Towards global integration of the labour market economics essay

Economics

China suffers the worst brain drain in the world, according to a new study that found seven out of every 10 students who enrol in an overseas university never return to live in their homeland. Despite the booming economy and government incentives to return, an increasing number of the country's brightest minds are relocating to wealthier nations, where they can usually benefit from higher living standards, brighter career opportunities and the freedom to have as many children as they wish. The Chinese Academy of Social Sciences revealed 1. 06 million Chinese had gone to study overseas since 1978, but only 275, 000 had returned. The rest had taken postgraduate courses, found work, got married or changed citizenship. Smart foreigners who study at U. S. universities -- often at taxpayer expense through scholarships -- face a tough fight after graduation if they want to stay in the country. There's fear U. S. immigration laws could cripple the nation's economic growth. That's why a group of senators this week suggested creating a fast track to award green cards to foreign students in STEM fields (science, technology, engineering and math). The current system sets quotas that limit individual countries to no more than 7% of all green cards. That makes it harder for applicants from India or China, compared to applicants from Belgium or Iceland. Immigrants make up a surprisingly large share of STEM students in Master's and Ph. D programs: more than 40%. And that 52% of all new doctorate degrees were earned by foreign students. The sheer number has ballooned to 205, 600 students as of 2011, according to Immigration and Customs Enforcement records. Republicans and Democrats in the House scrambled to push through two bills that would have provided up to 55, 000 new visas to foreign students who earn advanced degrees in

the so-called STEM fields of math and science. One of the bills, sponsored by Rep. Lamar Smith (R-Texas), would have created 55, 000 visas for those students. Smith's bill, however, also required that the same number of visas be eliminated from another existing legal immigration category -- green cards awarded as part of a lottery system. The other bill, sponsored by Rep. Zoe Lofgren (D-San Jose), would have created 50, 000 visas without eliminating any existing visas. In the end, Smith's bill failed to secure enough votes and Lofgren's proposal remains stalled in committee.

Motivation and Objective

Skilled Immigration vs. skilled emigration- which is a better lever for the economy- STATA - Estimation on different scenarios- Consider China: FDI, government policy (endogenous economic model)- Consider US: Provision of visas

Research Significance

Literature Review on Brain Drain Issues

This section gives a review of the theoretical and empirical literature on brain drain from when the term was first introduced (1950s) up until recent years.[1]To understand the impact of brain drain I will start by defining the term 'brain drain'. According to Bushnell and Choy (2001), the word 'brain' refers to any skills, competencies or attributes that form potential asset to any organisations or nations. Use of 'drain' reveals a situation where the rate of exit is greater than normal or greater than desired. Combining these two words implies that the outflow of the most talented asset at an appreciable rate. The term 'brain drain' was first introduced in the 1950s by the British

Royal Society to describe the outflow of skilled professionals such as scientists and technologists to the United States and Canada in the 1950s and early 1960s. During the following decades the topic of brain drain was more popular in the context of developing-developed countries and also North-South America. For example, in the brain drain literature (Maurice Schiff and Wang, 2009) relating to North-South trade-related technology diffusion in small and large states in the South America, it was pointed out that the economic productivity increases with North-South trade-related technology diffusion, and decreases with the brain drain. In general, traditional (neoclassical) literature holds that the positive technological externalities of immigration arises due to abundant capital that is available to capitalise in the host country. A new theory called the New Growth Theory was developed in the mid-1980s and proposes that innovation and new technologies do not occur by chance, rather, it is guided by human beings' desires and unlimited want to seek for profits. In other words, if profit incentive is great enough, people will choose to grow its human capital through means of education, and also through acquiring available highly skilled professionals (from within the nation and internationally) to seek for new innovations. In the 1960s and 1970s, debates concluded that brain drain was driven by the imbalances in the world system. Theories like the modernisation and world system theory suggest that the world will continue to remain imbalance and that brain drain will permanently remain as a cost to the source countries. These theories have important implication on brain drain issues as they explain reasons for the outflow of human capital. In fact, the next section in this paper is dedicated to review some of the important

world system theories. In addition, empirical literatures such as Bhagwati and Hamada (1974) and McCulloh and Yellen (1977) agree with the propositions put forward by these theories as findings indicate that brain drain contributes to the increased inequality at the global level. There were massive debates on the feasibility of holding these 'brains' back in the source countries. Firstly, keeping these talents at home is easier said than done, and even if it can be successfully done, there is a great chance that this could lead to 'brain waste', especially in many under-developed countries. Furthermore, emigration restrictions would violate a human right enshrined in the international treaties. Bhagwati (1976) argues that there is a way to compensate for the brain drain from the source countries. Under his proposal, a supplementary income tax known as the 'brain drain tax' can be imposed on immigrants' earnings in the source countries. This is not unusual in recent days as seen in the case of the United States, US citizens and permanent residents abroad, like those at home, are required to pay the US federal taxes. Finally, starting from the late 1990s, there were empirical results showing that brain drain can have both detrimental and beneficial effects to the source countries, subject to circumstances such as the state of development of the source countries. A notion of 'brain gain' was used to represents the beneficial effects. For example, Beine et al. (2001) has pointed out that allowing migration to take place would increase the average level of education of the workforce in the sending countries since only a fraction of these migrants actually choose not to return. More generally, brain gain can be modelled on the assumption that labour is homogeneous or heterogeneous. The latter limits the research to the case when not all

labour in the economy are equal, and that only the most skilled residents emigrate (Docquier and Rapoport, 1997).

Theoretical Approaches to Education Abroad, Human Capital Formation, and National Development in an Unequal World

This section lays out the main theories concerning human capital formation and international labour mobility and their implication on national education development in an unequal world. They include the theories of modernisation, dependency, world-system, and development-state. Modernisation theory sets out that there is a clear division between modern society and traditional society, and that the Western countries such as the US and UK have already arrived at modernity. According to modernisation theory, in order to achieve economic prosperity, the development in any less-developed, undeveloped or Third World countries will have to follow an industrial society paradigm based on the modern societies. These include the replacement of traditional values in less-developed countries by modern or Western ones such as the ideologies of capitalism and democracy (Handelman, 2006; Rostow, 1985; Weber, 2009). To achieve that, education policies to allow the transfer of knowledge, skills and modern values from Western society to the Third World are crucial (Parsons, 1977; Inkeles and Smith, 1974). This point of view is strengthen by the evidence that major Asian nation states such as Meiji Japan, China, Singapore and Taiwan have sent government-funded students to study in Western universities and then we saw modernisation along with significant economic development in these sending countries. (Yee, 1995; Duke, 2009). Dependency theory arose as a

reaction to modernisation theory. Dependency theorists see the world as a dichotomy between core (more developed) countries and periphery (less developed) countries (Frank A. G., 1967), where it is also assumed that the economic relationship between core and periphery countries is marked by dependency, exploitation and the unequal exchange of resource. This implies that even if Third World countries attempt to connect themselves to Western countries by various means such as education development, investment, technology transfers, and closer integration to the Western countries, their economies remain underdeveloped. One reason suggested is that the agents of modernisation in peripheral countries are local leaders or elites who hold belief, values and interests consistent with that of core countries in which they received their higher education. These agents tend to follow Western patterns, fighting against traditional values that are seen as obstacles to modernisation. In other words, the agents who play key role in modernisation are also agents of exploitation and unequal exchange of resources which, as a result, retain the periphery's rigid position as the weaker members in a world market economy. World-system theory builds upon dependency theory in accepting view of inequality and imperialism as fundamental features of capitalist world. However, it is a multidisciplinary approach to world history or social change that is driven more by empirical evidence than economic theory. World-system theory deviates from dependency theory's core principle in that it puts world system as the central unit of analysis rather than nation states. For example, world-system theorists argue that exploitation exists in all zones of capitalist world economy and not just between core and periphery nations. World-system

theorists hold that the world economy can be divided into countries with core, semi-periphery, and periphery state and that the system is dynamic (Frank, 2001; Wallerstein, 1974, 1984). More precisely, a nation's development status is determined by its national competitiveness in the world system and it can gain, or lose, the core (semi-periphery, periphery) status through employing the right economic strategies. Development of world-system leads to the commodification of resources including natural resources, land, human labour and human relationships as they are gradually being turned into tradable items in a global market which dictates their exchange value. Some scholars have applied the core-periphery framework to interpret educational relations, leading to a view that the world education system reflects the world economic system. In particular, the research oriented universities in the 'core countries' are usually in the leading position to those educational institutions in less developed countries. For example, reputable academic institutions in the United States tend to attract the largest number of international students. Furthermore, Altbach (1981) and Ginsburg et al. (1990) have pointed out the dependency of higher education in periphery countries on those in core countries. This can be seen when not only ordinary students but large number of personnel in local organisations are often sent abroad for training, resulting in brain drain phenomena. Other indicators of dependency include adopting educational models in core countries and great efforts to publish journals, articles or books in the developed countries. The world-system theory sheds lights on the possibility of a nation to reposition itself in the world system through moving within core, semi-periphery and periphery structure. However, there

is no sufficient literature to explain the ways in which a nation can enhance its competitiveness through developing its human capital. This is because the development of world-systems theory were based on economic data and historical analysis before 1970s, hence it was mainly focused on the dynamics in Western Europe and the Americas. Therefore, we are unsure if the world-system propositions alone can help in understanding the status of China in the world system and how it can defy modernisation and dependency theory in gaining its position as a core country, if it is possible at all. Development-state theory builds upon the existing literature on world-system theory and agrees with it in that it focuses on a nation's ability to compete in the capitalist world, but in addition explores the role of state (or government) in achieving the nation's goal. While modernisation theory emphasises the state's role in responding to cultural, education and economic factors externally, developmental-state theorists focus on the relationship between the state, labour and local industries. In this model of capitalism, the state has more independent, or autonomous, political power, as well as more control over the economy. The development-state theory provides a useful framework for explaining how developmental states have influenced their educational system in the process of enhancing national competitiveness, whilst preserving the national identity. Established by Johnson (1982), this theory is considered as a key breakthrough on East Asia in American literature (Cumings, 1999). In particular there are increasing number of literatures concerning economic growth in East Asia countries including Japan, Hong Kong, Taiwan, Singapore and South Korea. Johnson's (1982) book provides an example of the case in Japan. The Ministry of

International Trade and Industry (MITI) was one of the most powerful agencies of the Government of Japan supervising the enforcement of " industrial rationalization" and " industrial structure policy". This means having the legitimacy and authority to regulate and decide Japanese industrial policy, funding research and directing investment.[2]Given such a strong power, the MITI is described by Johnson " the greatest concentration of brainpower in Japan". The developmental-state theory became an important concept in the study on development of East Asian countries, at least before the broken out of Asian financial crisis in 1997. Nevertheless, it is still the most relevant theory relating to China's development model for three reasons. Firstly, being a communist country, China's state has absolute authority in making decision relating to national policies. In other words, China's national competitiveness depends greatly on the state's ability and quality of governance. Secondly, being one of the biggest economies in Asia, it is not surprising that the " Asian model" would have more implication on China's policy decisions. Finally, we have seen the emergence of China as one of the top leaders in the global scene, at least in the economic sense, which counters the main propositions put forth by the modernisation theory and dependency theory. In this sense, the ideas upheld by development-state theory would better explains the state's role in equipping manpower for competition in the global economy. Unfortunately, the literature of development-state is not specific enough in explaining the state's strategies in employing foreign resources in the use of internal development, especially in the context of human capital development. In the next section, I will discuss the intensity of the global competition in human capital. Following

that, a section is dedicated to exploring the evolution of China's brain gain strategies as well as discussing some of its characteristics which has lead to China's success in human capital development.

The Competition for Global Human Capital

China's Brain Gain Strategies

This section identifies three strategic moves employed by the Chinese state in paving the way for a long term brain gain. The first strategic move involves using the education abroad policy as a means of developing its human capital necessary for enhancing national competitiveness. Many has viewed the outflow of Chinese students to pursue higher education in developed countries as a consequence of the opening up of China's policy in 1997. However, this is inaccurate as in the case of a country with strong socialist ideology, any policies on educational development would comprise the state’s decisions and this includes setting out the rules and regulations on both sending students and scholars to study abroad. The following historical evidence brings out the point that the openness in international educational relationships would not have brought to any success without necessary support from the state. China's academic exchange and cooperation with American universities dates back to a century ago, but the importance of this academic relation did not receive much attention from the state until the late 1970s. In fact, the higher education system had been damaged by the Cultural Revolution (1966-1976) initiated by the state. The historical evidence has that the need of economic reconstruction within the nation has led to the Four Modernisations Program, first set forth by Zhou Enlai (the first Premier of People's Republic of China) in 1963 and enacted by

Deng Xiaoping (the " paramount leader" of the People's Republic of China) in 1978 to strengthen the fields of agriculture, industry, national defence, science and technology in China (Ebrey and Patricia Buckley, 2011). Suggestion on sending students abroad to study science and technology, especially in areas relating to national defence and economic development was given by the senior leadership of Tsinghua University, the then leading university in China. Deng anticipated some brain drain yet believed in the benefit it would bring to the country even if there are only a small proportion of them who returned.[3]On December 26, 1978, a group of 52 government-funded Chinese students were sent to study in the US, and the number of students sent increases in the subsequent years. in 1980s, only a tricke of students returned. Beginning year 1990s, higher educational reform in China leads to a trend of decentralisation which sees a transfer of partial decision-making power from the state level to provincial authority. Following that, there were more local involvement in the selection of students to be sent abroad to ensure that the chosen fields of studies are relevant to the local needs. Another trend resulting from decentralisation is the diversification of financing resources - a large percentage of students sent abroad were self-financing.[4]While this means that large number of students were not obliged to return upon graduation, it also implies that even if they choose to return, jobs were not guaranteed as state-owned enterprises could not provide jobs for all of them. The second strategic move towards brain gain involves creating a labour market to facilitate the inflow of its overseas graduates. Recognising that foreign-trained scholars could offer knowledge and skills necessary for the grow of China's high-tech sector, the state

created exclusive high-tech development zones for returnees, known as the 'returning-student entrepreneurial parks', which soon became the main place for returnees to develop their own business in China, while enjoying preferential treatment, business start-up loans and tax exemptions. It is reported that (Human Resources Market News Reporter, 2010) the number of entrepreneurial parks increased rapidly from around 60 in the 1990s to 115 by year 2006, and over 150 by year 2009. Also, the number of companies, most of which were high-tech enterprises, located in the entrepreneurial parks increased from 5000 in year 2003 to over 8000 by year 2009. The entrepreneurial parks have successfully absorbed overseas Chinese talents who were 'young and had no deep roots in China' and had 'no doubt they would risk losing everything by returning to China to restart their careers' (South Morning Post Reporter, 2008). It was reported that more than 20, 000 returnees have been able to utilise these convenience offered by the state. For example, the popular Chinese web hub Sohu. com was created by Zhang Chaoyang who returned to China in year 1995 with approximately USD500, 000 venture capital provided by the state to start his business. Other important moves to encourage the return of talents includes creating and funding programs to provide financial support as well as incentives to those overseas Chinese graduates who agree to return to serve China on either a long- or short-term basis. The third strategic move towards brain gain relates to China's ambition to acquire workers with higher education and members of higher positions in the international academic community. Since the beginning of the twenty-first century, the state has given high priority to increasing its profile in the international academic

community, by means of selectively importing high-profile overseas graduates, particularly those with rich working experience and high reputation in the international community of science and technology.[5]This can be seen as the state's move in reaping the benefits from its long term investment in abroad educational policy. In 2006, PRC's then president Hu Jintao put forward the vision of building an 'innovation-oriented country' (chuangxinxing guojia) as a ultimate goal in China's science and technology development by 2020. In his speech, Hu explicitly expressed the state's ambition and the need for science and technology elites to lead the way (People's Daily Online Reporter, 2007). In response to that, the state promised a series of generous state-sponsored programs to recruit high-level scholars from overseas. Examples include the Project 211 (1995), Project 985 (May 1998) and Project 111 (September 2006), Gusu Talent Project of the SuZhou province (2010) and the ChangJiang Scholars Recruitment Scheme. China's rapid economic growth in the past 30 years can be seen as a result of the strategic moves in its abroad education policy, although credit should also be given to contribution from other state policies. However, with regard to the educational achievement in the global sense, there are ample evidence to gauge the return on the series of strategies employed by the Chinese state in the past 30 years. To some extent, the number of international publications, with the number of times these publications are cited by other literature reflects the strength of an academic institution. A survey (Ministry of Education, China) has shown that in between year 1990 and 2005, grants amounting to as much as 400 million yuan have aided 13, 572 overseas returnees in researches and publications. The investment has

paid off as China's Science Citation Index (SCI) ranking rise from 38th in year 1979, to 15th in year 1989 and 8th in year 2000 (Institute of Science and Technical Information of China, 2009). In the next section, I have gathered statistics published in the annual reports under China's Ministry of Education regarding the of number of students involved under the abroad education policy. This section is aimed at providing a graphical representation on the dynamic of students studying abroad in the past 30 years.

The Dynamic of Chinese Students Studying Abroad

With the deepening of China's educational reform and opening up since year 1978, the number of students studying abroad has increased significantly over the years and China is currently one of the biggest source country for international students. In the period of year 1978-2011 a total number of 2. 25 million students have travelled abroad for education, where 0. 82 million of them have returned. As of year 2011, more than 1. 4 million students are still abroad, among which approximately 1. 1 million are not graduated (college, undergraduate, postgraduate and PhD).[6]Figure 1. 1: Number of students travelling abroad for education. Figure 1. 1 shows that the outflow rate of students has risen significantly in year 2002 (49%) and 2008 (24%), but with different dynamics. While the outflow rate experienced a temporary drop due to outbreak of SARS in year 2003, the outflow rates after year 2008 remained high at more than 24% every year (27. 53% in year 2009, 24. 16% in year 2010). Figure 1. 2: Number of students returning to ChinaFigure 1. 2 shows that the students return rate increases gradually in the early 2000's but it begins to increase more and exponentially after year 2008 to almost as high as the outflow rates in the same year. The lower-than-expected net

outflow rates in recent years are a contrary to the popular conception on China's severe brain drain. Furthermore, statistics show that 818, 400 out of 2. 25 million students who travelled abroad for education since the opening up of China's economy in 1978 have chosen to return. While only 317, 900 graduated students remained abroad this translates to a total return rate of 72. 02% as of year 2011.

The Endogenous Economic Model

1. Revisiting Cobb-Douglas Production Function

This paper aims to quantify the cost and benefits of emigration of skilled workers, that is, to estimate China's real economy production given different scenarios. For that we need an economy production function to relate factor inputs such as physical capital, human capital and total factor productivity (as a residual) to economic output. As usual, GDP per worker is used as a proxy for the economic output.[7]In line with the economic growth literature (Mankiw, Romer and Weil, 1992; Hall and Jones, 1999), a human capital augmented labour growth model is calibrated for our analysis. In particular, a constant-return-to-scale Cobb-Douglas production function is used to relate the input factors to economic output.[8]This procedure is called 'growth accounting' where contribution of different factors to economic growth are measured and then total factor productivity can be computed (indirectly) as a residual.[9]We specify the production function for output Y

( )

where K denotes the stock of physical capital, H is the amount of human capital-augmented labour used in generating output production, A is a labour

augmenting measure of total factor productivity, C is private consumption, IK is investment in physical capital, IH is investment in human capital, and is the output elasticity of physical capital. In this model we assume that labour L is homogeneous within the country and each unit of labour has attained an average E years of education. Thus, the human capital-augmented labour is given by

( )

In this specification the function captures the efficiency of a unit of labour with E years of education training relative to one with no education training (). The derivative reflects the return on education.[10]In particular, an additional year of education increases labour efficiency proportionally by . My paper respects George Psacharopoulos (1994) surveys evidence from many countries on the return to education estimates and based on his summary of Mincerian wage regression (Mincer, 1994), we assume that is a piecewise linear function with different for a few range of educational attainment. Specifically, for the first four years of education I assume a China specific average rate of return (social and private education) of 16. 2%, corresponding to Hossain (1997). For the next four years of education I use 13. 5%, the average Psacharopoulos reported for Asia region. Finally, for education beyond eighth years I assume a value of 14. 9%, the average for the world as a whole as reported by Psacharopoulos. Regarding the output elasticity of physical capital I assume a standard value of = , which is found widely consistent with national income accounts data for most developed countries. I follow Mankiw, Romer and Weil (1992); Klenow and Rodriguez

(1997); and Hall and Jones(1999) in writing equation (1) in terms of output per worker, y = Y/L:

$$( )$$

where h = H/L. This equation allows us to decompose output per worker into contribution of capital-output ratio (or capital intensity), education attainment, and productivity. There are a few reasons for using equation (3) in this paper. Firstly, along a balanced growth path, it is known that the capital intensity is proportional to the investment rate hence by using capital-output ratio instead of capital-labour ratio, which is another commonly used contributing factor, the function output can be more easily interpreted.[11]Secondly, this specification is useful in the context of brain drain as it captures growth effect from skill accumulation (direct human capital effect) and knowledge spill-overs (indirect human capital effect). A detailed set-up of the model will be discussed in the next section.

2. Model Set-up and Definitions

The academic literature has so far largely focused on cause of brain drain, impact of brain drain on destination and source countries, and condition in which brain drain may become brain gain. Evaluating the cost and benefits of brain drain to the economy has remained as a major challenge due to its inherent complexity which arises due to the presence of secondary interaction effects between different primary effects of emigration on economy output. My paper aims to evaluate the impact of brain drain on China's economy. For that a country specific model with well established parameter estimates is constructed to gauge the high number of channels of

net emigration on GDP. This endogenous model is inspired by the brain drain literature (Johann Daniel Harnoss, 2011) on the estimation of brain drain cost on Malaysian economy. There are a few reasons for the choice of output per worker instead of output per capita as my basic measure of economic performance. Firstly, output per worker as a measure of productivity of the economy relates the productivity or efficiency of each unit of labour directly to economic productivity and this is relevant to any implication on emigration policies, which is the core purpose of this paper. Also, since I am measuring the impact of those leaving (emigrate) the country on those left behind, it is only appropriate to use number of workers as the GDP-generating units to avoid any 'composition effect'. When analysing impact of outflow of skilled emigrants or brain drain it is useful to use the notion of net skilled emigration. This is the net of outflow of skilled emigrants (or 'brain') minus any inflow of 'relevant' skilled immigrants. My analysis on skilled emigration is limited to the impact of outflow of Chinese students who enrol in an overseas university, many of whom have never returned to their homeland. Hence, the a 'relevant' skilled immigrants would be foreign students who have enrolled in China's universities.[12]In addition, I define 'skilled worker' as a person with educational attainment and aged 25 and above, and the proxy for number of skilled workers in China is obtained from the widely used statistics (Barro and Lee 2013). Physical capital is defined as the stock of productive capital in the form of machinery, buildings, equipment, and other tangible and non-tangible assets that are used in the economic production. As the stock of physical capital increases, the amount of capital available to each worker increases (this is called the capital

deepening). Solow (1956) has pointed out that accumulation of physical capital is an important source of growth, especially for economies that are not yet at the steady state. This is especially true for the case of China where for the past 30 years, China’s rapid growth was powered by substantial physical capital investments applied to a large stock of medium-skill labour accumulated before the economic reforms of China in 1979.[13]At the same time, however, the stock of high-skill labour was low due to the suspension of tertiary education during the Cultural Revolution from 1966 to 1976. In addition, if the Solow model is correct and if growth is due to physical capital accumulation, we should expect the growth to slow down as the process of capital accumulation continues in the long run.[14]Thus, the dynamic of net skilled emigration (especially at high-skilled level) from China can have important impact on whether the human capital level of China can generate the capacity to further utilise the capital accumulation at the later state of development, which could then sustain the growth momentum. Generally, emigrants from a nation can have influence on the physical capital stock through means of remittances or investments through the diaspora network, but this also includes similar investment in the other direction (outflow of investment). Hence, for the purpose of this analysis, I will assume a constant capital investment rate to model the physical capital. Human capital is defined as the accumulation of productive capital in the form of competencies, knowledge and skills embodied in the ability to perform labour so as to produce economic value. The concept of human capital was invented by the economist Theodore Schultz to promulgate an aggregate economic view of human being acting within economies and contributing as

labour. Since not all labour are equal the quality of labour can be improved through investing in them. In other words, the concept of human capital leads to the idea of educational capital, which is the investments made in education. In fact, the role of human capital in economic development, productivity growth, and innovation has frequently been cited as a justification for government subsidies for education and job skills training. Empirical results also show that differences in human capital investment partially explain the gaps in income levels across countries. The precise assessment on the importance of human capital level has been a major challenge due to lack of empirical measure on the stock of accumulated skill. Hanushek and Woessmann (2008), for example, have attempted to focus on measuring the schooling quality (test scores) rather than quantity (years of schooling). In this paper, however, I measure the stock of human capital as the average years of schooling weighted with selected values representing the return to education defined as the extra income generated for an additional year of education attainment.[15]The detailed formulation of a piecewise linear function measuring the human capital level is shown in the previous section. Total factor productivity (TFP) in a Cobb-Douglas production function accounts for effects in total output not caused by the inputs (physical capital and labour). It cannot be measured directly and is modelled as a residual, often called the Solow residual. TFP is interpreted as the total efficiency of the use of other main inputs - it is not factor specific. These factors could include effects from knowledge spillovers, quality of institutions, trade openness, and other technological externalities. For example, the emigration of entrepreneur without educational qualification

would not be captured under human capital but it can have impact on the economy output through channel under TFP.

Input

Channels

Factors

Output

Net skilled emigrationNo direct effectPhysical CapitalGDP per worker

Direct emigration effectHuman Capital

Incentive effect

Productivity growth effectTotal Factor Productivity

Diaspora effect

Figure 2. 1: Model set-up - four main transmission channels on GDP per workerAs shown in figure 2. 1 the impact of net skilled emigration can be accessed through four main transmission channels. Firstly, emigration of skilled workers directly lowers the average stock of accumulated skills of China workers necessary for producing economic output. This is the direct emigration effect of human capital. Secondly, there is an indirect human capital effect on economic output - the incentive effect. This happens as there is an incentive of earning higher wages abroad and often also a higher quality education. Emigrants therefore travel abroad for education and seek for opportunity to acquire necessary skills to be better marketable in the labour markets (especially foreign market).[16]Since not all of these emigrants stay in the foreign markets, this leads to accumulation of human

capital upon their return to China. In the context of human capital, while the direct emigration effect has negative impact on economy output, the incentive effect actually works the opposite direction. Total factor productivity can affect the economy output through many ways. In this paper, I summarise these factors as two main transmission channels. Firstly, it is the 'productivity growth effect' which represents the growth in productivity as dependent on growth in human capital levels. For example, the return to education for skilled workers affects how fast the human capital grow and in turn determines the growth rate of total factor productivity. Second channel to total factor productivity is the 'diaspora effect'. The term diaspora originally took its meaning by reference to a homeland which defined the identity of an ethnic community. In my case, the Chinese diaspora refers to all the Chinese living outside of China. More generally, a diaspora network represents the infrastructures emigrants have created in order to actively take part in the development of their home countries. This has positive impact on economy through knowledge exchange, trade and foreign direct investment (FDI) which ultimately leads to growth in total factor productivity.[17]Figure 2. 2: Key data inputs, assumptions and parametersFigure 2. 2 presents the detailed parameter estimates constructed to gauge the effect of net skilled emigration to GDP per worker through four transmission channels under the human capital and total factor productivity inputs. Once this model is calibrated using data, a series of scenario analysis was done

Empirical Results: Exogenous Net Emigration

Appendix