerman, 1992), Canada (Corak and Heisz, 1999), the United Kingdom (Atkinson *et al.*, 1983; Dearden *et al.*, 1997), Sweden (Björklund and Jantti, 1997), Norway (Bratberg *et al.*, 2005), France (Lefranc and Trannoy, 2005), and Italy (Mocetti, 2007; Piraino, 2007). In Asia, similar studies are mainly in developed countries such as Japan (Lefranc *et al.*, 2014; Ueda, 2009), South Korea (Choi and Hong, 2011; Lee, 2014; Ueda, 2013), Taiwan (Kan *et al.*, 2015; Ueda and Sun, 2013), and Singapore (Ng, 2007, 2013; Ng *et al.*, 2009).[3]

There are few studies for developing countries, especially transition economies like Vietnam. My objective is to contribute empirical evidence to the literature of intergenerational economic mobility, and my study is the first implemented

[3] For previous intensive surveys, see Björklund and Jäntti (2009), Black and Devereux (2011), Blanden (2013), Corak (2006), and Solon (2002).

in Vietnam. I use Vietnamese data to estimate regressions of offspring's individual earnings, individual income, or family income on fathers' individual earnings. Moreover, findings from this study are compared to results from other countries, especially for developing countries and Asian countries, in order to reveal whether or not Vietnamese society is relatively mobile.

In studies of intergenerational mobility, researchers' main objectives are to estimate intergenerational elasticity (IGE) or correlation (IGC) of earnings or income. In this study, I focus on the former estimate, IGE. IGE is a reasonable statistic that accounts for the degree of the intergenerational association between parental resources and economic status of children. In principle, a high IGE estimate between parents' and children's economic success explicitly provides an implication of a low degree of mobility with a measurable magnitude of intergenerationally perpetuated inequality. In other words, a poor child is less likely to escape poverty and move upwardly while the likelihood for a child who was born in wealthy families to remain at the top position from the social ladder of economic outcome is high. In such a society with high IGE, the degree of equality of opportunity is relatively low. In contrast, a modest IGE estimate indicates a high level of economic mobility across generations, and therefore a high degree of the equality of opportunity.

In order to obtain IGE estimates, in principle, researchers demand a representative sample in which information on the approximate permanent economic outcome for both parents and children as adults is available. Unfortunately, such data sets are rarely available, especially in developing countries, including Vietnam. As a result, I cannot apply this approach to this country. In this study, in order to surmount the problem of lack of data, I use the two-sample two-stage least squares (TS2SLS) estimator to estimate IGEs

between fathers and sons and fathers and daughters. TS2SLS is first developed by Björklund and Jäntti (1997) in order to estimate intergenerational earnings mobility in Sweden and the United States.

In principle, TS2SLS employs two samples including a primary sample and a secondary one. The primary sample consists of observations on son-father or daughter-father pairs in which information on children's economic outcome and socio-economic characteristics, and fathers' socio-economic characteristics is available. However, because information on fathers' real economic outcome is not available in this sample, the regression of children's economic status on that of fathers cannot be done in such a sample. To overcome the problem of unavailability of fathers' real economic status variable, a secondary sample of "potential" fathers, i.e. male workers, from another sample that includes both information on observations' economic outcome and same socio-economic characteristics as in the primary sample, is employed in order to predict missing information on true fathers' economic outcome in the primary sample. The estimates regressing potential fathers' economic outcome on their socio-economic characteristics variables in the secondary sample are used to predict true fathers' economic status in the primary sample. The true fathers' economic outcome in the primary sample is predicted by plugging the true fathers' socio-economic characteristics into the regression generated from the secondary sample.

In this study, two primary samples of father-son pairs and father-daughter pairs are taken from the Vietnam Household Living Standards Survey (VHLSS) of 2012 (GSO, 2013). A secondary sample of potential fathers is extracted from the Vietnam Living Standards Survey (VLSS) of 1997-1998 (GSO, 1999). The socio-economic characteristics used to predict the true fathers' individual

earnings in this study include education, occupation, industry, and geographic region.

When the TS2SLS estimator is used to estimate IGEs, it is important to emphasize that the choice of different sets of socio-economic characteristics to predict fathers' economic outcome in the first stage may produce different IGE results. Therefore, in addition to estimate baseline IGE estimates, the robustness of IGE estimates to various model specifications in the first stage is checked in this study.

Moreover, the literature of intergenerational economic mobility shows that the sample choice of age intervals can affect the degree of IGE estimates. In this study, sub-samples with different age ranges are used to estimate corresponding IGEs and to show whether the choice of age range alters IGE results for Vietnamese data.

Intergenerational mobility is seen as a locally geographic issue because IGE estimates can be different across geographic locations, even within a country. Recently, Chetty *et al.* (2014a, 2014b) provide informative evidence on the effect of the geographical location on IGE estimates from the United States where the IGE estimates show that there are both areas with highest degrees of mobility and areas with low degrees of mobility across generations, compared to other developed countries. In this study, the sensitivity of IGE estimates to different geographic regions within Vietnam is also examined.

In addition to estimating IGEs by the TS2SLS estimator, I use the transition mobility matrix approach to investigate intergenerational mobility of earnings and income in Vietnam. The transition mobility matrix is seen as a complementary approach to a mean regression in the exploration of

intergenerational mobility. Transition mobility matrix has been employed in some previous intergenerational mobility studies such as Chetty *et al.* (2014a), and Peters (1992) for the United States, and Dearden *et al.* (1997) for United Kingdom.

For the results, I find that the baseline IGE estimates of Vietnamese sons are 0.361, 0.394 and 0.567 for individual earnings, individual income, and family income, respectively. Meanwhile, the baseline IGE estimates of Vietnamese daughters are 0.284, 0.333 and 0.522 for individual earnings, individual income, and family income, respectively. These IGE estimates explicitly reveal that Vietnam has the intermediate degrees of individual earnings and individual income mobility, and the low degree of family income mobility cross generations for both sons and daughters by the international comparison.

Chapter 2
Literature Review

After reviewing the literature of intergenerational economic mobility, I note several issues that are highlighted in this chapter. These include the geography of intergenerational economic mobility research throughout the world, and the existence of various IGE estimates across countries or even within a nation and possible reasons. In addition, I examine the evolution of the methodological approach to measurement errors problems in empirical intergenerational mobility studies.

Regarding the geography of intergenerational economic mobility in the world, most studies have been carried out in North American and European countries, especially the United States (Aaronson and Mazumder, 2008; Bhattacharya and Mazumder, 2011; Björklund and Jäntti, 1997; Chetty *et al.*, 2014a, 2014b; Mazumder, 2005; Solon, 1992; Zimmerman, 1992), Sweden (Björklund and Chadwick, 2003; Björklund and Jäntti, 1997; Gustafsson, 1994; Hirvonen, 2008; Österberg, 2000), the United Kingdom (Atkinson, 1981; Dearden *et al.*, 1997; Nicoletti and Ermisch, 2008), and Canada (Aydemir *et al.*, 2013; Corak and Heisz, 1999; Fortin and Lefebvre, 1998). Generally, available IGE estimates in these regions show that the degree of intergenerational earnings or income mobility is highest in Scandinavian countries whereas the United States, and the United Kingdom have the modest levels of mobility across generations (Björklund and Jäntti, 2000; Corak, 2006; Solon, 2002).

In terms of the degree of IGE estimates, the existing literature shows that there are various IGE estimates across country, or even within a country. To account for this fact, different estimation methods and various rules of constructing samples are seen to be the main reasons.

The United States is seen as the most active country for studying intergenerational mobility with a lot of different IGE estimates found. For example, Solon (1992) finds an estimate of 0.41 for American sons if the OLS estimator is applied and fathers' earnings are averaged over six years while the corresponding figure is 0.53 if the instrumental variable (IV) estimator is employed. A sample of sons, in this study, is restricted to those aged between 25 and 33 and data is taken from *Panel Survey of Income Dynamics*. Meanwhile, Zimmerman (1992) also shows there is a difference in IGE estimates if different estimation methods are applied using a sample from *National Longitudinal Survey*. In particular, IGE estimates for using OLS and TSIV as the estimation methods are 0.54 and 0.67, respectively. Samples in this study include sons aged from 29 to 39. Björklund and Jäntti (1997) find an estimate of 0.52 for American sons using the TS2SLS estimator. Leigh (2007) uses a sample of sons aged between 25 and 54 and the TS2SLS estimator to find that IGE estimates range between 0.4 and 0.6 in the United States.

Other countries also reveal the similar pattern. For instance, the IGE estimates for Sweden can vary from 0.13 with the OLS estimator and a three-year average measure of fathers' earnings (Österberg, 2000) to 0.36 when the TS2SLS estimator is used (Björklund and Jäntti, 1997). Meanwhile, Björklund and Chadwick (2003) also use OLS to estimate IGE for Sweden, and fathers' earnings are averaged over a six-year period to find an IGE estimate of 0.24, which is higher than an IGE estimate from Österberg (2000).

In the United Kingdom, in Atkinson (1981) IGE estimates of father-son are found to be 0.36 for using the OLS estimator with a raw earnings variable, and 0.43 for applying OLS with a lifecycle adjusted earnings variable, using data from *York Rowntree Survey*. Meanwhile, Dearden *et al.* (1997) also estimate father-son IGEs using another sample from *National Child Development Survey*. The results of IGE estimates are 0.24, 0.44, and 0.58 for using the OLS estimator with a raw earnings variable, the OLS estimator with a lifecycle adjusted earnings variable, and the TSIV estimator, respectively.

For other developing countries, IGE estimates are relatively high. For example, for Brazil, a high IGE estimate of 0.69 is found (Dunn, 2007). Similar results are evidently figured out in South Africa with an IGE estimate of 0.609 (Hertz, 2001), or between 0.62 and 0.68 (Piraino, 2015).

In Asia, studies of intergenerational mobility have mainly been carried out in Japan, South Korea, Singapore, and Taiwan. Among these countries, Singapore is seen as the most mobile country with IGE estimates between 0.23 and 0.28 (Ng, 2007; Ng *et al.*, 2009). In Japan, Lefranc *et al.* (2014) find an IGE estimate for Japanese males is nearly 0.35. This study also reveals the stable trend of intergenerational earnings mobility in Japan over the last decades.

Meanwhile, Ueda (2013) also investigates the IGE in South Korea. The results show that a father-son IGE is found to be 0.24 when using a combination of the method of simulation extrapolation and the multiyear-average method while this figure is approximately 0.25 when using the TSIV estimator. In another study, Kim (2013) finds an IGE of 0.40 for South Korea by using the TS2SLS estimator.

In addition to these countries, intergenerational economic mobility is examined in some developing countries in Asia. For example, in China Gong *et al.* (2012) find an IGE estimate of 0.63 in China's rural areas while Fan *et al.* (2013) finds an IGE interval between 0.335 and 0.416 for sons, and between 0.205 and 0.496 for daughters throughout the whole country. Meanwhile, Lillard and Kilburn (1995) find a very high level of mobility with an IGE estimate of 0.27 when the OLS estimator is used whereas Grawe (2004) finds a low level of mobility with an estimate of 0.54 when using the TSIV estimation for Malaysia.

Importantly, Chetty *et al.* (2014a, 2014b) recently find that in a country that is comprised of a collection of various heterogeneous areas like the United States, IGE estimates are substantially different across various geographic locations. Using a very large data source for many areas within the country, the authors find that the United States has both areas with the most mobile degrees and those with the modest mobile degree compared to other developed countries. Intergenerational mobility is a spatially local problem. The geographic variation of IGE estimates is strongly accounted for by five main factors including residential segregation, income inequality, school quality, social capital, and structure of family. Findings about the effect of the geography on IGE estimates and affected factors as well from Chetty *et al.* (2014a, 2014b) provide very significant contributions to the existing literature of intergenerational mobility in order to understand why IGE estimates are empirically different in addition to because of the different uses of estimation methods, and the rules of constructing samples as discussed above. Therefore, the transmission of economic outcomes across generations can be different for each geographic area within a country. Hence, specific considerations of geographical locations are

very important to find more reliable and reasonable results for intergenerational mobility in a country.

The literature of intergenerational economic mobility has witnessed an evolution of the methodology that has addressed the issue of measurement errors in order to produces more reliable IGE estimates with possible minimized biases. Economists have paid much attention to measurement errors of economic outcome in intergenerational mobility studies. Measurement errors primarily involve two main sources of bias, including lifecycle bias and attenuation bias (Black and Devereux, 2011).

Economists have paid much attention to lifecycle bias when they estimate IGEs. Lifecycle bias of IGE estimates arises from measuring children's economic outcomes at their early ages or older ages. To minimize lifecycle bias, therefore, an economic outcome should be imputed at ages at which workers' economic outcomes are in a stable status so that such a measure can better be a proxy for their lifetime economic outcomes (Grawe, 2006; Haider and Solon, 2006; Solon 1992). In other words, measurement errors in a dependent variable, i.e. children's economic outcome, can produce biased IGE estimates. Hence, the application of classical measurement errors assumptions is not accepted in this case. To solve this problem, Haider and Solon (2006) suggest using measures of economic outcome at ages around the age of 40 in order to produce better IGE estimates with possible minimized bias.

In the early stage of intergenerational economic mobility research, particularly in the 1980s, economic outcomes were usually measured in a single year (Becker and Tomes, 1986; Behrman and Taubman, 1985). However, such a measure can be suffered from possible transitory shocks of economic outcome around the long-term measure. In principle, an economic outcome should be measured in

permanent status because it captures the lifetime economic status of a person (Friedman, 1957). Under the assumptions of classical measurement errors, measurement errors in the independent variable, i.e. fathers' economic outcome, yield biased and inconsistent IGE estimates (Peters, 1992). Zimmerman (1992) and Solon (1992) conclude that such measurement errors from fathers' economic outcomes primarily tend to produce downward bias that is known as attenuation bias.

To overcome this source of bias, economists suggest using a multi-year average measure rather than a single-year measure of economic outcome because an average measure of multi-year data have been seen as a better capture of permanent economic status (Mazumder, 2005; Solon, 1992; Zimmerman, 1992). Nevertheless, average measures of economic outcome from different numbers of years also tend to produce different magnitudes of IGE estimates. For instance, Solon (1992) finds that the IGE estimate from the five-year average of fathers' income that is approximately 33% higher than an IGE estimate for a single year fathers' income, and it is a more reliable estimate. However, Mazumder (2005) shows that an average over a more-than-five-year period of economic outcomes even does provide a better proxy of long-term income rather than a five-year average as seen in Solon (1992). Consequentially, this strategy has widely been applied to minimize attenuation bias in empirical studies of intergenerational economic mobility; for example Hussein *et al.* (2008) for Danish data; Björklund and Chadwick (2003), Hirvonen (2008), and Österberg (2000) for Swedish data; Österbacka (2001) for Finnish data; or Corak and Heisz (1999) for Canadian data.

The application of the TS2SLS estimator can be viewed as an alternative approach to resolve attenuation bias. Kan *et al.* (2015), Piraino (2015), Cervini-

Plá (2014), and Lefranc *et al.* (2014) are recent examples of applying the TS2SLS estimator.

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Chapter 3
Research Context

Among transition economies, Vietnam is a typical case for investigating intergenerational economic mobility because of its recent reforms to redirect the economy from centrally-planned to market-oriented. In this section, I provide an intensive understanding of the context of development of Vietnam's economy which is crucially linked to the current study. Firstly, I introduce reforms and economic achievements that Vietnam has experienced in the renovation era. I then discuss expansions of education as an important consequence. Finally, I focus on the issue of inequality as this has importantly been aligned to the transition of this economy.

3.1 Reforms and Achievements

Vietnam has undergone a transition of its economy since the event of *Đổi Mới* ("Renovation") in 1986.[4] The transition has been marked with important reforms of economic policies related to economic integrations, the achievements of impressive economic growth, increased GDP per capita, and considerable poverty reductions in Vietnam.

[4] The Sixth National Congress of the Vietnamese Communist Party in December 1986 had launched a new plan for changing the economy from a centrally-planned to a market-oriented system (Thayer, 1987).

Firstly, Vietnam has integrated more deeply into the world economy through joining international organizations and free trade areas. For instance, Vietnam has been a member of the Association of Southeast Asian Nations (ASEAN) since 1995, ASEAN Free Trade Area since 1996, and the World Trade Organization (WTO) since 2007. Such an international integration provides the profound background for the "openness", and then the growth of Vietnam's economy.

As a consequence, main activities related to the foreign exchange including attracting foreign direct investment (FDI) and exports have remarkably enhanced. For example, the FDI of Vietnam has increased from USD 0.5 billion in 1992 to nearly USD 11 billion in 2010 (World Bank, 2012a). Further, the increased FDI has contributed to economic growth for the private sector, increased exports, and the widespread of technological progress (Anwar and Nguyen, 2010; Ngoc, 2008; Nguyen and Xing, 2006; Vu, 2008). By 1999, the FDI sector has contributed about 13% to the total GDP growth and approximately 25% to the entire tax revenue (Freeman, 2002). Meanwhile, Vietnam's exporting activities have grown considerably during the age of renovation.

Economic policy reforms have promoted Vietnam to become one of the most remarkable emerging economies with highest economic growth rates in Southeast Asia (Irvin, 1995). By illustration, on average, the annual GDP growth rate of Vietnam was approximately 8.6% between 1991 and 1998 (Nghiep and Quy, 2000), and reached the apex of about 9.5% in 1985 (WDI, 2014). Moreover, Vietnam has successively retained its high rate of economic growth since the 1997 Asian financial crisis. Specifically, from 2000 and prior to the 2008 global financial crisis, the average annual economic growth rate of

Vietnam was 7.5%, which was higher than corresponding figures of the world economy, ASEAN, Asia Pacific, and India with 3.9%, 5.4%, 5.9%, and 7.3%, respectively (IMF, 2009). Therefore, the economic reforms have provided the positive impacts on economic growth of Vietnam's economy.

Economic growth has enhanced GDP per capita for Vietnamese compared to the period before the 1986 *Đổi Mới* (UNDP, 2011). In 1985, Vietnam was still one of poorest countries in the world with low GDP per capita (Thayer, 1987). However, the country has become a middle-income one since 2009 (Welle-Strand *et al.*, 2013). Between 1993 and 2008, Vietnam achieved an average annual growth rate of approximately 6.1% in GDP per capita (World Bank, 2012b).

Increases in GDP per capita have contributed to poverty reduction in Vietnam. Poverty rates have decreased from about 58% in 1993 to 14.5% in 2008, and less than 10% in 2010 (World Bank, 2012b). Also, over 60% of rural households, approximately 70% of Vietnam's population, have escaped poverty (Inchauste, 2012). In addition, there has been an annual increase of approximately 7% in consumption expenditure between 1993 and 1998 (Glewwe and Jacoby, 2004).

3.2 Expansions of Education

During the era of renovation of Vietnam's economy, expansions of education have been witnessed in both demand and supply sides. Changes in the structure of the economy from an agriculture-based to an industry-and-service-based economy have increased demand for skilled workers in Vietnam (Cai and Liu, 2014). Moreover, the demand for education has also gone up because of wealth

effects stemming from substantial income growth among Vietnamese households (Glewwe and Jacoby, 2004).

From the supply side, the provision of education has increased because of enlarged investments from the government and the private sector. Historically, Vietnam's education system has predominately been funded, managed and controlled by the state. In the new era of educational reform, the public budget for education investments has increased. For example, the budget was over 13% of GDP in 2010 (GSO, 2011). In addition to developments of state-funded educational institutions, the private sector has increasingly contributed to the human capital in Vietnam (Ngo *et al.*, 2006; Mok, 2008). This growth of non-public education has advanced Vietnamese citizens' accessibility to education (Goyette, 2012). For example, the enrollment rates for lower secondary and upper secondary schools had gone up from 66% to 72%, and from 23% to 31% between 1993 and 1998, respectively (GSO, 1999).

An important contribution of education expansions to Vietnam's economy is to provide more educated workers for labour markets. For example, rates of workers with primary education qualification or non-diploma had gone down from 49% in 1993 to 51% in 2002 and 44% in 2006 (GSO, 1994, 2003, 2007). In contrast, rates of those hold tertiary qualifications had increased from 1.8% in 1993 to 3.3% in 2002 and 4.2% in 2006 (GSO, 1994, 2003, 2007). The rates of workers who hold the secondary and high school qualifications had increased with 26% and 14% in 1993, 30% and 16% in 2002, and 33% and 19% in 2006 (GSO, 1994, 2003, 2007). Having more skilled workers has allowed the shift from the physical-capital-accumulation-based growth to the productivity-based one in Vietnam's economy (Saich *et al.*, 2008; Welle-Strand *et al.*, 2013; World Bank, 2013).

Also, the returns to schooling has increased in Vietnam. For instance, wage has gone up from 4.2% in 1993 to 4.8% in 1998 for female workers (Liu, 2006), and from 2.9% in 1993 to 5% in 1998 for whole labor force (Gallup, 2004).[5] Increases in returns to human capital can lead to wage differentials, and income inequality when educated workers have more opportunities to improve their income due to their higher levels of education, especially in the private and non-farming sectors (World Bank, 2013). Sakellariou and Fang (2014) implicitly reveal that labor market reforms along with the *Đổi Mới* have led to real wage growth, increases in labor earnings, and income inequality. In this context, inequality in outcomes from labor markets has been given massive attention from researchers as well as policy makers (Imbert, 2013).[6]

3.3 Inequality

During the period of reforms and renovation, inequality in Vietnam has constantly risen although its magnitude is not at the apex in Asia (World Bank, 2014). Demonstratively, Gini indices increase from 33, 35.4 to 40.7 in the years of 1993, 1998, and 2000, respectively (Fritzen, 2002). In 2012, Vietnam's Gini index equals 0.39, which is lower than that of China, Thailand, and Indonesia, and larger than that of India, and Cambodia (World Bank, 2014).

Inequality is a public concern because it can undermine harmonious growth, an important target of Vietnam's development (World Bank, 2014). Moreover,

[5] Exceptionally, Liu (2006) provides an inverse result, which is a decrease in returns to education from 5.9% in 1993 to 3.5% in 1998 for male workers, respectively.

[6] Inequality in labor market outcomes can be accepted in some extent because it helps create and retain innovation and hard working motivations (Acemoglu and Robinson, 2013). However, if inequality comes from other factors such as institutional weaknesses, or parental positions rather workers' human capital or efforts, it is probably disincentive. Inequality of opportunities is therefore a massive problem for a permanent innovative economy.

whether poor citizens are marginalized from the economic growth is of considerable concern to economists and social researchers (Fritzen, 2002).

There have been numerous studies into inequality in socio-economic outcome in Vietnam over last decade. From the sociological perspective, there are studies of inequality in education (Glewwe, 2004), and inequality in health (Granlund *et al.*, 2010; Huong *et al.*, 2006; Khe *et al.*, 2004; Minh *et al.*, 2003, 2006; Wagstaff *et al.*, 2003). Furthermore, inequality studies in the economic literature focus on economic outcome such as income (Liu, 2008; Milanovic, 1998), and consumption expenditures (Fesselmeyer and Le, 2010; Le and Booth, 2014).

However, most studies in inequality in Vietnam focus on inequality at one time point within a generation rather than the transmission of inequality from one generation to the next that shows the inequality of opportunity. Also, the inequality of opportunity is increasingly paid more attention in Vietnam (World Bank, 2014). However, there is currently no solid evidence on the inequality of opportunity in economic outcome in Vietnam. This study is the first study on intergenerational economic mobility that informatively provides the understanding of the inequality of opportunity in Vietnam.

Chapter 4
Data Sources and Samples

In this thesis, I apply the two-sample two-stage least squares (TS2SLS) estimation to estimate IGEs for Vietnam. Within this approach, I employs two primary samples of sons and daughters as adults from the Vietnam Household Living Standards Surveys (VHLSS) of 2012 (GSO, 2013) and one secondary sample of potential fathers from the Vietnam Living Standards Surveys (VLSS) of 1997-98 (GSO, 1999). In this chapter, my aims are to introduce sources of data and how samples are constructed.

4.1 Data Sources

The two main sources of data used in this thesis are VLSS and VHLSS. The first source is from VLSS that was implemented between 1993 and 1998 by the General Statistical Office (GSO) of Vietnam as the main census of Vietnamese households before the year of 2000.[7] The secondary sample of "potential" fathers is extracted from VHLSS of 1997-1998. The VLSS of 1997-98 has a representative sample with 6,000 households from representative communes[8] cross the country surveyed (World Bank, 2001). In the survey, households' socio-economic information, including education, employment, health, activities

[7] VLSSs were received financial supports from United Nations Development Program (UNDP) and the Swedish and International Development Agency (SIDA), and based on Living Standards Measurement Study (LSMS), the technical method from the World Bank (Haughton and Nguyen, 2010).
[8] Communes are smallest units of the administrative management in Vietnam.

of agricultural production, activities of non-agricultural production, housing, migration, fertility, and savings and credit in each household is elicited (Haughton and Nguyen, 2010; World Bank, 2001).

The second source of data is from the VHLSS, which is the most important data source for basic socio-economic information of Vietnamese households since 2000. Moreover, the VHLSS includes in a series of bi-annual surveys of which the VHLSS of 2002 is the first round. VHLSS aims to make enquiries of representative households' key socio-economic information of all members, including demographic information, expenditure, income, employment, education, health, housing, consumptions, and the programs of poverty reduction. The sample sizes of VHLSS are considerably larger than those of the VLSS. In this thesis, two primary samples of father-son pairs and father-daughter pairs are taken from the VHLSS of 2012, which comprises 23,235 households surveyed across Vietnam. The data from both the VLSS and the VHLSS are cross-sectional data.

4.2 Samples

One sample of male workers from the VLSS of 1997-98 and two samples of father-son pairs and father-daughter pairs from the VHLSS of 2012 are used to investigate the persistence between fathers' economic status and offspring's economic success in Vietnam. Among these three samples, two samples of father-son pairs and father-daughter pairs from VHLSS of 2012 are the primary samples. A sample of male workers from VLSS of 1997-1998 is the secondary sample of "potential fathers", which is used to predict the missing values of true fathers' log of individual earnings in primary samples.

Descriptive statistics of these three samples are summarized in Table 1. For the primary sample of son-father pairs, the ages of sons are restricted to the range from 25 to 54 in the year of 2012. Eventually, there are 1344 observations in this sample and the average age for sons and fathers are roughly 29 and 58, respectively. Therefore, their average ages in 1998 were 15 and 44 year olds, respectively.

[Insert Table 1 here]

For the primary sample of daughter-father pairs, there are 632 observations. The age range of daughters is between 25 and 47, and their average age is approximately 28 while the corresponding figure for their fathers is about 58 in this sample. In 1998, the average age for daughters and fathers were 14 and 44, respectively.

For the secondary sample of "potential fathers," male workers whose ages vary from 31 to 51 are included. The size of this sample is 1041 observations.

In all three samples, individuals' information on socio-economic characteristics including education, occupation of employment, industry of employment, and geographic region are uniformly coded. In the case of education, there are five dummy variables, including *(1) non-diploma or primary*, *(2) secondary*, *(3) vocational*, *(4) high school*, and *(5) tertiary*. In terms of occupation, there are seven categories, including *(1) very highly skilled professionals, supreme government officials and administrators, and high-class managers*, *(2) high-grade professionals, administrators, and government officials, high-grade technicians, and supervisors of non-manual workers*, *(3) typical non-manual*

workers, higher grade (administration and commerce) and lower grade (sales and services), *(4) lower-grade technicians, supervisors of manual workers*, *(5) skilled manual workers*, *(6) semi- and un-skilled manual workers*, and *(7) farmers and farm workers in agricultural production.*

Regarding the classification of industry of employment, there are ten categories, including *(1) agriculture*, *(2) manufacturing*, *(3) public management*, *(4) health and education*, *(5) trade and finance*, *(6) utilities*, *(7) transportation and communication*, *(8) construction*, *(9) mining*, and *(10) community and social services.* On the classification of geographic region, there are six dummy variables. These include *(1) Red River Delta (RRD)*, *(2) Northern Midland and Mountain Areas (NMMA)*, *(3) North Central and Central Coastal Areas (NCCCA)*, *(4) Central Highlands (CH)*, *(5) South East (SE)*, and *(6) Mekong River Delta (MRD).* Specific classifications for occupation, industry, and geographic region are respectively presented in Table A1, Table A2, and Table A3 of *Appendices.*

In empirical studies of intergenerational economic mobility, economists emphasize the source of measurement errors that result in lifecycle bias and attenuation bias. Referring to lifecycle bias, Haider and Solon (2006) show that when a child's economic outcome is not measured in long-run, a consequence is the measurement error which potentially generates lifecycle bias in IGE estimates. Specifically, if economic outcome is measured in the early or late ages of a child's working life, IGE results tend to be underestimated. They also suggest that when constructing a sample, including only children who are aged around the age of 40 is an appropriate choice because at around this age, a measure of economic outcome is the most suitable proxy for permanent outcome. As a consequence, the potential lifecycle bias is minimized.

However, due to the availability of data, I use a wider range of ages for both sons and daughters in primary samples in order to estimate baseline IGEs in this study rather than the age range as seen in Haider and Solon (2006). In particular, the primary sample of sons includes those aged between 25 and 54 while the age interval for the primary sample of daughters is from 25 to 47. Moreover, most children in each sample are under the age of 30. Illustratively, there are 73.36% of sons aged from 25 to 30 while the corresponding figure for daughters is 77.85%. Therefore, primary samples used in this study are relatively young.

Although Vietnam has been seen as a country with high rates of young labor force participation, a common census statistic shows that the proportion of young workers who are under the age of 30 was around 30% from 2007 to 2011 (GSO, 2012). In this study, with very large proportions of sons and daughters aged under the age of 30 compared to the common census statistic, it is important to concede that samples are probably not well representative of the population. Such samples with a large proportion of young workers used in this study can be explained by a fact that the available data source is limited to children who are co-residential with their fathers. The distribution of children's ages in primary samples of sons and daughters are respectively demonstrated in Figure A1 and Figure A2 of *Appendices*. Hence, according to Haider and Solon (2006) I expect that with the available data, the baseline IGE estimates for full samples of sons and daughters in this study are downwardly biased in some extent.

If I use the age interval proposed by Haider and Solon (2006) for constructing primary samples, I eventually attain a sub-sample of 450 sons aged between 30 and 50 with 33.48% of the full sample, and a sub-sample of 182 daughters aged

from 30 to 47 with 28.80% of the full sample. Although these sub-samples are small in size, they are also used to estimate IGEs in order to make comparisons with baseline IGE estimates achieved from regressions for full samples. Also, my aim is to check whether there are effects of age selection on IGE estimates for Vietnamese data.

For attenuation bias, using a current or short-run measure of economic outcome of "potential" fathers in the secondary sample may result in a substantial underestimation of the true IGE estimates because temporary economic outcome is potentially a noisy proxy for long-run one (Solon, 1992; Zimmerman 1992). This measurement error leads to attenuation bias that results in a downwardly biased IGE estimate (Solon 1992; Zimmerman 1992).

In this study, I use the TS2SLS estimator as a useful approach to measurement errors stemming from using a one-year measure of individual earnings as the proxy for fathers' economic outcome. This is because when the transitory shocks are not correlated with the predictors of fathers' individual earnings, estimates from the TS2SLS estimator are consistent (Inoue and Solon, 2010).

When we compare the distributions of fathers' socio-economic characteristics between the primary and secondary samples as shown in Table 1 we can recognize that two samples are relatively matched in some categories. For example, *secondary* amounts to 33.7% in the secondary sample, 32.4% in the primary sample of father-son pairs, and 29.3% in the primary sample of father-daughter pairs. Meanwhile, there are 25.8%, 14.8%, and 20.3% of fathers whose the highest qualification is a high school one in the secondary sample, the primary sample of father-son pairs, and the primary sample of father-daughter pairs, respectively. For the geographic region group, *Red River Delta (RRD)* occupies about 26.7%, 23.6%, and 21.8% of observations in the secondary

sample, the primary sample of father-son pairs, and the primary sample of father-daughter pairs, respectively.

However, there are also unmatched distributions of fathers' socio-economic characteristics between the primary and secondary samples as shown in Table 1. For example, in the education group, *non-diploma or primary* is the most frequent category for fathers' education in both the primary sample of son-father pairs with 40.1% and the primary sample of daughter-father pairs with 33.8% but it only has 13.4% in the secondary sample. For the occupation group, *farmers and farm workers* only accounts for 9.3% among fathers' occupation categories in the secondary sample whereas it occupies up to 44.3% and 40.8% among fathers' occupation categories in son-father and daughter-father primary samples, respectively. Meanwhile, among categories of industry, while there is only 11.5% of *agriculture* in the secondary sample, the corresponding figures in the primary samples of son-father and daughter-father pairs are respectively 53.9% and 50.9%.

The unmatched distributions of fathers' socio-economic characteristics between the primary and secondary samples can be accounted for by a characteristic that only child-father pairs who are living together within families are included in the primary samples.

Chapter 5
Research Methods

5.1 Two-Sample Two-Stage Least Squares Estimation

Basically in many studies of intergenerational mobility, IGE is typically estimated from the following regression:

$$Y_i = \beta_0 + \beta_1 X_i + \epsilon_i \qquad (1)$$

where Y_i is the log of the i^{th} children's permanent economic outcome, X_i correspondingly denotes the log of their father's long-run economic outcome, and ϵ_i is an error term. In this study, economic outcomes for children are measured by three different variables including individual earnings, individual income, and family income. For fathers, the proxy of economic outcome is their personal earnings from the labor market.

The coefficient β_1 in equation (1) is the parameter of interest. The coefficient β_1 is the measure of IGE, and then $(1- \beta_1)$ measures the intergenerational economic mobility. If information on lifetime economic outcomes for both children and fathers are available, ordinary least squares (OLS) estimator can be applied to consistently estimate β_1. However, even a proxy for lifetime economic outcome such as multiple years of averages is rarely available, and it is especially true for datasets in developing countries. In many available datasets, only information on children's economic outcome (Y_i) is reported while information on parents' economic outcome (X_i) such as earnings or

income is commonly not reported, especially for data from developing countries like Vietnam. Fortunately, parents' socio-economic characteristics such as education, occupation, and industry are available.

In this paper, the problem of unavailable data is overcome by applying two-sample two-stage least squares (TS2SLS) estimation for Vietnamese data. The TS2SLS estimator is based on the idea of the two-sample instrumental variable (TSIV) estimator invented by Angrist and Krueger (1992). Inoue and Solon (2010) show that in the two-sample environment, TS2SLS is asymptotically more efficient than TSIV.

The first application of the TS2SLS estimation is based on Swedish and American data in Björklund and Jäntti's (1997) paper. Since then numerous studies have used TS2SLS to investigate intergenerational mobility such as Fortin and Lefebvre (1998) for Canada, Lefranc and Trannoy (2005) for France, Dunn (2007) for Brazil, Gong *et al.* (2012) for urban China, Piraino (2015) for South Africa, Lefranc *et al.* (2014) for Japan, or Cervini-Plá (2014) for Spain.

In this study, TS2SLS is used to estimate β_1 in (1). In doing so, two different samples and two stages are used to obtain β_1 . The first is the primary sample. In this sample, information on children's long-run economic status is available. However, information on fathers' permanent economic outcome is not available. Fortunately, some important socio-economic characteristics of fathers, Z_i , including their education, occupation, industry of employment, and geographic region are available in the primary sample. These are used to impute their missing values on the permanent economic outcome. The secondary or supplemental sample includes information on male workers' economic outcome and their socio-economic characteristics, Z_i , as those in the primary sample. Male workers in this sample are the potential fathers for individuals in the

primary sample, and variables of these male workers are employed to predict the missing economic outcome of fathers in the primary sample.

From existing literature, fathers' economic outcome predictors are empirically education (Lefranc *et al.*, 2010), or occupation (Fortin and Lefebvre, 1998), or education and occupation (Björklund and Jantti, 1997; Núñez and Miranda, 2011; Ueda and Sun, 2013), or education, occupation, and industry (Gong *et al.*, 2012; Kim, 2013), or education, occupation, and geographic region (Lefranc *et al.*, 2014). In this thesis, the socio-economic characteristics of potential fathers Z_i consists of *education*, *occupation*, *industry*, and *geographic region* are used to predict fathers' individual earnings.

Regarding the two stages to achieve the IGE, the first is to predict the missing values of fathers' permanent economic status in the primary sample. To do this, firstly it is necessary to estimate the relationship, $\widehat{\gamma}$, between fathers' socio-economic status and fathers' current economic outcome (X_i) using the secondary sample.

In the primary sample, missing values of the logs of fathers' permanent earnings or income are calculated by the following equation:

$$\widehat{X}_i = \widehat{\gamma} Z_i \qquad (2)$$

where $\widehat{X}_i$ represents fathers' predicted economic outcome, and $\widehat{\gamma}$ is the corresponding coefficients of Z_i estimated in the first stage.

The second stage is to estimate the IGE for fathers and children using the primary samples. In other words, children's economic outcome is regressed on the imputed economic outcome of fathers. In summary, β_1 which is estimated by the TS2SLS estimator is the IGE of children's economic status with respect to their fathers' economic success in this study.

5.2 Transition Mobility Matrix Approach

The transition matrix approach is a complementary method to the least squares regression approach, and it is also useful to examine the pattern of intergenerational mobility. A transition matrix of mobility indicates the possibility that an adult son or daughter changes his or her position in the distribution of economic outcome, i.e., earnings or income, relative to the position of their parents. The distribution of earnings or income is often presented as quartiles or deciles. Such a transition matrix of mobility is shown in a contingency table.

In this study, the quartile matrices of mobility are used to express mobility patterns of earnings and income for both sons and daughters in Vietnam. To do this, a father's and a child's economic outcome are divided into four equal-sized groups and ranked orderly. The quartile 1 is indexed for the bottom quartile of those who are in the range from the 0^{th} to 25^{th} percentile while the quartile 4 is denoted for the top quartile of those who are in the range from the 75^{th} to 100^{th} percentile of the distribution of economic outcome.

There are two benchmark cases for mobility including "perfectly mobile" and "zero mobile." Perfect mobility is the case in which the father's economic success does not affect the child's economic outcome at all. In this case, therefore, there is a 25% possibility for a child to be in any quartile regardless of his or her father's position from the distribution of economic outcome. In contrast, there is no chance for a child to change the position given his or her father's position from the distribution of economic outcome in the benchmark of zero mobility. In this case, the transition matrix becomes an identity matrix

with all elements of 1 in the main diagonal and 0 elsewhere. Although it is rare to have such extreme cases in reality, these two cases can be used as two bounds in order to recognize the degree of mobility of earnings or income in an empirical study.

This approach is applied in many previous studies. For example, Dearden *et al.* (1997) find that the possibilities of upward or downward moving are low for children born to fathers in the top and bottom quartiles in the United Kingdom. There are about 12.8% and 11.8% of sons and daughters was born to fathers whose income in the bottom quartile move up to the top quartile from the income distribution. There are approximately 6.4% and 12.9% of sons and daughters born to fathers in the top quartile moving down to the bottom quartile from the income distribution. In addition, children born to fathers in the top quartile are likely to remain the same positions as their fathers. Specifically, 52.2% and 47.6% of sons and daughters born to fathers in the top quartile of the distribution of income remain the same positions as their fathers.

Chapter 6
Empirical Results

6.1 First-Stage Results

The secondary sample of potential fathers from VLSS 1997-98 that consists of 1041 male workers aged from 31 to 54 and is used to predict missing information on true fathers' individual earnings in the primary samples. Potential fathers' average age in this secondary sample is 39.97. The rationale for the choice of this age range is based on an age-range-to-minimize-lifecycle-bias suggestion from Haider and Solon (2006).

In the first stage, the log of potential fathers' individual earnings is regressed on age, age squared, and dummy variables for education, occupation, industry, and geographic region. The analysis focuses on the estimates for these socio-economic characteristics because these are parameters of interest in the first-stage model. The results from the preferred specification are presented in Table 2. The R^2 is 0.186, which suggests that nearly 20% of the variation in the log of individual earnings of potential fathers can be explained by these socio-economic characteristics in the model.

[Insert Table 2 here]

An observation of the estimate coefficients show that earnings differentials occur among categories within each group as well as across various groups of socio-economic characteristics for male workers in this secondary sample. For education, *tertiary* generates the highest returns of 56.7% which is higher than *non-diploma or primary* (the omitted variable) that produces the lowest returns. Meanwhile, for occupation, *lower highly skilled* yields the highest returns at 38.4% higher than *famers and farm workers* (the omitted variable) which produces the lowest returns. For industry, two categories *utilities* and *construction* yield the highest and the lowest returns with 19.7% higher and 28.6% lower than *mining* (the omitted variable), respectively. For the geographic location group, *RRD* and *MRD* have the highest and the lowest returns with 50% higher and 4.2% lower than *CH* (the omitted variable), respectively. These results are relatively appropriate for individual earnings differentials in the context of Vietnam.

In Table 2, it can be seen that education and geographic region have larger variations on male workers' individual earnings rather than occupation and industry. This can be explained by increases in earnings differentials along with increased returns to education (Imbert, 2013; Liu, 2006), and increased gaps of earnings among different geographic regions (van de Walle and Gunewardena, 2001; World Bank, 2014) in Vietnam over two last decades.

Note that, age and age-squared are included in independent variables in the first-stage model. However, estimated coefficients for age and age-squared variables are not used to generate missing values of the log of fathers' true personal earnings in primary samples because true fathers' individual earnings is imputed as permanent individual earnings rather than at a specific age during their working life.

Due to the lack of individual income data from VLSS of 1997-98, individual earnings is only a proxy for fathers' economic outcome. Therefore, the predicted economic status of fathers in the primary samples is only individual earnings. However, because there are three measures of children's economic outcomes including individual earnings, individual income, and family income in the primary samples, there are there types of IGE estimate in the second stage. These are the estimate of the elasticity between children's individual earnings and fathers' individual earnings, the estimate of the elasticity between children's individual income and fathers' individual earnings, and the estimate of the elasticity between children's family income and father's individual earnings. In all cases, the independent variables include age, age-squared, and the log of father's individual earnings imputed from the first stage.

6.2 Empirical Results for Sons

Baseline Intergenerational Elasticity for Sons

The baseline IGE estimates for sons are reported for three different cases of using sons' different economic outcomes as dependent variables and presented in Table 3. The sample size for these estimates is 1344 individuals.

[Insert Table 3 here]

In Table 3, it can be seen that the baseline IGE estimates are all statistically significant at the level of 1%. In Column 1 of Table 3, an IGE estimate of 0.361 is found for individual earnings. Meanwhile, an IGE estimate of 0.394 is found

for individual income as shown in Column 2. Moreover, when family income is used as a proxy for sons' economic outcome, the baseline estimate of IGE increases to 0.567 as shown in Column 3 of Table 3. These IGE degrees point out that a 10% difference in fathers' individual earnings likely lead to roughly 3.61%, 3.94% and 5.67% differences in sons' individual earnings, individual income and family income, respectively in Vietnam.

The result also indicates that the persistence of fathers' individual earnings on sons' family income tend to be considerably higher than those in cases of individual earnings and individual income. The baseline IGE estimate for family income is 57.06% and 43.91% higher than corresponding estimates for individual earnings and individual income, respectively.

Because a son's individual income is equal to his individual earnings plus other income, the marginal effect of his father's individual earnings on his individual income equals to the sum of the marginal effect of his father's individual earnings on his individual earnings and the marginal effect of his fathers' individual earnings on his other income. The marginal effect of a father's individual earnings on a son's individual earnings is the IGE estimate in Column 1. Furthermore, a father's individual earnings is positively correlated with his son's other income, or in other words, the marginal effect of a father's individual earnings on a son's other income is also positive. Therefore, the marginal effect of a father's individual earnings on a son's individual income as in Column 2 is larger than that of a father's individual earnings on a son's individual earnings. The result that the baseline IGE estimate for individual income is larger than the corresponding figure for individual earnings is reasonable.

In the same logic, the baseline IGE estimate is larger for family income than for individual income, and for individual earnings because family income equals the sum of all family members' individual income.

Compared to other countries, the baseline IGE estimates of Vietnamese sons are ranked as intermediate levels for individual earnings, and individual income. These intermediate IGE degrees are relatively similar to previous IGE estimates in some countries such as 0.42 in Spain (Cervini-Plá, 2014), 0.40 in South Korea (Kim, 2013), 0.35 in Japan (Lefranc *et al.*, 2014), and 0.40 in French (Lefranc and Trannoy, 2005).

Meanwhile, the baseline IGE estimate of Vietnamese sons' family income with respect to fathers' individual earnings is relatively high as shown in the international scale of IGE estimates. The mobile degree of family income across generations for Vietnamese sons is relatively low and can be equivalent to IGE in some countries such as South Africa with an estimate of 0.62 (Piraino, 2015), Brazil with an estimate of 0.60 (Ferreira and Veloso, 2006), urban China with an estimate of 0.63 (Gong *et al.*, 2012), Chile with an estimate of 0.57 (Núñez and Miranda, 2010), and Italy with an estimate of 0.50 (Mocetti, 2007; Piraino, 2007).

Of course, many other countries are more mobile relatively compared to Vietnamese society when IGE the estimates for sons are considered. For example, Björklund and Jäntti (1997) find an estimate of 0.28 for Sweden.

Transition Mobility Matrix for Sons

Next, I analyze the mobility patterns across generations from economic outcome distributions for sons. There are three cases of quartile transition matrix for

three measures of economic outcome. In all these cases, the proxy for fathers' economic outcome is personal earnings which is predicted in the first stage using fathers' education, occupation, industry, and geographic region.

Table 4 shows the father-to-son mobility between quartiles from the distribution of individual earnings in the labor market. Focusing on the diagonal terms, it can be observed that the proportions for the sons to maintain their positions from the distribution of individual earnings at the same ones as their fathers' are not considerably different for the top and bottom quartiles. For example, 39.76% of sons remain in the top quartile as their fathers. From the opposite side, 37.08% of sons have the same position as their fathers' in the bottom quartile. Further, the percentage of sons who remain in the second and third quartiles as their fathers are 26.91% and 28.14%, respectively. These results, therefore, indicate a nearly symmetric pattern of mobility between upward mobility from the bottom quartile and downward mobility from the top quartile. The results support the intermediate degree of mobility across generations for sons' individual earnings as shown in the baseline IGE result.

[Insert Table 4 here]

The patterns are the same for individual income and family income. The results are presented in Table A4 and Table A5 in *Appendices*.

6.3 Empirical Results for Daughters

Baseline Intergenerational Elasticity for Daughters

Similar to sons, there are three cases for estimating the baseline IGEs for daughters which correspond to three measures for daughters' economic outcomes, including individual earnings, individual income and family income. Note that for these three cases, the unique measure for father's economic outcome is personal earnings.

Table 5 shows the baseline IGE estimates for daughters with a sample of 632 individuals. As indicated in Column 1, a baseline IGE estimate of 0.284 is found for individual earnings. This IGE degree indicates that a 10% difference in fathers' individual earnings is likely to result in an approximately 2.84% difference in daughters' individual earnings in Vietnam.

[Insert Table 5 here]

When the dependent variable is daughters' individual income, the IGE estimate increases to 0.333 as shown in Column 2. Relatively, the baseline IGE estimate of individual income is 17.25% higher than that of individual earnings. This IGE degree implicates that a 10% difference in fathers' individual earnings is likely to result in an approximately 3.33% difference in daughters' individual income in Vietnam.

These IGE estimates for Vietnamese daughters' individual earnings and individual income explicitly indicate the average levels of intergenerational mobility compared to other countries. Such an average degree of intergenerational mobility in Vietnam is similar to an estimate of around 0.386 in Spain (Cervini-Plá, 2014), an estimate of nearby 0.35 in Japan (Lefranc *et al.*, 2014), or an estimate of 0.4 in South Korea (Ueda, 2013). Meanwhile, some

countries have lower IGE estimates for daughters than that of Vietnam. For example, Sweden has an estimated IGE of approximately 0.25 (Hirvonen, 2008).

Column 3 of Table 5 presents the baseline IGE estimate for daughters' family income with respect to fathers' individual earnings. Accordingly, the IGE estimate in this case is 0.522. This degree of intergenerational persistence shows that a 10% difference in fathers' individual earnings probably leads to an approximately 5.22% difference in daughters' family income in Vietnam. This result is suggestive of a meaningful persistence across generations for daughters' family income. Comparatively, a persistent level is significantly higher for family income than for individual earnings and individual income with increased proportions of 83.80% and 56.76%, respectively. This IGE estimate for daughters' family income in Vietnam is higher than an estimate of 0.429 in the United States (Chadwick and Solon, 2002).

Observing the baseline IGE estimates for both Vietnamese sons and daughters, it can be recognized that the patterns are same for intergenerational mobility of earnings and income both in personally and family. Particularly, the degree of persistence between children's family income and fathers' individual earnings is highest compared to that between children's individual income and fathers' individual earnings, and between children's individual earnings and fathers' individual earnings.

Importantly, among sons and daughters, daughters have smaller degrees of economic outcome persistence from fathers' background than sons for all three measures of economic outcome, although these gaps are small. Specifically, the baseline IGE estimates for sons and daughters are respectively 0.361 and 0.284 for individual earnings, 0.394 and 0.333 for individual income, and 0.567 and 0.522 for family income. The gaps between sons' and daughters' baseline IGE

estimates for three measures of children's economic outcome are 0.077, 0.061, and 0.045, respectively.

This finding is similar to estimates from previous studies. For example, Chadwick and Solon (2002) find IGE estimates of 0.535 and 0.429 for American sons and daughters. Nilsen *et al.* (2012) estimate IGE coefficients are between 0.16 and 0.34 for sons, and between 0.12 and 0.23 for daughter in Norway. On the contrary, in some other countries sons is more mobile than daughters. For example, Lefranc *et al.* (2014) find baseline IGE estimates for sons are close to 0.34 while corresponding figures for daughters are nearly 0.39 although the difference between these baseline estimates is small.

Transition Mobility Matrix for Daughters

Regarding the transition mobility matrix for daughters, Table 6 presents the changing mobility patterns of daughters' position on individual earnings compared to their fathers' economic status. In general, the transition matrix for individual earnings mobility for daughters is relatively symmetric and is relatively similar to that of sons. In addition to the IGE results, this result of the transition matrix also provides evidence on the finding of the modest difference of degree of mobility across generation between sons and daughters.

[Insert Table 6 here]

Approximately one third of daughters in the primary sample have the same top and bottom quartiles as their fathers. The corresponding figures are respectively

37.13% and 31.01%. Moreover, the proportion of daughters whose fathers are in the top quartile move downwardly to the bottom quartile is 20.25% and is larger than the 15.57% of daughters who move upwardly to the top quartile from their fathers' bottom quartile.

The results of the transition mobility for individual income and family income are the same as individual earnings. The results are presented in Table A6 and Table A7 in *Appendices*.

Chapter 7
Robustness Checks

Having presented the main IGE results of individual earnings, individual income and family income of sons and daughters with respect to their fathers' individual earnings in Chapter 6, I now analyze the robustness of these IGE estimates along three dimensions. Firstly, the sensitivity of the IGE estimates of full samples of sons and daughters to the various first-stage model specifications is examined. Secondly, the sensitivity of the IGE estimates to the different age ranges of children in primary samples is specifically checked. Thirdly, IGE estimates for different geographic regions are analyzed in order to reveal whether there are geographical effects on the IGE estimates in Vietnam.

7.1 Robustness Checks of IGE Estimates to Different First-Stage Model Specifications

As noted in the literature, the TS2SLS estimator may endogenously biased because the socio-economic characteristics employed to predict fathers' economic outcome may have a direct impact on children's economic outcome. Moreover, the magnitude of the bias depends on the set of socio-economic characteristics used to predict fathers' economic outcome. Therefore, it is necessary to investigate the sensitivity of the IGE estimates to the changing

different sets of predictors in order to shed light on whether the estimates are sensitive to the different model specifications in the first stage.

In particular, the IGE coefficients are estimated from fifteen different combinations of socio-economic characteristics as predictors. Changing the set of fathers' own earnings predictors shows how estimated IGEs vary. Full samples of sons or daughters are used to estimate IGEs of their individual earnings, personal income, and family income with respect to their fathers' own earnings in fifteen cases as mentioned above. For both sons and daughters, IGE estimates from different models are compared to the baseline IGE estimates.

Analysis for Sons

The full sample which consists of 1344 sons aged from 25 to 54 is used to estimate the IGEs. Table 7 presents results for fifteen cases in which different sets of fathers' individual earnings predictors are used in the first stage. The results are shown in three columns 1, 2, and 3 corresponding to three measures of sons' economic outcomes including individual earnings, individual income, and family income.

[Insert Table 7 here]

Firstly, Column 1 reports the results of robustness checks for the IGE estimates of sons' individual earnings with respect to their fathers' individual earnings. The estimated coefficients of IGE are all statistically significant at 1%.

The IGE estimates for different sets of fathers' economic outcome predictors vary around the baseline IGE estimate of 0.361 in case 15 *(education, occupation, industry, and geographic region)*. In particular, the IGE estimates are between 0.264 in case 8 *(occupation and industry)* and 0.396 in case 9 *(occupation and geographic region)*. The absolute difference between these two extreme IGE estimates is roughly 0.132. Compared to the baseline estimate, the IGE estimates are smaller with a maximum proportion of 26.87% or higher with a maximum proportion of 9.70%.

When using an individual predictor in the first stage model, the results from case 1 to case 4 in Column 1 of Table 7 indicate that the estimator with *education* (case 1) generates the largest IGE with an estimate of 0.371 while that with *industry* (case 3) produces the smallest IGE with an estimate of 0.274. The gap between the two estimates is 0.097.

Secondly, the robustness check of IGE estimates to different specifications of the first-stage model for sons' individual income is shown in Column 2 of Table 7. Coefficients of the IGE estimates in all cases are statistically significant at 1%. The results indicate that when changing the sets of socio-economic characteristics for predicting fathers' individual earnings, the IGE estimates alter around the baseline value of 0.394 in case 15 *(education, occupation, industry, and geographic region)*. Specifically, the minimum IGE estimate is 0.315 in case 4 *(geographic region)* which is equivalently 20.05% lower than the baseline estimate. Meanwhile, the maximum IGE estimate is 0.430 in case 9 *(occupation and region)* and is 9.14% higher than the baseline estimate. The gap between these two estimates is about 0.115.

When using an individual predictor in the first stage model, from case 1 to case 4 it can be seen that the estimator with *education* (case 1) produces the largest

IGE with an estimate of 0.400 while that with *geographic region* (case 4) creates the smallest IGE estimate with a degree of 0.315. However, the gap between these two extreme IGE estimates is relatively small with a value of 0.085.

Finally, Column 3 of Table 7 shows the robustness check of the IGE estimates when sons' family income is used as the dependent variable. Accordingly, degrees of IGEs estimated from other cases with different sets of fathers' individual earnings predictors substantially vary around a baseline IGE estimate of 0.567 in case 15 *(education, occupation, industry, and geographic region)*. Specifically, the smallest estimate is 0.265 in case 4 *(geographic region)* while the largest estimate with a degree of 0.812 in case 2 *(occupation)*. The gap between these extreme IGE estimates with of 0.547 is considerably substantial compared to the corresponding figures of 0.132 and 0.115 when individual earnings and individual income are used as the proxy of sons' economic outcome, respectively. In other words, the mobility of sons' family income with respect to their fathers' individual earnings broadly ranges from the least mobile to the most mobile levels. The choice of a set of socio-economic characteristics to predict fathers' personal earnings, therefore, has a considerable impact on the IGE estimates of family income.

In addition, for using an individual predictor for fathers' individual earnings in the first stage, the estimator with *occupation* (case 2) generates the largest IGE estimate with a degree of 0.812. Meanwhile, the estimator with *geographic region* (case 4) results in the smallest IGE with an estimate of 0.265. This result is contrary to *education* (case 1) for the largest IGE estimate in Column 1 and Column 2, and *industry* (case 3) for the smallest IGE estimate in Column 1.

Analysis for Daughters

For daughters, the full sample comprises 632 individuals aged from 25 to 47. In the same manner as for sons, the robustness check for IGE estimates to the first-stage model specifications are implemented for three measures of daughters' economic outcome including individual earnings, individual income, and family income. There are also fifteen different sets of fathers' individual earnings predictors. The results are presented in Table 8.

Firstly, Column 1 of Table 8 shows IGE estimates when the proxy for daughters' economic outcome is individual earnings. All estimated coefficients are statistically significant at 1%. The results show that the IGE estimates in other cases vary around the baseline IGE estimate of 0.284 in case 15 *(education, occupation, industry, and geographic region)*. Specifically, estimates alter from 0.237 in case 1 *(education)* to 0.406 in case 9 *(occupation, and geographic region)*.

Compared to the baseline estimate, the IGE estimates can be smaller with a maximum proportion of 16.55%, or higher with a maximum proportion of 42.96%. The absolute difference between the highest and lowest estimates is 0.169. In comparison to sons, although the IGE estimates for daughters are generally smaller, the range in which the IGE estimates change is larger in the case of daughters with 0.169 compared to 0.132 for sons.

[Insert Table 8 here]

When using the individual socio-economic characteristics in the first stage model, the results from case 1 to case 4 indicate that the estimator with

occupation (case 2) produces the largest IGE estimate with a degree of 0.375 while that with *education* (case 1) yields the smallest IGE with a degree of 0.237. The result is different to sons' case 1 which shows that *education* produces the largest IGE.

Secondly, the robustness check for daughters' IGE estimates to the different first-stage model specifications for individual income is provided in Column 2 of Table 8. Accordingly, all IGE estimates in this column are statistically significant at 1%.

When various specifications of the model in the first stage are used, the IGE estimates in the second stage fluctuate around the baseline estimate of 0.333 in case 15 *(education, occupation, industry, and geographic region)*. In particular, the IGE estimates vary from the minimum one of 0.273 in case 1 *(education)* to the maximum estimate of 0.477 in case 9 *(occupation, and geographic region)*. Hence, these IGE estimates are higher or smaller than the baseline one with a maximum proportion of 43.24% or 18.02%, respectively. The absolute gap between these upper- and lower- bounds is 0.204. This gap is larger than that for individual earnings with a difference of 0.169. Also, it is larger than the corresponding figure for sons with a gap of 0.115.

In terms of using individual predictor, on the IGE estimate in Column 2 of Table 8, the estimator with *occupation* (case 2) produces the largest IGE with a degree of 0.433 while the estimator with *education* (case 1) yields the smallest IGE estimate of 0.273. This reveals an opposing result for sons' individual income where the estimator with *education* (case 1) produces the largest IGE and the estimate with *geographic region* (case 4) is the smallest one.

Finally, the robustness check for IGE estimates of daughters' family income with respect to their fathers' individual earnings are given in Column 3 of Table 8. Accordingly, all IGE estimates are statistically significant at 1%. The baseline estimate in this Column is 0.522 in case 15 *(education, occupation, industry, and geographic region)*. Compared to the baseline estimate, IGE estimates for other cases in general vary around it. Specifically, IGE estimates are between 0.370 in case 4 *(geographic region)* to 0.784 in case 2 *(occupation)*. The difference between these extreme estimates is 0.414. Therefore, the IGE estimates are maximum 50.19% higher and 28.12% lower than the baseline estimate.

For using the sole predictor of fathers' individual earnings in the first stage, it can be seen that the estimator with *occupation* (case 2) produces the largest IGE whereas that with *geographic region* (case 4) yields the smallest IGE.

7.2 Robustness Checks of IGE Estimates to Different Age Ranges

From the existing literature, changes in children's age ranges in the primary sample may lead to the variation of the IGE estimates (Grawe, 2006; Haider and Solon, 2006). In this section, the sensitivity of the IGE estimates to different sub-samples of various age intervals is analyzed for both sons and daughters. Also, the results are compared to the baseline IGE estimates in Chapter 6.

Analysis for Sons

Table 9 presents the IGE estimates for sons in various sub-samples of different age ranges. The IGE estimates are reported for three measures of sons'

economic outcome including individual earnings in Column 1, individual income in Column 2, and family income in Column 3. There are three age intervals considered including 25-29 in Panel A, 30-34 in Panel B, and 35-54 in Panel C of Table 9. The IGE coefficients are all statistically significant at 1%.

[Insert Table 9 here]

The results explicitly indicate that there are considerable variations of IGE estimates across sub-samples with different age intervals of sons. In Column 1 of Table 9, when sons' economic outcome is individual earnings, the IGE estimates span from 0.337 in a youngest son sample (25-29) in Panel A to 0.476 in an oldest son sample (35-54) in Panel C. The difference of these samples is 0.139. In Column 2 of Table 9, a similar pattern is shown with a range of the IGE estimates between 0.358 in a sample of sons aged 25-29 and 0.491 in a 35-54 aged sample. The gap between the two extreme estimates is 0.133.

The IGE estimates are generally larger in son samples with older age intervals than in samples with younger sons for individual earnings in Column 1, and individual income in Column 2. However, the IGE estimates in Column 3 of Table 9 show an opposite pattern for family income. Particularly, for family income the largest IGE estimate is in a sample of sons aged 30-34 with a coefficient of 0.689 (Panel B) while the smallest estimate is from a sample of sons aged 35-54 with a degree of 0.514 (Panel C). The gap between these estimates is about 0.175. Therefore, for family income the oldest sample become to be most mobile which is contrast to the youngest samples for individual earnings, and individual income as shown in Columns 1 and 2.

In addition, using a rule of age selection from Haider and Solon (2006), a sample of 450 sons aged from 30 to 50 is formed to achieve IGE estimates with the minimized lifecycle bias. The IGE estimates from this sample are given in Panel D. In particular, IGE estimates for individual earnings, individual income, and family income are 0.412, 0.468, and 0.669, respectively. All these estimates are statistically significant at 1%. These estimates are 14.13%, 18.78%, and 17.99% higher than baseline IGE estimates in the full sample of sons aged 25-54 as shown in Chapter 6, respectively for individual earnings, individual income, and family income. Therefore, a sample of sons aged around 40 is less mobile in individual earnings, individual income, and family income than the full sample of sons aged from 25 to 54.

Analysis for Daughters

Table 10 reports the IGE estimates when different sub-samples of different age ranges for daughters are used. The IGE coefficients are all statistically significant at 1%. There are two main age intervals of daughters including 25-29 presented in Panel A, and 30-47 presented in Panel B. These are used to achieve the IGE estimates for individual earnings, individual income, and family income.

[Insert Table 10 here]

Generally, changes in the IGE estimates of the different age intervals for daughters are similar to the results for sons. As is evident in the samples of ages from 25-29 to 30-44, the IGE estimates increase from 0.240 to 0.437, from 0.290

to 0.482, and from 0.455 to 0.715 for individual earnings, individual income, and family income, respectively. Between the two above sub-samples, there are substantial differences in the IGE estimates. Specifically, the increased percentages of the IGE estimates in the sample of daughters aged 30-34 compared to those in sample of daughters aged 25-29 are 82.08%, 66.21%, and 57.14% for individual earnings, individual income, and family income.

When applying Haider and Solon's (2006) rule of age selection, a sample is limited to 182 daughters aged from 30 to 50. The IGE estimates are 0.403, 0.447, and 0.688 for individual earnings, individual income, and family income as shown in Panel C. In comparison with the baseline results as reported in Chapter 6, these lifecycle-minimized IGE estimates are considerably higher. In particular, the IGE estimates for three measures of economic outcome increase from 0.284, 0.333, and 0.522 to 0.403, 0.447, and 0.688, with equivalently increased proportions of 41.90%, 43.23%, and 31.80%, respectively.

7.3 Robustness Checks of IGE Estimates to Different Geographic Regions

In investigating the persistence of parental economic outcome on offspring's economic success, the geography is an important matter. Chetty *et al.* (2014a) show that the degree of mobility of income is not unique, and it can substantially vary across geographic areas within a country. In this study, the IGE coefficients for specific geographic regions within Vietnam are also estimated to reveal whether there are spatial effects on IGE estimates in Vietnam. In particular, IGEs are estimated for five main regions, including *Red River Delta (RRD)*, *Northern Midland and Mountain Areas (NMMA)*, *North*

Central and Central Coastal Areas, and Central Highlands (NCCCACH), *South East (SE)*, and *Mekong River Delta (MRD)*.

Analysis for Sons

Table 11 documents IGE estimates for individual earnings in Column 1, individual income in Column 2, and family income in Column 3 in different regions in Vietnam. Almost IGE coefficients are statistically significant at 1%. Exceptionally, IGE coefficients for individual earnings, and individual income in *MRD* (Panel E) are statistically significant at 10% and 5%, respectively.

[Insert Table 11 here]

There are significant variations of IGE estimates across different spatial regions for all three measures of sons' economic outcome. Firstly, for individual earnings as shown in Column 1, the IGE estimates span from 0.263 for *MRD* to 0.553 for *SE*. The gap between these two extreme estimates is 0.290. Secondly, for individual income as presented in Column 2, the IGE estimates are between 0.292 for *MRD* and 0.645 for *SE*. The absolute difference between these extreme estimates is about 0.353. Thirdly, for family income as presented in Column 3, the IGE estimates range from 0.519 for *MRD* to 0.868 for *RRD*. The absolute gap between two extreme estimates is 0.349.

The results therefore indicate that there are apparent effects of the geography on the IGE estimates in Vietnam. In particular, for individual earnings and individual income, *MRD* is the most mobile region whereas *SE* occupies the

most immobile location in Vietnam. For family income, *MRD* still remains the highest position for mobility while *RRD* is the most immobile location in Vietnam.

Analysis for Daughters

Tables 12 shows IGE estimates for daughters in different regions for individual earnings in Column 1, individual income in Column 2, and family income in Column 3. As in the sons' case, daughters' IGE estimates apparently vary among geographic regions within each measure of economic outcome.

Firstly, for individual earnings as shown in Column 1, the IGE estimates are between 0.131 for *MRD* and 0.368 for *SE*. The gap between these extreme estimates is 0.237. However, it is important to note that IGE estimates for *RRD* and *SE* are only statistically significant at 10% and 5%, respectively. Other estimates for *NMMA*, *NCCCACH*, and *MRD* are not statistically significant at 10%.

[Insert Table 11 here]

Secondly, for individual income as presented in Column 2, the IGE estimates alter from 0.132 for *MRD* to 0.405 for *SE*. The difference between these estimates is 0.273. Among IGE estimates, coefficients for *NCCCACH*, *SE*, and *RRD* are statistically significant at 10%, 5%, and 1%, respectively. Other estimates for *NMMA*, and *MRD* are not statistically significant at 10%.

Finally, for family income as presented in Column 3 of Table 12, there are sizeable differentials in IGE estimates among geographic regions. Particularly, the smallest estimate is 0.290 in *NMMA* whereas the largest estimate is 0.852 in *NCCCACH*. The absolute gap of these estimates is largely with a degree of 0.562. However, among IGE estimates, the coefficients for *RRD*, *NCCCACH*, and *SE* are statistically significant at 1% while coefficients for *NMMA*, and *MRD* are not statistically significant at 10%.

Chapter 8
Conclusion

In this paper, I empirically investigate the extent of intergenerational mobility of economic outcome for sons and daughters using Vietnamese data from VLSS of 1997-1998 and VHLSS of 2012. I employ the TS2SLS estimator to estimate the persistence of fathers' individual earnings on their offspring's individual earnings, individual income, and family income.

My baseline IGE results explicitly reveal that Vietnam has the intermediate degrees of individual earnings and individual income mobility cross generations for both sons and daughters by the conventional international scale of intergenerational mobility as shown in Black and Devereux (2011), and Blanden (2013). Comparatively, these results show that Vietnam has the same mobile position as Japan (Lefranc *et al.*, 2014), Taiwan (Kan *et al.*, 2015), and South Korea (Kim, 2013) in Asia.

Meanwhile, my baseline IGE estimate for both sons' and daughters' family income with respect to their fathers' individual earnings indicate the low degree of mobility in Vietnam. This result is the same as that of other developing countries such as Brazil (Dunn, 2007), or South Africa (Hertz, 2001; Piraino, 2015).

Yet, it is necessary to be very careful in interpreting IGE results in this study because of its limitations, particularly about data issue. One of the

shortcomings of data in this study is the use of small samples at one point in time. Hence, the IGE estimates do not demonstrate the long-run trends of intergenerational mobility in Vietnam. Understanding the long-run trends of intergenerational mobility can potentially result in an in-depth comprehension of the fundamental mechanisms of the transmission of economic outcome from generation to generation (Aaronson and Mazumder, 2008; Lee and Solon, 2006). Moreover, small samples potentially provide less reliable estimates, especially for estimating IGEs in specific regions or age groups.

In addition, the samples in this study include children and fathers who live together within families. Consequentially, downwardly bias estimated results of IGE potentially suffer from this shortcoming of data. Furthermore, Haider and Solon (2006) show that IGE estimates tend to be upwardly biased or downwardly biased if offspring outcome is measured at young or old ages. The bias is minimized at children's age of around 40. The samples of sons and daughters in this study have larger proportions of young rather than older individuals. This characteristic therefore is likely to produce a downward bias on the IGE estimates.

The potential downward bias possibly explains why the IGE estimates for Vietnam in this study are smaller than the predictions for other countries which have the same context of development with Vietnam such as China.

Regardless of possible problems as mentioned above, especially the size of potential bias, the findings from this study provide significant and informative contributions to the existing literature on this line of research. Generally speaking, the IGE results provide helpful explanations for intergenerational mobility in Vietnam. From the literature of international mobility of socio-economic status includes some studies in Vietnam. For example, Hertz *et al.*

(2007) find an estimate of 0.58 for the correlation of education between parents and children in Vietnam. In addition, in Emran and Shilpi (2011) the transmission of occupational status across generations in Vietnam is also investigated. In these studies, the proxies for socio-economic status focus on the social aspects of intergenerational mobility such as education or occupation rather than economic dimensions. In a different manner, the current study is the first that employs key economic outcomes including earnings and income as the socio-economic status of fathers and children in Vietnam. Therefore, the IGE estimates in this study significantly provide important contributions to existing literature on intergenerational mobility in Vietnam as well as developing countries.

When the TS2SLS is applied to estimate IGEs, the choice of predictors to predict fathers' economic outcome in the first stage can affect the degree of IGE estimate. In this paper I find that for both individual earnings, and individual income, the different choices of socio-economic characteristics for predicting fathers' individual earnings provide various IGE estimates that in general alter around baseline ones. This finding is consistent with results from previous studies, for example Cervini-Plá (2014) for Spain, Kim (2013) in South Korea, Lefranc *et al.* (2014) for Japan, and Piraino (2015) for South Africa.

In addition, in this study I find that there are variations of the IGE estimates across sub-samples of children with different age ranges. Specifically, individuals from older groups tend in general to have larger IGEs than younger groups. These empirical findings in Vietnam again consolidate the conventional pattern of age effects on IGE estimates in the existing literature.

Similarly I also uncover explicitly spatial effects on the IGE estimates among different geographic regions within Vietnam. In particular, relative

intergenerational mobility is lowest for both sons and daughters as adults in the South East and highest for those in Mekong River Delta of Vietnam. Moreover, the estimates for separate regions are found to be different from the full samples. These finding of the clear effects of the geography on the IGE estimates is consistent with the results from Chetty *et al.* (2014a, 2014b), or Chetty and Hendren (2014) for the United States.

In Vietnam, along with positive achievements of economic growth for a typical transition economy, the rise of inequality is viewed as a massive problem facing this emerging economy. The literature on inequality in Vietnam has been abundantly conducted over the last decades. However, almost all previous studies on inequality are conducted within a generation. Measures of inequality from cross-sectional data traditionally give "snap-shots" at a moment in the timeline, and thus do not provide information on the transmission of inequality overtime. Instead, measures of intergenerational elasticity of economic outcomes provide a "dynamic picture" of inequality from one generation to the next which is investigated in this thesis.

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TABLES

Table 1: Descriptive statistics of samples

Variables	Secondary sample (VLSS 1997-98)		Primary sample of son-father pairs (VHLSS 2012)				Primary sample of daughter-father pairs (VHLSS 2012)			
	Potential fathers [a]		Fathers		Sons [b]		Fathers		Daughters [c]	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age (years)	39.969	5.903	57.590	7.294	29.059	4.037	57.596	6.810	28.463	3.517
Education										
(1) non-diploma or primary (= 1 if yes, = 0 if no)	0.134	0.339	0.401	0.497	0.204	0.424	0.338	0.493	0.165	0.371
(2) secondary (= 1 if yes, = 0 if no)	0.337	0.473	0.324	0.467	0.202	0.407	0.293	0.455	0.161	0.368
(3) vocational (= 1 if yes, = 0 if no)	0.136	0.343	0.056	0.219	0.064	0.245	0.076	0.265	0.040	0.195
(4) high school (= 1 if yes, = 0 if no)	0.258	0.438	0.148	0.366	0.330	0.476	0.203	0.402	0.332	0.479
(5) tertiary (= 1 if yes, = 0 if no)	0.135	0.342	0.071	0.260	0.200	0.408	0.090	0.287	0.302	0.467
Occupation										
(1) very highly skilled (= 1 if yes, = 0 if no)	0.136	0.342	0.074	0.260	0.155	0.362	0.085	0.280	0.220	0.415

(2) lower highly skilled (= 1 if yes, = 0 if no)	0.093	0.291	0.032	0.172	0.089	0.284	0.041	0.179	0.188	0.391
(3) typical non-manual (= 1 if yes, = 0 if no)	0.205	0.404	0.137	0.344	0.119	0.324	0.165	0.371	0.177	0.382
(4) lower-grade (= 1 if yes, = 0 if no)	0.096	0.295	0.042	0.198	0.148	0.355	0.049	0.216	0.138	0.345
(5) skilled manual (= 1 if yes, = 0 if no)	0.207	0.406	0.158	0.364	0.009	0.094	0.157	0.364	0.005	0.069
(6) semi- and un-skilled manual (= 1 if yes, = 0 if no)	0.170	0.376	0.114	0.315	0.271	0.445	0.095	0.293	0.155	0.362
(7) farmers and farm workers (= 1 if yes, = 0 if no)	0.093	0.291	0.443	0.497	0.209	0.407	0.408	0.492	0.117	0.322
Industry										
(1) agriculture (= 1 if yes, = 0 if no)	0.115	0.320	0.539	0.499	0.097	0.296	0.509	0.500	0.086	0.195
(2) manufacturing (= 1 if yes, = 0 if no)	0.167	0.373	0.099	0.299	0.205	0.404	0.092	0.289	0.391	0.488
(3) public management (= 1 if yes, = 0 if no)	0.168	0.374	0.065	0.247	0.092	0.290	0.090	0.287	0.079	0.270
(4) health and education (= 1 if yes, = 0 if no)	0.206	0.404	0.026	0.159	0.068	0.251	0.032	0.175	0.226	0.419
(5) trade and finance (= 1	0.101	0.301	0.074	0.261	0.098	0.298	0.085	0.280	0.104	0.306

if yes, = 0 if no)										
(6) utilities (= 1 if yes, = 0 if no)	0.012	0.111	0.020	0.054	0.034	0.102	0.012	0.040	0.008	0.089
(7) transportation and communication (= 1 if yes, = 0 if no)	0.055	0.228	0.045	0.207	0.089	0.285	0.052	0.223	0.025	0.157
(8) construction (= 1 if yes, = 0 if no)	0.106	0.308	0.084	0.278	0.230	0.421	0.070	0.255	0.032	0.175
(9) mining (= 1 if yes, = 0 if no)	0.012	0.111	0.019	0.112	0.039	0.153	0.028	0.097	0.009	0.097
(10) community, and social services (= 1 if yes, = 0 if no)	0.058	0.233	0.029	0.168	0.048	0.178	0.030	0.171	0.040	0.195
Geographic Region										
(1) Red River Delta (RRD) (= 1 if yes, = 0 if no)	0.267	0.443	0.236	0.425	0.236	0.425	0.218	0.413	0.218	0.413
(2) Northern Midland and Mountain Areas (NMMA) (= 1 if yes, = 0 if no)	0.068	0.252	0.139	0.346	0.139	0.346	0.104	0.306	0.104	0.306
(3) North Central and Central Coastal Areas (NCCCA) (= 1 if yes, = 0 if no)	0.259	0.438	0.252	0.434	0.252	0.434	0.241	0.428	0.241	0.428
(4) Central Highlands (CH)	0.017	0.130	0.028	0.164	0.028	0.164	0.023	0.147	0.023	0.147

(= 1 if yes, = 0 if no)										
(5) South East (SE) (= 1 if yes, = 0 if no)	0.223	0.416	0.112	0.316	0.112	0.316	0.147	0.355	0.147	0.355
(6) Mekong River Delta (MRD) (= 1 if yes, = 0 if no)	0.166	0.373	0.233	0.423	0.233	0.423	0.267	0.443	0.267	0.443
Log of monthly individual earnings (VND 1000)	5.636	0.885	5.042	0.420	7.839	0.604	5.066	0.434	7.711	0.628
Log of monthly individual income (VND 1000)					7.930	0.632			7.822	0.656
Observations	1041			1344				632		

[a] Potential fathers aged from 31 to 54

[b] Sons in father-son sample aged from 25 to 54

[c] Daughters in father-daughter sample aged from 25 to 47.

Table 2: The preferred first-stage regressions. Dependent variable: Individual earnings (monthly, VND 1,000, in log)

Preferred variable	Coefficient
Education	
(2) secondary	0.274**
	(0.118)
(3) vocational	0.304**
	(0.125)
(4) high school	0.445***
	(0.113)
(5) tertiary	0.567***
	(0.117)
Occupation	
(1) very highly skilled	0.251
	(0.193)
(2) lower highly skilled	0.384**
	(0.182)
(3) typical non-manual	0.223
	(0.192)
(4) lower-grade	0.292
	(0.212)
(5) skilled manual	0.123
	(0.205)
(6) semi- and un-skilled manual	0.060
	(0.179)
Industry	
(1) agriculture	– 0.074
	(0.266)
(2) manufacturing	0.109
	(0.225)
(3) public management	– 0.180
	(0.254)
(4) health and education	0.138
	(0.255)
(5) trade, and finance	0.084
	(0.259)
(6) utilities	0.197
	(0.305)
(7) transportation and communication	0.192
	(0.269)

(8) construction	– 0.286
	(0.271)
(10) community and social services	– 0.274
	(0.272)
Geographic Region	
(1) Red River Delta (RRD)	0.500**
	(0.207)
(2) Northern Midland and Mountain Areas (NMMA)	0.484**
	(0.220)
(3) North Central and Central Coastal Areas (NCCCA)	0.309
	(0.212)
(5) South East (SE)	0.288
	(0.240)
(6) Mekong River Delta (MRD)	– 0.042
	(0.225)
R^2	0.186
Observations	1041

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Omitted variables: *(1) non-diploma or primary* in the education group; *(7) farmers, and farm workers* in the occupation group; *(9) mining* in the industry group; and *(4) Central Highlands (CH)* in the geographic region group.

Table 3: The baseline IGE estimates for sons (full sample)

	Dependent variable (monthly, VND 1000, in log): Sons'		
	individual earnings	individual income	family income
	(1)	(2)	(3)
β_1	0.361***	0.394***	0.567***
	(0.038)	(0.041)	(0.049)
R^2	0.075	0.081	0.093
Observations	1344	1344	1344

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Bootstrapping standard errors (with 1000 replications) are in parentheses. Father's individual earnings is predicted by *education, occupation, industry,* and *geographic region.*

Table 4: The transition matrix – The probability of sons' individual earnings quartile given fathers' individual earnings quartile

Fathers' individual earnings quartile (%)*	Sons' individual earnings quartile (%)			
	Bottom	Second	Third	Top
Bottom	37.08	26.12	20.51	16.29
Second	26.61	26.91	26.61	19.88
Third	21.86	26.05	28.14	23.95
Top	13.76	20.49	25.99	39.76

* Father's individual earnings is predicted based on the set of socioeconomic characteristics including *education, occupation, industry,* and *geographic region.*

Table 5: The baseline IGE estimates for daughters (full sample)

	Dependent variable (monthly, VND 1000, in log): Daughters'		
	individual earnings	individual income	family income
	(1)	(2)	(3)
β_1	0.284***	0.333***	0.522***
	(0.058)	(0.060)	(0.071)
R^2	0.061	0.068	0.088
Observations	632	632	632

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Bootstrapping standard errors (with 1000 replications) are in parentheses. Father's individual earnings is predicted by *education, occupation, industry,* and *geographic region.*

Table 6: The transition matrix – The probability of daughter's individual earnings quartile given father's individual earnings quartile

Father's individual earnings quartile (%)*	Daughter's individual earnings quartile (%)			
	Bottom	Second	Third	Top
Bottom	37.13	27.54	19.76	15.57
Second	26.00	26.00	28.00	20.00
Third	20.38	30.57	23.57	25.48
Top	20.25	27.85	20.89	31.01

* Father's individual earnings is predicted based on the set of socioeconomic characteristics including *education, occupation, industry,* and *geographic region.*

Table 7: Robustness checks for sons to different first-stage model specifications

The set of fathers' earnings predictors in the first stage	Dependent variable (monthly, VND 1000, in log): Sons'					
	individual earnings		individual income		family income	
	(1)		(2)		(3)	
	β_1	R^2	β_1	R^2	β_1	R^2
(1) education	0.371***	0.064	0.400***	0.067	0.631***	0.091
	(0.045)		(0.047)		(0.058)	
(2) occupation	0.304***	0.034	0.356***	0.040	0.812***	0.092
	(0.058)		(0.061)		(0.074)	
(3) industry	0.274***	0.024	0.340***	0.029	0.603***	0.038
	(0.074)		(0.078)		(0.097)	
(4) geographic region	0.324***	0.030	0.315***	0.028	0.265***	0.013
	(0.066)		(0.070)		(0.088)	
(5) education and occupation	0.384***	0.068	0.421***	0.074	0.738***	0.122
	(0.044)		(0.047)		(0.056)	
(6) education and industry	0.346***	0.062	0.385***	0.069	0.583***	0.086
	(0.043)		(0.046)		(0.056)	
(7) education and geographic region	0.346***	0.071	0.364***	0.072	0.522***	0.081
	(0.039)		(0.041)		(0.050)	
(8) occupation and industry	0.264***	0.030	0.319***	0.037	0.632***	0.064
	(0.056)		(0.060)		(0.075)	
(9) occupation and geographic region	0.396***	0.061	0.430***	0.066	0.708***	0.094
	(0.050)		(0.053)		(0.060)	

(10) industry and geographic region	0.334***	0.045	0.364***	0.048	0.455***	0.040
	(0.050)		(0.054)		(0.065)	
(11) education, occupation and	0.349***	0.063	0.391***	0.071	0.628***	0.098
industry	(0.043)		(0.046)		(0.056)	
(12) education, occupation and	0.385***	0.080	0.412***	0.084	0.641***	0.112
geographic region	(0.040)		(0.042)		(0.050)	
(13) education, industry and	0.343***	0.071	0.372***	0.075	0.508***	0.078
geographic region	(0.038)		(0.040)		(0.049)	
(14) occupation, industry and	0.366***	0.057	0.406***	0.063	0.601***	0.074
geographic region	(0.047)		(0.051)		(0.059)	
(15) education, occupation, industry	0.361***	0.075	0.394***	0.081	0.567***	0.093
and geographic region	(0.038)		(0.041)		(0.049)	

Notes. * significant at 10%, ** significant at 5%, *** significant at 1%. Bootstrapping standard errors (with 1000 replications) are in parentheses. Sample size is 1344 observations.

Table 8: Robustness checks for daughters to different first-stage specifications

The set of fathers' earnings predictors in the first stage	Dependent variable (monthly, VND 1000, in log): Daughters'					
	individual earnings		individual income		family income	
	(1)		(2)		(3)	
	β_1	R^2	β_1	R^2	β_1	R^2
(1) education	0.237***	0.044	0.273***	0.046	0.500***	0.067
	(0.065)		(0.068)		(0.077)	
(2) occupation	0.375***	0.054	0.433***	0.058	0.784***	0.094
	(0.075)		(0.080)		(0.097)	
(3) industry	0.315***	0.038	0.387***	0.040	0.595***	0.038
	(0.095)		(0.099)		(0.123)	
(4) geographic region	0.311***	0.038	0.367***	0.039	0.370***	0.017
	(0.100)		(0.105)		(0.124)	
(5) education and occupation	0.303***	0.057	0.348***	0.061	0.631***	0.102
	(0.068)		(0.070)		(0.077)	
(6) education and industry	0.248***	0.048	0.292***	0.051	0.496***	0.069
	(0.066)		(0.068)		(0.076)	
(7) education and geographic region	0.265***	0.056	0.305***	0.061	0.469***	0.073
	(0.056)		(0.058)		(0.070)	
(8) occupation and industry	0.286***	0.042	0.339***	0.045	0.632***	0.066
	(0.075)		(0.079)		(0.098)	
(9) occupation and geographic region	0.406***	0.075	0.477***	0.086	0.692***	0.104
	(0.068)		(0.071)		(0.086)	

(10) industry and geographic region	0.306***	0.050	0.370***	0.056	0.484***	0.048
	(0.074)		(0.078)		(0.090)	
(11) education, occupation and	0.262***	0.050	0.307***	0.054	0.554***	0.083
industry	(0.068)		(0.070)		(0.076)	
(12) education, occupation and	0.330***	0.072	0.382***	0.081	0.589***	0.108
geographic region	(0.058)		(0.060)		(0.071)	
(13) education, industry and	0.263***	0.057	0.308***	0.063	0.463***	0.072
geographic region	(0.057)		(0.059)		(0.069)	
(14) occupation, industry and	0.330***	0.059	0.393***	0.067	0.593***	0.081
geographic region	(0.068)		(0.071)		(0.084)	
(15) education, occupation, industry	0.284***	0.061	0.333***	0.068	0.522***	0.088
and geographic region	(0.058)		(0.060)		(0.071)	

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Bootstrapping standard errors (with 1000 replications) are in parentheses. Sample size is 632 observations.

Table 9: The IGE estimates by different age ranges for sons

	Dependent variable (monthly, VND 1000, in log): Sons'		
	individual earnings	individual income	family income
	(1)	(2)	(3)
	Panel A. Sons aged 25-29		
β_1	0.337***	0.358***	0.520***
	(0.045)	(0.049)	(0.061)
R^2	0.066	0.066	0.083
Observations	892	892	892
	Panel B. Sons aged 30-34		
β_1	0.386***	0.456***	0.689***
	(0.072)	(0.071)	(0.088)
R^2	0.100	0.134	0.147
Observations	317	317	317
	Panel C. Sons aged 35-54		
β_1	0.476***	0.491***	0.514***
	(0.152)	(0.168)	(0.201)
R^2	0.099	0.098	0.068
Observations	135	135	135
	Panel D. Sons aged 30-50		
β_1	0.412***	0.468***	0.669***
	(0.067)	(0.068)	(0.083)
R^2	0.089	0.106	0.125
Observations	450	450	450

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Bootstrapping standard errors (with 1000 replications) are in parentheses. Father's individual earnings is predicted by *education*, *occupation*, *industry*, and *geographic region*.

Table 10: The IGE estimates by different age ranges for daughters

	Dependent variable (monthly, VND 1000, in log): Daughters'		
	individual earnings	individual income	family income
	(1)	(2)	(3)
	Panel A. Daughters aged 25-29		
β_1	0.240***	0.290***	0.455***
	(0.068)	(0.071)	(0.078)
R^2	0.044	0.054	0.087
Observations	450	450	450
	Panel B. Daughters aged 30-34		
β_1	0.437***	0.482***	0.715***
	(0.135)	(0.141)	(0.167)
R^2	0.097	0.100	0.128
Observations	149	149	149
	Panel C. Daughters aged 30-47		
β_1	0.403***	0.447***	0.688***
	(0.114)	(0.118)	(0.144)
R^2	0.096	0.095	0.120
Observations	182	182	182

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Bootstrapping standard errors (with 1000 replications) are in parentheses. Fathers' individual earnings is predicted by *education*, *occupation*, *industry*, and *geographic region*.

Table 11: The IGE estimates by different regions for sons

	Dependent variable (monthly, VND 1000, in log): Sons'		
	individual earnings	individual income	family income
	(1)	(2)	(3)
	Panel A. Red River Delta (RRD)		
β_1	0.327***	0.453***	0.868***
	(0.104)	(0.106)	(0.124)
R^2	0.055	0.094	0.161
Observations	317	317	317
	Panel B. Northern Midland and Mountain Areas (NMMA)		
β_1	0.471***	0.510***	0.845***
	(0.139)	(0.147)	(0.209)
R^2	0.083	0.088	0.123
Observations	187	187	187
	Panel C. North Central and Central Coastal Areas, and Central Highlands (NCCCACH)		
β_1	0.294***	0.324***	0.714***
	(0.081)	(0.088)	(0.112)
R^2	0.054	0.063	0.117
Observations	376	376	376
	Panel C. South East (SE)		
β_1	0.553***	0.645***	0.723***
	(0.136)	(0.140)	(0.186)
R^2	0.130	0.157	0.152
Observations	151	151	151
	Panel E. Mekong River Delta (MRD)		
β_1	0.263*	0.292**	0.519***
	(0.139)	(0.147)	(0.172)
R^2	0.022	0.020	0.042
Observations	313	313	313

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Bootstrapping standard errors (with 1000 replications) are in parentheses. Father's individual earnings is predicted by *education*, *occupation*, *industry*, and *geographic region*.

Table 12: The IGE estimates by different regions for daughters

	Dependent variable (monthly, VND 1000, in log): Daughters'		
	individual earnings	individual income	family income
	(1)	(2)	(3)
	Panel A. Red River Delta (RRD)		
β_1	0.281*	0.397***	0.802***
	(0.150)	(0.149)	(0.217)
R^2	0.087	0.102	0.147
Observations	138	138	138
	Panel B. Northern Midland and Mountain Areas (NMMA)		
β_1	**0.154**	**0.169**	**0.290**
	(0.170)	**(0.177)**	**(0.346)**
R^2	0.032	0.027	0.039
Observations	66	66	66
	Panel C. North Central and Central Coastal Areas, and Central Highlands (NCCCACH)		
β_1	**0.298**	0.360*	0.852***
	(0.195)	(0.196)	(0.159)
R^2	0.059	0.068	0.146
Observations	166	166	166
	Panel D. South East (SE)		
β_1	0.368**	0.405**	0.795***
	(0.150)	(0.169)	(0.242)
R^2	0.133	0.156	0.176
Observations	93	93	93
	Panel E. Mekong River Delta (MRD)		
β_1	**0.131**	**0.132**	**0.297**
	(0.178)	**(0.183)**	**(0.202)**
R^2	0.031	0.023	0.015
Observations	169	169	169

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Coefficients in bold are NOT significant at 10%. Bootstrapping standard errors (with 1000 replications) are in parentheses. Father's individual earnings is predicted by *education*, *occupation*, *industry*, and *geographic region*.

Appendices

Figure A1: The distribution of sons' age in the primary sample (VHLSS 2012)

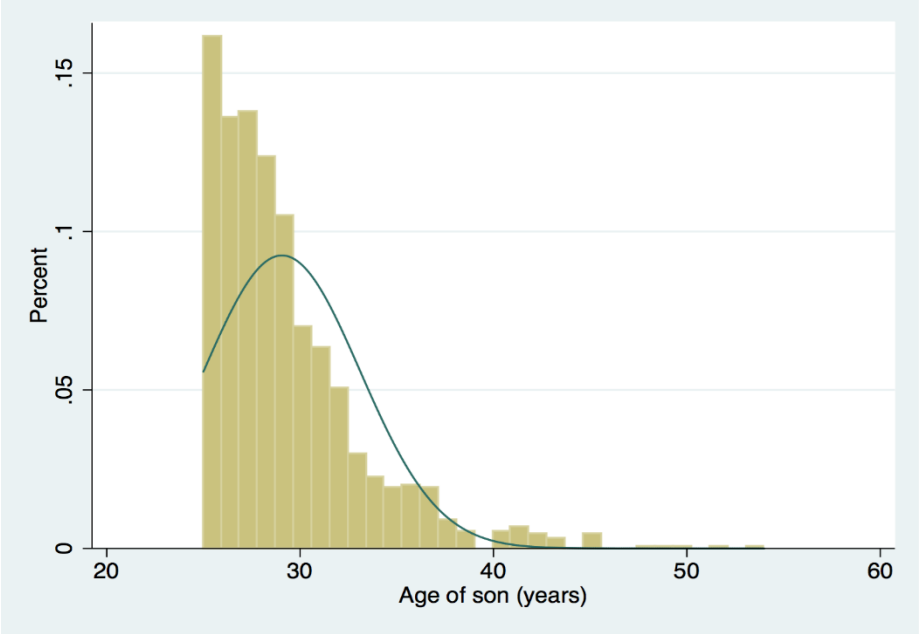

Figure A2: The distribution of daughters' age in the primary sample (VHLSS 2012)

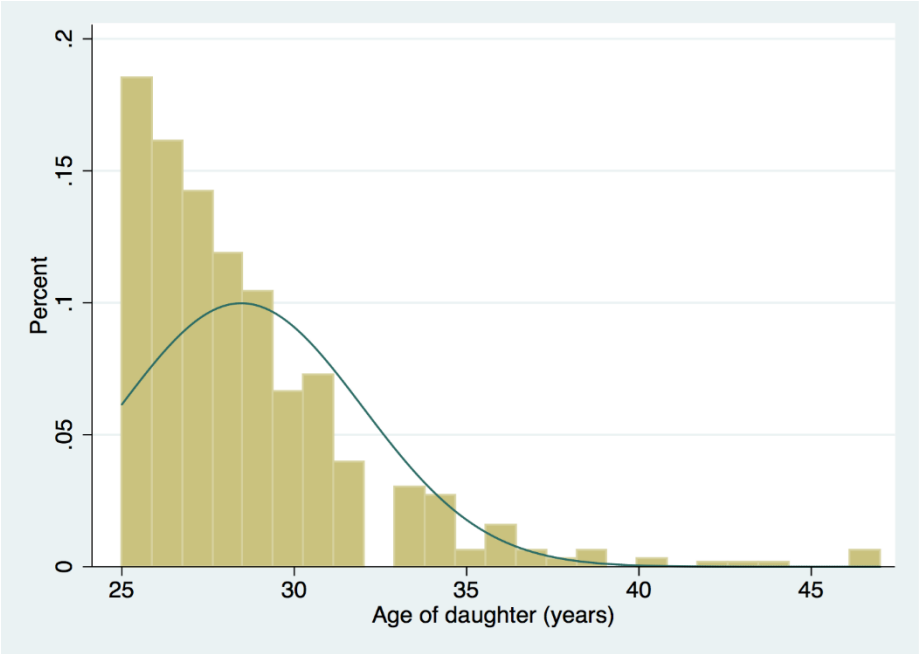

Table A1: Classifications of occupation in Vietnam

Occupation Category	Occupation
(1) very highly skilled	• Central government leaders and officials • Local government leaders • Officials in key socio-political organizations • Officials in key organizations (groups, general corporations, businesses, and schools) • Highly-skilled experts in key fields (technology, healthcare, education and training, IT and communication, legal, cultural and social affairs)
(2) lower highly skilled	• Technicians in science and technology • Technicians in healthcare • Specialists in business and management • Specialists in legal, cultural and social affairs • Technicians in IT and communication • Average-level teachers
(3) typical non-manual	• Members of the armed forces • General officers and desk-based officers • Data and input enumerators • Office assistants • Personal service staffs • Sales staffs • Personal care staffs • Security service staffs
(4) lower-grade	• Operators of fixed machines and equipment • Machine assembling workers • Vehicle drivers and operators of moving equipment
(5) skilled manual	• Workers with market-demanded skills in agriculture • Workers with market-demanded skills in forestry, fisheries and hunting • Workers in agriculture, fisheries, hunting and collection of farm produce for self-subsidy

(6) semi- and unskilled manual	• Construction-related workers (except electricians) • Metal smiths, mechanics and other workers related • Handcrafters, and printing-related workers • Electricians and electronics workers • Workers in food-processing, woodwork, garment making, and other handicrafts, and other workers related
(7) farmers, and farm workers	• Cleaners and domestic helps • Low-skilled workers in agriculture, forestry and fisheries • Workers in mining, construction, industry, and transport • Assistants in food preparation • Street-based and sales-related workers • Waste collectors and other low-skilled workers

Table A2: Classifications of industry in Vietnam

Industry Category	Specific Classifications of Industry
(1) agriculture	• Agriculture and related services (crop production, husbandry, and agricultural services) • Forestry and related services • Aquaculture production and exploitation
(2) manufacturing	• Foodstuff production and processing • Beverages production • Production of cigarette products • Textiles • Costume production • Production of leather and related products • Wood-processing and making of wood and bamboo products (except beds, wardrobes, desks, chairs); making products from straw and plaiting materials • Producing paper and paper-based products • Printing and reproduction of recorded media • Production of coke coal and refined oil products • Production of chemicals and chemical products • Production of medicines, pharmaceutical chemicals and materials • Manufacturing of rubber and plastic products • Manufacturing of products from other non-metallic minerals • Production of metals • Manufacturing of products from cast metal (except machines and equipment) • Manufacturing of electronic products, PCs and optical products • Manufacturing of electrical equipment • Manufacturing of unclassified machines and equipment • Manufacturing of motorized vehicles and truck trailers • Manufacturing of other transport vehicles • Manufacturing of beds, cabinets, desks and chairs • Other processing and manufacturing industries

	• Repair, maintenance, and installation of machines and equipment
(3) public management	• Government and state management • Political and socio-political organizations • Public security and defense
(4) health and education	• Education and training • Healthcare • Concentrated care and nursing • Non-concentrated social assistance • Professional, scientific and technological activities
(5) trade and finance	• Sales and repairs of automobiles, motorbikes, scooters, and other motorized vehicles • Wholesale (except automobiles, motorbikes, scooters, and other motorized vehicles) • Retail (except automobiles, motorbikes, scooters, and other motorized vehicles) • Financial services, except insurances and social insurance • Insurances, re-insurance, and social insurance, except compulsory social assurance • Other financial activities
(6) utilities	• Production and distribution of electricity, gas, hot water, steam and air conditioners
(7) transportation and communication	• Transport by railways, roads, and pipelines • Waterway transport • Airway transport • Warehouse and supporting activities for transport • Postal and delivery services • Publication activities • Cinematographic activities, production of TV programs, recording and musical publication • Broadcasting activities • Telecommunications • Computer programming, consulting services and other activities relating to computers • Information services

(8) construction	• Construction of houses of various kinds • Construction of technical civil works • Special-use construction activities • Business in real estates
(9) mining	• Exploitation of hard coal and lignite • Exploitation of crude oil and natural gas • Exploitation of metal ores • Other mining and quarrying • Mining supporting services
(10) community, and social services	• Legal, accounting and auditing activities • Activities of head offices; management consultancy • Architecture; technical check and analysis • Veterinary activities • Labor and employment services • Travel agency, tour operator and other supporting services relating to tour promotion and Investigation for safety reasons organization • Investigation for safety reasons • Services of cleaning houses, works, and public spaces • Office administration and support, and other business-supporting activities • Creative, arts and entertainment activities • Library, archive, museum and other cultural activities • Lottery, betting and gambling • Sports, recreation and entertainment • Activities of other associations and organizations • Repair of computers and personal and household utensils • Other personal services • Household employment generated by households; • Household self-production and self-services; • Activities of international organizations and bodies

Table A3: Provinces in geographic regions in Vietnam

Geographic Region	Province			
(1) Red River Delta (RRD)	Ha Noi	Quang Ninh	Hung Yen	Nam Dinh
	Vinh Phuc	Hai Duong	Thai Binh	Ninh Binh
	Bac Ninh	Hai Phong	Ha Nam	
(2) Northern Midland and Mountain Areas (NMMA)	Ha Giang	Lao Cai	Bac Giang	Son La
	Cao Bang	Yen Bai	Phu Tho	Hoa Binh
	Bac Kan	Thai Nguyen	Dien Bien	
	Tuyen Quang	Lang Son	Lai Chau	
(3) North Central and Central Coastal Areas (NCCCA)	Thanh Hoa	Quang Tri	Quang Ngai	Ninh Thuan
	Nghe An	Thua Thien Hue	Binh Dinh	Binh Thuan
	Ha Tinh	Dang Nang	Phu Yen	Khanh Hoa
	Quang Binh	Quang Nam		
(4) Central Highlands (CH)	Kom Tum	Dac Lak	Lam Dong	Dac Nong
	Gia Lai			
(5) South East (SE)	Binh Phuoc	Binh Duong	Ba Ria – Vung Tau	Ho Chi Minh
	Tay Binh	Dong Nai		
(6) Mekong River Delta (MRD)	Long An	Vinh Long	Can Tho	Ca Mau
	Tien Giang	Dong Thap	Hau Giang	Kien Giang
	Ben Tre	An Giang	Soc Trang	Bac Lieu
	Tra Vinh			

Table A4: The transition matrix – The probability of sons' individual income quartile given fathers' individual earnings quartile

Fathers' individual earnings quartile (%)*	Sons' individual income quartile (%)			
	Bottom	Second	Third	Top
Bottom	38.20	26.69	19.38	15.73
Second	28.44	29.05	22.32	20.18
Third	22.46	25.75	27.84	23.95
Top	14.37	21.41	23.24	40.98

* Father's individual earnings is predicted based on the set of socioeconomic characteristics including *education*, *occupation*, *industry*, and *geographic region*.

Table A5: The transition matrix – The probability of sons' family income quartile given fathers' individual earnings quartile

Father's individual earnings quartile (%)*	Son's family income quartile (%)			
	Bottom	Second	Third	Top
Bottom	33.99	31.74	21.63	12.64
Second	28.75	24.46	26.91	19.88
Third	22.16	26.65	27.54	23.65
Top	14.68	16.51	23.85	44.95

* Father's individual earnings is predicted based on the set of socioeconomic characteristics including *education*, *occupation*, *industry*, and *geographic region*.

Table A6: The transition matrix – The probability of daughter's individual income quartile given father's individual earnings quartile

Father's individual earnings quartile (%)*	Daughter's individual income quartile (%)			
	Bottom	Second	Third	Top
Bottom	38.92	23.95	22.16	14.97
Second	22.00	26.00	31.33	20.67
Third	21.02	24.84	26.11	28.03
Top	17.72	24.68	21.52	36.08

* Note: Father's individual earnings is predicted based on the set of socioeconomic characteristics including *education*, *occupation*, *industry*, and *geographic region*.

Table A7: The transition matrix – The probability of daughter's family income quartile given father's individual earnings quartile

Father's individual earnings quartile (%)*	Daughter's family income quartile (%)			
	Bottom	Second	Third	Top
Bottom	34.73	27.54	25.75	11.98
Second	24.00	26.00	29.33	20.67
Third	26.11	28.66	24.20	21.02
Top	14.56	17.72	20.89	46.84

* Father's individual earnings is predicted based on the set of socioeconomic characteristics including *education*, *occupation*, *industry*, and *geographic region*.