

Final Draft

Global Recession and Labor Market Adjustment: Evidence of Thai Automotive Industry*

By

Archanun Kohpaiboon^{**},

Pisut Kulthanavit^{**},

Prasert Vijitnopparat^{***} and

Nongnuch Soonthornchawakan^{**}

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** Faculty of Economics, Thammasat University, Thailand. The research benefits from suggestions and comments from Dr. Gyorgy Sziraczki, Lead Economist, International Labor Organization Office for Asia and the Pacific and his colleagues. The research team also benefits from Dr. Juthathip Jongwanich, Asian Development Bank for her suggestion on econometric analysis and forecast.

*** Faculty of Management Sciences, Khon Kaen University

Executive Summary

1. Given the current developmental stage of Thailand's automotive sector, the current global recession inevitably have a significant adverse effect on the sector performance. The sector experienced significant output contraction. Vehicle production volume contracted by 54 per cent in the first half of 2009 comparing to 2008. This inevitably induces an adverse effect on auto parts industries through their interconnection within the production networks. All interviewed enterprises experienced sale decline by about 34 per cent.
2. This caused a negative impact of labor demand from the automotive industry. Based on our survey sample, total employment of all interviewed enterprises dropped by 23 per cent between June 2008 and June 2009. Interestingly, the magnitude of output contraction is greater than that of employment contraction, reflecting the relatively high degree of skill-labor intensity, the relative importance of tacit knowledge, and to a certain extent the efforts of enterprises to avoid retrenchments.
3. It is unlikely for economic recovery to be V-shaped. According to our freshly built econometric model in this paper, vehicle production in 2010 is predicted to reach 977,257 units. It accounted only 70 per cent of the 2008 production volume. Given the bleak economic recovery and the fact that the slow and lagged recovery of labor market, unemployment is one in ongoing policy challenges.
4. Based on our survey, temporary, young, low education level, less experience workers are the most vulnerable to be retrenched in presence of negative shock like the current global recession. Our study fails to find any evidence that female workers are more likely to be retrenched as opposed to males. They are likely to be working poverty and usually urban-rural migrants. Hence, the adverse effect of global recession can pass through to rural areas and causes reverse migration. This eventually has a negative impact on poverty.
5. While enterprises opt to terminating contract of temporary workers, reducing working hours and laid-off to mitigate the adverse impact of global recession, most of retrenchment is a consequence of reducing working hours as revealed in both enterprises and workers survey. Interestingly an option like sought new customers seems to be very difficult due to the nature of production networks where exchanged products are tailor-made.
6. While there is evidence suggesting the effort to avoid retrenchment by the enterprises, the extent to which enterprises can hold their '*trained*' workers largely depends on access to financial resource. Employment contraction in part suppliers and indigenous suppliers in particular is higher as opposed to car manufacturers although the former tends to be more skill-specific than the latter.
7. Only 40 per cent of total retrenched worker samples, accept new job at the lower wage; 3 and 5 workers in formal and informal sectors, respectively. The others remain

unemployed workers. Seven workers remain in the Auto cities and are looking for new jobs whereas the rest are likely to move either to other provinces or return their hometown in rural areas. The rationale for the former remaining in the Auto cities is simply because they have higher expectation about job opportunities there than somewhere else.

8. Most of interviewed workers sent remittances to their relatives in rural areas. When the effect of global recession takes place, three-fourth of them cut their remittances in responses to the global recession. Nonetheless, it does not cause any significant effect on households in rural areas as these households still earn their own income and their occupations are not really related to the global economic performance.
9. Noteworthy, the observed moderate effect of the global recession on households is likely to subject to self selection bias where we can observe only households that are far above the poverty line. Pointed by local community persons and few household samples, there might be households that are vulnerable to poverty. These samples are likely to be reluctant to share their information.
10. Even though most of households (i.e. 88 per cent) prefer cutting their expense including food-related items to increasing their income, this is unlikely to affect their nutrition intake simply because many households usually catch fishes in a river and plant some vegetables in their backyard. Information based on the household samples is not sufficient to conclude about the likelihood that households pull their children from school as a result of global recession.
11. Two policy inferences can be drawn. Firstly, there is a room for government to enhance enterprises' ability in holding their trained workers by establishing loans on standby for enterprises to delay worker retrenchment and cope to any negative shocks. Such loans must be channeled wisely and timely simultaneously to any shocks that might occur in the future.
12. Secondly, as Thai economy would continue to be integrated to the global economy the country's economic shock absorber is needed. The shock absorber includes unemployment insurance scheme and other social safety net schemes. Evidence from household survey points to strengthen local-community oriented economic activities as another absorber. This concept would be in line with the King's sufficiency theory.

1. Issues

Global recession triggered by US subprime crisis has affected countries around the globe including East Asian economies which have experienced precipitous export contraction since the last quarter of 2008 (Athukorala & Kohpaiboon, 2009). Even though there was belief¹ that the recovery process sets in and positive growth would be observed soon, these crisis-affected developed countries will have to save more and import less in order to wind up the massive accumulated debts. Despite exhibiting positive number, economic growth would take several years to resume growth rate used to experience in the past few years (Shiller, 2008; IMF 2009). Hence, the expected slow recovery process would have a negative effect on East Asian economies as they have been long involved extensively into global production networks of multinational enterprises (MNEs) and their production capacity is set up to serve the global economy. Such a negative effect would create adverse effect their labor market inevitably, following with serious social and political consequences.

Nevertheless, how labor market responds to the global crisis largely depends on how labor market adapt to the shock which can vary from country to country as well as across industries (Manning, 2000). This is related to institutional factors and past development strategy such as trade openness, entrepreneurship, labor unionization, overall incentive structure. In a circumstance where real wage might be too rigid to adjust especially in downward direction, the impact on labor market of the global recession would be high level of unemployment (Bernanke, 2004; Ehrenberg & Smith, 2009). This is often associated with undesired social effects, all of which raise concerns about poverty and inequality issues. This is especially for developing East Asian economies, in which a number of workers remain vulnerable to poverty. On the other hand, in some countries, labor market might be very flexible so that real wages can be easily re-negotiated to suit to the new growth trajectory. For example, if firms rely on flexible employment systems which depended partly on contract and casual labor, so firms can quick adjustments of nominal wage in the recession. Another example, as argued by Freeman (1992), in periods of sharp economic downturn, labor unions and government controls are typically

¹ For example, optimistic view by European central bank and OECD in Financial Times, “*Downturn Bottom Out Trichet Signals*” 11 May 2009. Another example, the view expressed by US Federal Reserve Chairman in the Congress Testimony June 3, 2009.

weaker especially in poorer countries where their influence extends only to a limited segment of the workforce. The likelihood that workers can find another job opportunity in other industries including running their own business and the informal sector would be another factor affecting the nature of labor market adjustment. In Thailand where rural and urban sectors seem to be well integrated and the mobility between the wage sector and informal sector is very high (Bertrand *et al.* 1980), the labor market adjusts to shocks might not primarily through an increase in unemployment figures. As argued by Huynh, Kapsos, Kim and Sziraczki, (2008: p22) the first quarter 2009 figures indicate that the number of own-account and contributing family workers combined increased by 566,000 compared to the previous year, reflecting a flow of workers shifting from the formal sector (wage employment) to the lower productivity and informal activities.

In addition, in the increasing importance of global production sharing in which countries become more specialized in different segments of the production process, it is likely that workers are likely to gain more and more industry-specific skill. Sometimes, such skill is tacit knowledge, i.e. know-how possessed by individuals and organizations and that is embedded in routines and networks, but not necessarily codified. This makes firms become even more reluctant to opt to layoff options. Furthermore, as postulated in labor economics literature, certain characteristics of workers such as gender, age, experience play a role in determining the impact of negative shock on labor market adjustment. All in all, this suggests need for an in-depth case study of how labor market adapted to the sharp decline in national output formulate prudential policy to cushion the impact of the current global recession on labor market. Against this backdrop, this paper examines how labor market adjusts to the global recession, using Thai automotive industry as a case study.

The automotive industry is a classic example of the global production sharing, in which each country tends to specialize in different slices of the production process depending on their relative cost advantage and other relevant economic fundamentals. In this context, the decisions of how much to produce and for which market have to be combined with decisions of where to produce and with what degree of intra-product specialization. Secondly, Thailand is a regional hub of many leading multinational enterprises in automotive industry. Hence, the industry becomes more

export-oriented since 2000. The average export-output ratio of vehicles was nearly 50 per cent during the period 2003-7. Hence, the industry is affected by the global recession. Thirdly, when Thailand was chosen as a regional hub, a group of automotive firms are clustering, in which car assembler is at the centre of the cluster and surrounded with numerous suppliers. This similar pattern is also found in other regional hubs such as Mexico and Brazil (Kohpaiboon, 2009). Hence, probing the automotive industry would allow us to illustrate how the global crisis is passing through to suppliers and local communities.

The organization of this paper is as follows; Section 2 provides a brief discussion of research methodology. The following section illustrates the current developmental stage of Thai automotive sector. In Section 4, global recession and its impact on the automotive sector are discussed. Section 5 analyzes the survey of enterprises, workers and households. Conclusion and policy inferences are provided in the final section.

2. Research Methodology

Research methodology in this paper combines both quantitative and qualitative analyses are combined. The former is used to estimate the impact of the crisis on car manufactures the frontline of the automotive industry affected by the recent global recession. The latter is used to examine the adverse effect passing through all workers in the value chain ending at households whose relatives work in the automotive sector. A flexible questionnaire approach is used. In the approach, the questionnaire is filled by personal interview (either by phone interview or direct contact). Simultaneously, personal interview is also conducted in order to minimize the likelihood of missing important facets of the story and maximize insight what actually happens.

There are 181 samples covered in the qualitative analyses consisting of 41 enterprises in the automotive sector (5 car manufacturers, 24 Tier-1 suppliers and 12 Tier-2 suppliers), 90 workers (70 currently employed and 20 retrenched from the automotive sector) and 50 households (30 a close relative in the automotive sector and another 20 samples a close relative is recently retrenched). Most of enterprise and worker samples are located mainly in Rayong and Chonburi provinces, the eastern part of Thailand, where there are many three major export-

oriented car manufacturers located. These manufacturers accounted for 33 per cent of total production capacity and (Table 1). Each group has a separate questionnaire. Furthermore, personal interview with purposively selected information-rich samples (such as major car makers, representatives of automotive group in Thai Industrial Federation etc.) to gain the broader

3. Stylized Facts of Thai Automotive Industry

Thai automotive industry has become more export oriented since 1996. Units of vehicle export increased from 14,000 units in 1996 to 152,800 in 2000. An increase in vehicle export continued and reached 838,600 units in 2008 (Figure 2). As a result, vehicle export accounted for around 41 per cent of total locally assembled vehicles during the period 2000-08. This is contrast to the general presumption that the increased importance of vehicle export would simply be a temporary response from the collapse of domestic demand for vehicles during the onset of the economic crisis. Rather the increased importance of vehicle export would be regarded as a structural change.

Completely built-up (CBU) vehicles become the industry's major export item. The predominant export role of parts which accounted the lion share of the industry's export prior 1996 has been replaced by that of CBU vehicle. Figure 3 illustrates (real) dollar value of parts exports as well as the industry's exports which cover both parts and CBU vehicles. Hence the gap between these two lines indicates dollar value of CBU vehicle exports. During the period 1990-2007, auto parts exports continued with moderate growth rate. Their average annual growth rate was around 9.9 per cent which was far lower than that of CBU vehicle export whose average growth rate was 30 per cent per annum during the period 2000-07. As a result, the export share of parts to the industry's export sharply declined from 80 per cent during the first half of 1990s to around 52 per cent during the period 2000-07.

Pointedly, as Thai automotive industry has become more export-oriented, local content of locally assembled vehicles has increased naturally. In order to illustrate the increased local content of Thai manufactured vehicles, we calculate the ratio where the nominator is the (real)

dollar value of parts imports whereas the denominator is production volume of locally assembled vehicles during the period 1988-2007. The former is a summation of import value of 91 HS 6-digit items that are used for vehicles manufacturing. Before constructing the ratio, the value of imported parts is converted into real terms using import deflator (the ratio of real and current goods imports according to National Income Account). Hence the ratio would to some extent reflect import content. Note that the import value of parts covers items for both original and replacement equipment manufactures (henceforth referred to OEM and REM respectively) so that the ratio tends to overestimate the import content of locally manufactured vehicles. Illustrated in Figure 4, real value of imported parts per 1,000 cars dropped from \$8.1million during the late 1980s to around \$ 2 million during the period 2004-05.

Thailand specializes in manufacturing and exporting one-ton diesel pickups (Table 2). The pickups alone accounted for more than 50 per cent of total vehicle export throughout the period 1999-2004. In 2007 while (real) dollar value of one-ton diesel pickups continued to increase, a share of pick-up trucks declined to 43 per cent because the higher growth rate of passenger car export. Interestingly small (1,000-1,499 cc.) and medium (1,500-3,000 cc.) gasoline passenger vehicles have become increasingly important in total Thai vehicle export since 2001. Their shares increased to 7.9 and 23.3 per cent, respectively, by 2007. Interestingly, there also were sizable dollar values of import of (1,500-3,000 cc.) medium gasoline passenger cars. To some extent the presence of intra-industry trade in this product lines is due to different pattern of MNE production network in Southeast Asia that addressed below in Section 4.

Table 3 shows export destination of vehicle export during the period 1999-2005. The whole period is divided into three sub-periods, i.e. 1999-2001 (the onset of the crisis), 2002-05 (the relatively normal period) and the recent years (2006-07) in order to examine changes in export pattern. In the first sub-period, most of vehicle exports were not for Southeast Asian countries where major importing countries like Indonesia and the Philippines were adversely affected by the crisis. Where the passenger cars are concerned, there was a considerable change in export destination. The relative importance of Southeast Asian market for Thai passenger car

export significantly increased to for around 50 per cent during the period 2002-05, up from 12 per cent between 1999 and 2001. While the relative importance of Japan as an export destination of Thai passenger cars remained more or less unchanged between these three periods, Australia becomes increasingly the export destination in the recent years. By contrast, there has not any considerable change in export destination for pickups. This suggests that pickups have been targeted for export before the crisis. Exports of the passenger cars during the period 1999-2001 would be regarded as MNE response to mitigate the surged excess capacity as a result of the crisis though passenger cars are widely considered for regional rather than global market.

4. Global Recession and Impact of Thai Automotive Industry

At the time of writing this report (i.e. August 2009) there are some signs of global economic contraction bottoming. However the economic forces unleashed by the crisis will probably run rampant for years. This would have a longer impact on labor market as the recovery in the labor market is likely to occur at a lag as compared with output growth (Huynh, Kapsos, Kim and Sziraczki, 2008). Although the frequency of 'green sprouts' reported in the news media has been increasing recent weeks, it is still hard to paint a reasonable growth trajectory extending beyond even few months (the IMF has been revising its growth forecasts almost every month since the onset of the crisis!), there could even be a 'lost decade' for the US economy (and even for a few countries in Europe) like that suffered by Mexico in the 1980s, or by Japan in the 1990s (Shiller 2008; ADB 2009 *Asia Economic Monitor July 2009*). Interestingly, the current economic downturn is also unusually synchronized around the globe. These characteristics, when interpreted in the context of the accumulated evidence on recessions in developed countries over the period since 1960s, point to process of slow recovery and a subsequent longer period of slow growth (IMF 2009). After the recovery process sets in, the US and other crisis affected developed countries will have to save more and import less in order to wind down the massive accumulated debts.

When the automotive industry is concerned, two opposite forces are running under the current circumstance. On the one hand, emerging market economies in East Asia remain the playing field for carmakers to gain their market share. For example, in 2006, more than 50 per

cent of GM Motors revenue came from their affiliates in the developing country (Economists, 2008). Demand in many emerging market economies as well as OCEANIA would be boosted by stimulus packages used in these economies (ADO, 2009).

On the other hand, these economies' growth performance relies on export growth, export-led growth strategy. In this global economic setting there has been a growing emphasis in Asian policy circles on the need for rebalancing growth— engineering a structural shift in aggregate domestic demand away from exports and towards domestic market (ADB 2009). The policy measures under consideration include both measures to redress export bias in the incentive structure and various measures to reduce high saving propensity with a view to boosting domestic demand (ADB 2009). The major focus of this policy advocacy is on China. China faces a formidable political constraint in shifting policy emphasis away from export-oriented growth. There is strong domestic pressure to maintain the momentum of employment-intensive growth through export orientation (Yu 2007, Gan 2008). Given the ample availability of unskilled and semi-skilled labour, and capital involved in export-production is internationally mobile, export-orientation and import-substitution (without imposing policy barriers to imports) are not mutually exclusive policy priorities for China. Hence, this would cast doubt long-term effect of growth engine shifts to the East in the context of automotive industry.

Thai automotive industry would be affected directly and indirectly by global recession. The direct effect comes from the fact that despite exhibiting a downward trend in recent years, EU-15 market remains one of the major export destinations of Thai vehicles and pick-up trucks in particular (Table 3). There also would be an indirect effect as other export destinations like OCEANIA and Middle East of Thai vehicles are affected by the global recessions.

Figure 5 reveals monthly vehicle production (units) in Thailand as well as export-production ratio (per cent) between January 2006 and June 2009. Production contraction has been firstly observed since the last quarter 2008. This seems to be in contrast to other manufacturing goods which export contraction began in about the second quarter of 2008, from 124,656 units in October 2008 to 61,067 units in February 2009. The output contraction reached

bottom in April 2009 at 53,644 units, the lowest since the 1997 crisis. In May and June 2009, vehicle production showed a sign of recovery, reaching 61,752 and 74,717 units, respectively. The observed recovery would be partly due to the high uncertainty observed in the beginning of economic crisis. Consumers tend to pursue 'wait-and-see' strategy until they gain more information. It seems very significant in durable goods like vehicles. Besides, the pickup sign in vehicle sales is to a certain extent a consequence of fiscal stimulation in many countries around the world. Patterns observed from the export-production ratio suggest that output contraction comes from both domestic market and export. The ratio more or less remains unchanged during the period 2007-the first half of 2009. The exception is only December 2008-January 2009 where the ratio increased noticeably. This would be simply due to the political problem peaked during December 2008 and January 2009.

To examine whether or not the industry is bottoming out, a single equation of vehicle production is estimated using data between 1971 and 2007. The estimated equation is the reduced form of demand for and supply of vehicles. Vehicle demand covers both domestic market and export, depending on income and wealth whereas supply of vehicle is a function of foreign direct investment (FDI) inflows into the automotive sector, measured by FDI of machinery and transport equipment. The full detail of the equation is in Appendix I.

The model performs well in generating the forecast of vehicle production. For example the forecasted figure of vehicle production in 2008 is 1,320,284 units whereas the actual one is 1,393,700 units, i.e. underestimation by 5 per cent. In 2009, vehicle production forecast is 876,124 or output contraction is about 37 per cent of 2008 production volume. In the first half of 2009, vehicle production reduced by 54 per cent, implying the industry bottomed out already. In the second half of 2009, therefore, vehicle production would increase by 26 per cent from the first half of 2008. This forecast is in line with the recovery sign of production revealed in the enterprise survey (see more detail below). Nonetheless, it is unlikely for the V-shape rebound for vehicle production. In 2010, vehicle production will reach 977,257 units which is about 70 per cent of the 2008 production volume. The recovery process occurs gradually and only some of retrenched workers would be returned to their job.

5. Response of Global Recession: Evidence from the Survey

5.1 Enterprises (Car Manufacturers and Part Suppliers)

To gain how enterprises respond to the global recession, the enterprise survey was conducted during July-August 2009. There are 41 enterprises covering in this survey consisting of 5 car makers, 24 Tier-1 Suppliers and 12 Tier-2 Suppliers (Table 4). Three car makers which are located in Rayong and Chonburi provinces, the focused area are covered in this study. Most of Tier-1 suppliers are located in Rayong and Chonburi provinces whereas Tier-2 suppliers are geographically dispersed, some of which are in Rayong and Chonburi provinces whereas many are in Bangkok and Samutprakarn provinces. The unbalance in covered sample sizes between Tier-1 and 2 samples is due to the fact that our research's initial focus is on Rayong province and its neighbor and the nature of industrial clustering in the automotive sector is the geographical proximity between car manufacturers and Tier-1 suppliers as documented in Figure 6. Hence most of interviewed samples are Tier-1 suppliers. Types of parts are widely covered in the interview ranging from metallic pressed parts (e.g. chassis, body parts, inner products), rubber parts (e.g. hose, gasket), plastics, electronic parts, accessories, mould and die, heat controllers, fuel tank and seats.

All enterprises in the automotive sector experienced sale contraction. The contraction magnitude is on average 34 per cent for domestic market and 14.2 per cent for export market (Table 4). Evidence that the former's figure is higher than that of the latter does not imply the insignificant impact of global recession on automotive sector. It reflects the nature of automotive industry where global production network is prominent. Consider only the car industry a difference in output contraction between domestic market and exports is small. Global recession has a direct effect on vehicle export and an indirect effect through the country's export performance which lower domestic demand for goods including vehicles. Even though domestic sale contraction might be due to internal factors, interviewed enterprises do not highlight its dominant impact. By contrast, a difference in output contraction between domestic

market and exports is far larger in auto part industries. Most of part suppliers are not the direct exporter. The export-output ratio for auto part suppliers are about 15 per cent as opposed to 41.9 per cent for car manufacturers. Hence, the adverse impact of global recession was passing through order from car manufacturers in the domestic market. Hence, the observed impact of global recession output contraction mostly comes from domestic market. There is no lag effect of passing-through effect of global recession as the automotive sector adopts a full Just-in-time (JIT) system, zero inventory system.

Regard to measures employed to cope with the impacts of the crisis, cut back production, reduced non-labor costs, reduced working time, reduced labor costs, stopped operation temporarily and stopped recruiting workers are the first response of the enterprises (Table 5). They are employed simultaneously.² The two other measures, namely sought new customer and cancelled upgrading of existing facilities vary from firm to firm. Each firm is in a different position to employ 'cancelled upgrading of existing facilities' measure. This is due to the nature of investment in the automotive industry which is a long-term planning and it involves huge sunk cost. Some firms made investment decision long before the recent global recession hence its investment plan is irreversible for the time of global recession taking place. In addition, Southeast Asia including Oceania like other emerging market economies is still a playing field for car manufacturers in the next few years. Competition is expected to be even more intense. Enhancing competitiveness seems to happen anyway. Global recession might alter some investment projects only for a few months.

Sought new customers measure is another measure where each enterprise has uneven opportunity to use it. Generally it is usually open for car manufacturers due to the increasing competition long before presence of the current global recession. In contrast, this measure does not seem feasible for many Tier-1 suppliers as their products seem to be highly firm-specific. In addition, orders were made 2-3 years before manufacturing process actually starts. Particularly, selected Tier-1 suppliers must involve in the product development process with carmakers. The

² Two exceptions are one which yet start its operation during the interview conducted and the other which is less industry-specific and changes find orders from other non-auto customers.

criterion to be accepted suppliers for new model consists of both price and non-price factors. The latter is related to technical capability and detailed product specification. It takes 2-3 years before mass production actually happens. When Tier-2 suppliers are concerned, sought new customers measure is open for only Tier-2 suppliers which have a certain degree of product diversification. Two samples of Tier-2 employed this measure as their product is not entirely for the automotive industry.

Among the chosen measures, namely reduced working time and stopped operation temporarily measures need a special attention as employing them has a significant implication on labor market. Most of the enterprises ranked in the second among the chosen measures. The enterprises opt to them only when negative shocks tend to have longer-term impact, e.g. 5-6 months. There is usually difficulty to find skillful workers. When enterprises employ them, it could create a wrong impression of enterprise prospect and certainty. This makes even more difficulty in finding workers in the future. Nonetheless, global recession impact is expected to last for a year, these two measures are used by many enterprises. It is unlikely for them to hold their workers and absorb shocks by cutting their profit margin.

Since the 1997 crisis aftermath many enterprises adopted a more flexible employment system in their production system in which firms hire both permanent and temporary workers instantaneously. In addition, they usually run overtime (OT) to enhance capacity utilization and to avoid any possible overinvestment problems. As a consequence, enterprises in the automotive industry experienced an increase in labor-capital ratio in their production process (Kohpaiboon, 2006). In the new employment system, firms hire temporary workers to recruit good manner workers as it is unlikely for firms to have full information about workers until they actually work. This becomes relevant for the industry like automotive, in which workers tend to be more skill intensive. Workers in the automotive industry usually obtain secondary school education. When fresh graduates are recruited, they must actually work in production line to acquire tacit knowledge. Training might also be provided during the orientation weeks. Firms do not want to waste resources to train workers who stay with them for few months. Of course, such an employment system is also a result of cost-saving motivation. It is only the permanent worker

who benefits from social security and receives compensation in case of terminating contracts. This also aims to avoid overinvestment in physical capital, enhance production efficiency and manage to absorb any shocks.

In our samples, the ratio of temporary workers³ to total workers is 23.2 per cent in June 2008. Most of these workers are in production line. The ratio associated with car manufacturers is higher than that of part suppliers as the former tends to be more labor-intensive than the latter (Table 6). By nature, temporary workers would work in less skill-intensive jobs within the firm. When they acquire a certain level of skill and perform well in their duty, they would be selected as a permanent worker. On the other hand, when there is a negative shock, this group of workers would be the first to be retrenched.

In the recent global recession⁴, total employment of all interviewed enterprises dropped by 23 per cent between June 2008 and June 2009. 64 per cent of retrenched workers are temporary workers (Table 6). Many enterprises do not renew contract of these temporary workers. But retrenchment also occurs as a consequence of reducing working hours. This is especially true for smaller enterprises. In general, workers in the automotive sector come from northeastern part of Thailand while most of auto firms are near the Laem Chabang industrial ports (i.e. Rayong, Chchoengsao, Chonburi, Aydhaya and Pathumthani, referred to as the Auto cities for brevity). Cost of living in Northeastern part is much lower than the Auto cities. The estimated living cost for a single worker living alone in these auto cities is at least 4,000-6,000 baht a month. A worker must have at least 20-30 regular working days in order to stay in these cities.⁵ Otherwise, they would be better off to stay in their home towns.⁶

³ Temporary workers are all paid short-term (i.e. for less than a year) employees with no guarantee of renewal of employment contract.

⁴ All enterprises revealed their lower employment level, starting significantly in the first quarter of 2009. While the downward trend was firstly observed in the last quarter of 2008, enterprises did not respond as it remained unclear whether or not it is a temporary effect driven by internal shock (i.e. political conflicts) and the usual business cycle observed in the last quarter. It was December 2008 which car makers firstly realized a sharp drop in export order for January 2009.

⁵ This calculation is based on normal hour wage at 200 baht a day (8 working hours).

From 2007 to the second quarter of 2008 where demand for vehicles expanded rapidly (Figure 5), most of firms in the automotive industry run two working shifts (16 hours) and overtime so that a worker by laws can work at most 11-12 hours a day (8 usual hours and 3-4 hours of overtime) and 5.5-6 days a week.⁷ This is equivalent to 34-42 regular working days. This was attractive for workers in Northeastern region to work in the Auto cities.⁸ When the industry was hit by global recession, these factories operate only 8 working hours a day and 5 days a week. Some factories operated only 3 days a week. Many workers face difficulties to remain in the Auto cities.

Interestingly, workers in Rayong province and somewhere else tend to behave differently.⁹ Many workers in the former have not yet returned home in Northeastern region. These workers still hope to find new jobs in these industrial estates. Nonetheless, this option is not for all workers in Rayong province. It is viable for those who have relatives including wife and friends who are not severely affected by the recession and willing to help. This reflects by a number of filled applications in job recruiting companies in Rayong province. As the survey was conducting, there were thousands of freshly unemployed workers who were interested in job matching festival in July 18-19, 2009. They use their social network to absorb external shocks (global recession) with hope to find new jobs in these three industrial estates (Laem Cha Bung, Eastern Seaboard and Map Ta Phut Industrial Estates). In other words, workers in Rayong area have high expectation of job opportunities in these industrial estates. It is much harder for workers elsewhere (e.g. Bang Phli Sub-province in Samut Prakarn province, and Ban Sao Tong

⁶ This is based on a simple assumption that a worker is single and does not share accommodation with any friends. Despite unrealistic such an assumption is introduced for hypothetical reason and will be relaxed in the discussion below.

⁷ Some firms works on Saturday in every two weeks.

⁸ Of course, the estimated living cost is based on a rather restrictive assumption that a worker is single and does not share accommodation with any friends. When it is relaxed, i.e. workers share accommodation with other people (wife, friends, relatives, etc.) and friend so the living cost per person would be even lower.

⁹ We are fully aware a shortcoming from sample bias. In particular, interviewed workers are dominated by those working in Rayong.

Sub-province in Bangkok) because their perception toward job opportunity is smaller. They usually return to hometown in rural area and Northeast region in particular.

When types of workers are concerned, it is production workers whose job security is relatively lower than other types of workers (management and professionals and official workers) in presence of negative shock like the impact of global recession. Most of retrenched workers are semi-skilled production workers. As a result, a proportion of production to total workers dropped in all types of enterprises (Table 6). Despite relatively stable, other types of workers are also affected by measures employed by enterprises such as stopped operation temporarily, and reduced bonus. Regard to gender issue, there is no evidence based on the enterprise survey suggesting that the impact of global recession on female workers is greater than that on male workers. Nonetheless it is very difficult to generalize this finding to other industries as jobs in the automotive sector demands physical strengthen. Hence most of female workers who are in the automotive industry are not in production line so that we do not observe any difference on the impact of global recession.

When questions related to enterprises' strategy in adjusting their existing workforce are raised, most of them chose reducing working time which affected about 80 per cent of total workforces (Table 7). For other options, it varies from enterprise to enterprise. For example, reduced wages and bonuses, developing alternative work arrangements and provide training are also used and affected 34, 29 and 25 per cent of workforces, respectively. Note that when reduced wages and bonuses option is concerned, most of enterprises referred to the expectation that bonus would be cut as a result of the poor performance in the first half of this year. Cutting wage does not seem possible due to presence of minimum wage regulation. Interestingly, laid-off worker option, covering both voluntary resignation and no-renewing contract of temporary workers, is found in the case of relatively large enterprises employing both permanent and temporary workers. It is clear in case of no-renewing contract. From viewpoint of permanent workers, it is difficult to work in the large enterprises which is relatively more stable and has brighter career path as opposed to smaller enterprises. Hence these workers would be more reluctant to resign unless they are laid off. In smaller enterprises, workers tend to be more

sensitive to any changes in wages and other benefits. The selected option must be consulted with the union. Note that this is applicable for only the large enterprises (i.e. car manufacturers and some leading Tier-1 Suppliers) as there is labor union in the smaller enterprises.

There are another two interesting trends emerged. First, the size of employment contraction is less than that of sale contraction reflecting the nature of skill intensity of the automotive sector. Second, based on the ratio of temporary workers to total workers, employment contraction would be higher for car manufacturers. In fact, it is opposite. The size in car manufacturers is slightly lower than that in part suppliers, i.e. 21 and 25 per cent for car manufacturers and parts suppliers, respectively. This would reflect the fact that many part suppliers are facing credit constraints so that their ability to hold their trained workers during the recession period is limited. It is especially true for indigenous enterprises, some of which experienced employment reduction by 40 per cent or more.

The percentage change in employment is virtually indifferent between Tier-1 and 2 suppliers simply because of the dominant role of larger firms in calculating the average figure. Personal interview suggests that the impact on Tier-1 suppliers seem to be identical regardless what parts enterprises produced. By contrast, impacts on tier-2 supplies vary. Some experienced severe impact while the impact on the others remains marginal. The various impacts observed are related to how firms' products are auto-specific. The higher the degree of product specific, the more the severe of recession impact passed through. For example, two tier-2 suppliers which share more or less the same size in terms of a number of workers have totally different experience. Four part suppliers in Tier-2 experienced employment contraction within the range between 40-60 per cent. Their product solely supplied for carmakers. The effect in the other is marginal as the firm also supplies parts for agricultural machines firms. One indigenous supplier is belonging to Thai conglomerate and in a better position in terms of financial resources so that employment reduction occurs only in temporary workers.

Impact on labor markets seems to be different from parts to parts according to their difference in skill worker intensity. Here the ratio between temporary to total workers is used as a proxy of skill intensity. The lower the ratio, the more the skill intensity part suppliers are. This also has implication on the expected decline in employment. The use of temporary to total workers ratio is confirmed by interview evidence. In particular, what revealed by recruiting firms is firms in rubber and electronic parts are usually more demanding in recruiting process, e.g. conducting long and serious examinations and long interview session. This is simply because they are looking for workers who are committed to their jobs to avoid job turnovers. Interestingly, what they focus is not formal education attainment *per se* but workers' attitude and maturity. As revealed by a number of enterprises in the survey skillful workers are needed to efficiently run production process,. Skill cannot be fully acquired by prior training session. On-the-job training is crucially needed. Rubber parts sample in the enterprise survey shares with us that training period before being in the product line is one month and then these trained workers must have actual experience on production line. Whether compound rubbers are well mixed and ready for injection or intrusion process cannot be judged by its appearance. Electronic parts firms share the same experience of one-month long training prior being in production line. In these industries, it is more difficult to find a suitable worker.

Enterprises' preference of need for government assistance is revealed in Table 8. Three remarks need to be addressed here. Firstly, more than half of the sample (54%) request for tax reduction. It seems unclear why firms need further income tax reduction in the period of significant output contraction and in the expectation of financial loss. Such request might simply reflect the impulse response for enterprises to any request for government assistance. This is similar to options like provide reductions in employers' contribution and provide subsidies on input costs, ranked as the second and third in the enterprise's preference. Interestingly the ratio is virtually the same in each group of enterprises.

Secondly, only few firms and car manufacturers in particular point to the request for further excise tax reduction on vehicles. This would help to boost domestic demand for vehicles and mitigate the external shock. Nonetheless, a proposal for further excise tax reduction is

heavily based on the assumption that domestic consumers are not much affected by the global recession and can well respond to price changes.¹⁰ Finally, provide support for skills training of workers seems to be the option requested by part suppliers but not car manufacturers. This reflects the increasing importance of production network in which firms in the network tend to be more specialized in certain product line. Training of workers is important. This is also related to the enterprises ability to hold trained workers in presence of negative shocks. While only one-third of part suppliers expressed this request, to a certain extent the reported figure reflects the distribution of parts covered in the survey. To probe this issue in depth, a number of part suppliers must be larger and balanced among types of parts.

5.2 Worker Survey (Still employed and Freshly Retrenched)

Evidence of impact of global recession on workers is based on interview with 90 workers, 20 of who are retrenched from the auto industry (referred to unemployed workers henceforth).¹¹ The survey was conducted during July 2009. Most of these workers work in Rayong and Chonburi provinces. 70 workers (or 77.8 percent of total worker sample) are still employed and 20 workers were retrenched from the industry (Table 9). More than 80 per cent was conducted by face-to-face interview. Workers are from 36 provinces, most of which are Northeastern region (70 per cent). In other word, these workers are rural-to-urban migrants. The worker sample is dominated by male, accounting for about 75 percent of the sample size. This is due to the nature of work in the automotive industry that physical strength is needed (interview evidence from the job recruiting firm) (Table 9). In the survey sample, 74, 9 and 7 are production workers, managements & professionals and non-production staff, respectively. When types of enterprises are concerned, 62.2 per cent of the sample work and/or had working experience at the Tier-1 suppliers. The second largest group of workers is those with car manufactures (23.3 per cent). The rest is those associated to Tier-2 suppliers.

¹⁰ This remains a debatable issue in the context of export-led growth economy like Thailand. Negative income effect induced by global recession might dominate any positive price effect from excise tax cut on domestic demand. It is beyond the scope of recent study to answer it.

¹¹ This is regardless that they are currently employed by other industries.

Based on our sample, an education level and working-year experiences would be crucial factors that explicate employed and unemployed workers' characteristics. 50 percent of unemployed workers completed their education level with secondary or lower while only 31.4 percent of employed workers completed their education level with secondary or lower. The average working experience in the automotive industry of unemployed workers is only 3 years and 2 months (37.85 months), but that of employed workers is 5 years and 10 months (70.07 months) (Table 9).

The magnitude of global recession impact measured in terms of income contraction is sizable. Workers experienced nearly 41 per cent drop in their real income (Table 10).¹² The figure is the weighted average figure of employed and unemployed workers. The magnitude of income decline in the latter is 79.5 per cent whereas that in the former is about 29.9 per cent. When unemployed workers are concerned, 55 percent of them were laid off in February 2009 and have remained unemployed since then. So that their income completely decreased by 100 percent. Among 20 unemployed workers, only 8 accept new job at the lower wage; 3 and 5 workers in formal and informal sectors, respectively).¹³ A magnitude of their income reduction is 41.4 percent (Table 10). There are 7 unemployed workers live with relatives and friends and are looking for new jobs in the Auto cities. The other 5 unemployed workers are not willing to share their information during the interview but are likely to move either to other provinces or return their hometown in rural areas.

When the employed workers income reduction is concerned, it is cutting working hours instead of wage reduction as the major cause. This is consistent with the finding in the enterprise survey discussed in the previous section. Wage reduction is about 17 per cent whereas working hours dropped by 33 per cent. Nevertheless, for the time interview was conducted, the industry was bottomed up. Some enterprises resume their overtime in spite yet on regular basic as in the past 2 years. Hence, the magnitude of income reduction is only 29.9 per cent.

¹² CPI of the central region is used as a proxy of the deflator of Eastern region due to data unavailability.

¹³ The informal sector includes motorcycle services, grocery shop and general mechanic.

The magnitude of adverse effect on their income is not significantly different between employees working in car manufacturers and those in parts suppliers. The magnitude is within a narrow range between 37- 42 per cent, reflecting the inter-connection between car manufacturers and part suppliers in the global production network. Wage reduction is about 17 per cent as a consequence of no overtime operation whereas working hours dropped by 33 per cent. It seems that the magnitude of income reduction in the automotive sector is larger comparing to the country's average, proxied by change in quarterly real GDP per workforce reported in *Labor Force Survey*, conducted by National Statistic Offices (NSOs).¹⁴ From the second quarter 2008 to the first quarter 2009, (real) GDP per workers reduced by 2.1 percent.

Based on our interviewed samples, male and female workers have more or less the same chance to be laid off. Particularly, 77.6 percent of male workers are still working in the industry. The corresponding percentage for female workers is a bit higher, i.e. 78.3 percent. Inferring this finding to the gender discrimination problem countrywide must be cautious as the study's survey sample is too small to do so. In terms of an effect on income, male and female workers experienced 42.4 and 36.6 per cent, respectively, reduction in their income (Table 9). In our sample, male workers have more working experience in the automotive industry than female workers have: 5 years and 7 months (67 months) versus 3 years and 10 months (46 months). Also, 94.0 and 91.3 percent of male and female workers received/has received training at their workplace, respectively.

In terms of benefit reduction, managements and professional mentioned that their concern is a decrease in bonus while some production workers report that their enterprises cut transfer services between home and the manufacturer. Some interviewees mentioned that their enterprises canceled the new year party and a family fun day to save the cost. This is a part of reduced non-labor cost of the enterprises. What revealed by workers is decreasing overtime operation and working days are the most severe effect on them. Therefore, their earnings have substantially reduced and this forced some workers to quit their jobs. In general, there is a consultation between enterprises and trade union in employing measures that would affect workers. For

¹⁴ The better proxy, quarterly wage compensation per workers, is constrained by data availability problem.

example, when an enterprise reduced working days of the production workers, the trade union at this enterprise help negotiate so that the workers were still be paid 75 percent of the earnings of those working days. The case of Auto Alliances November last year where there was labor strike and one-month operation cease tends to exceptional and unlikely to infer to the overall relationship between enterprises and trade union in the automotive sector.

It is likely that the effect of global recessions on workers can pass through to their close relatives in rural areas as about 90 per cent of interviewed workers (i.e. 82 workers) sent remittances to their relatives in rural areas. There are only 8 male workers who have not sent any remittances. Most of these 82 workers send remittances on a regular basic, i.e. every month, every two/three months. In some cases, it occurs for a special occasion like Thai New Year (i.e. Songkarn). The remittance amount is within a range between 500 and 6,000 baht averaging out at 3,750 baht a month. When the recession has been in effect, 73.2 per cent of these 82 workers cut their remittances. 26.8 per cent of these workers or 22 workers, dominated by male workers (16 out of 22 workers), remain unchanged their transferred amount simply because they leave their children in rural areas. 73.9 percent of female workers significantly reduced the remittance payment to family while the corresponding figure for male workers is 69 percent. As expected, employed and unemployed workers reduced the remittance payment to their family differently. 47.4 per cent of the latter cut remittances more than 75 per cent. The corresponding figure for the former is about 15.9 per cent.

Interestingly, as mentioned above there are 22 workers who do not change their remittances made to their relatives in rural areas. 15 out of these 22 workers received financial supports from their friends and social networks or the Thai government, i.e., a 'Bt 2000 Government Cheque'.¹⁵ The other workers are in the management level and completed their education at least with a bachelor degree¹⁶ so that they have been slightly affected by the crisis in terms of income reduction. In particular, their income decreased by 12.8 percent compared to the whole sample average at 41 percent. They have more perspective about personal savings.

¹⁵ Note that 51 workers from the total samples received a 'Bt 2000 Government Cheque'.

¹⁶ There is a worker who just completed a primary education. This worker got access to loan from the local financial institute (the cooperative) to smooth the consumption.

Regard to other measures undertaken by workers to cushion the impact of global recession, half of workers interviewed cut their expense in food, utilities, transport, communication and entertainment items. For other expenditure items, it seems unchangeable like rental costs, install payment for durable goods, health care, education. About 31 per cent of them ask financial assistance from friends and relatives. Male and female workers show different patterns in their expenditure cut. The former cuts on foods and drink and entertainment whereas the latter emphasizes on utilities, transports and communications. Interestingly, workers of Tier-2 suppliers have cut expenditures on food minimal, compared to other two groups. Based on the survey, only 23.1 percent of these workers has cut expenditures on food. The corresponding percentage is 61.9 and 60.7 percent of workers in car manufacturer and Tier-1 suppliers, respectively. The different behavior of these workers in cutting their food expense is because the former tends to be in the lower end of the income spectrum as opposed to the latter and always lives in sufficiency with minimal expenditures. It is unlikely for them to further cut food expenses.

5.3 Household

As discussed in Section 5.2, there would be an adverse impact of global recession on households which at have a close relative working in the automotive sector through remittance flows. To assess the impact, the 'affected household' survey was conducted. Household here is referred to that having at least a member or a close relative living elsewhere recently been involved in the automotive industry between June 2008 and August 2009. The sample is drawn independently from the worker sample. The survey was conducted during the period 1-21 August 2009 through both face-to-face and phone interviews with 50 households in 19 provinces, 11 of which are in the northeast region. The others are in Central provinces such as Singburi, Kamphaengphet and Uthaitani and Eastern provinces (e.g. Chonburi). 30 household samples are those a family member is working in the automotive industry and 20 households where a family member has been dismissed from the industry. The average member in a household is 5 people, of which 4 members aged 15 years or older. Figure 7 provides a distribution of some households samples in Northeastern provinces.

Since 47 out of 50 households in the survey receive remittance payments from their relatives working in the automotive industry, these households are negatively affected by the effect of global recession. When the global recession hits the automotive industry, workers lower their remittances to their relatives in rural areas (i.e. households) (see further discussion below). The average amount of remittances from relatives working in the automotive industry is 2,500 baht. Under a specific assumption, this amount of remittances accounted for about 50-62.5 per cent of standard cost of living.¹⁷ The households also receive remittances from relatives working in other occupations (e.g. other industries, civil servants, agriculture sector, and informal sector). Note these households including the three which do not receive remittances own residences and earn their own income. Hence, received remittances account for about 30.8 per cent of total household revenues (incomes plus remittances)

About 75 per cent of them receive them on regular basis, i.e. every month, every three months. Few of them receive on occasional, i.e. special occasion like New Year and Songkarn. Given the level of household income (12,000 baht) and the cost of living (4,000-5,000 baht)¹⁸, received remittances help them to achieve higher living standard especially having more durable goods (cell phone, vehicles, and electrical appliances). Even though when the global recession took place and their close relatives cut their remittances by 45.4 per cent, it reduces households' revenue by 12.1 per cent. Note that a reduction in income of households whose a close relative is still working is about 13.8 percent. This is higher than those whose a close relative was retrenched. The latter's corresponding percentage is 11.5 percent. The resulting discrepancy can be explained two reasons. First, 3 and 5 households with employed and unemployed workers in the automotive industry have their members started working, respectively. One retrenched worker has received monthly income 40 per cent higher than a previous job in an auto-part supplier and she has not reduced the remittance support. Second, 5 out of 28 household

¹⁷ The monthly living cost estimate is based on experience of a household which consist of parents, a boy (nephew) who has not been yet in school and a teenager (son) in the secondary school. The estimate is regarded as the upper bound for the household sample as there are two dependents living in the household. A number of dependents are less for other samples. This estimate is used to provide a rough picture of how large remittances are. It cannot be generalized for all households in Northeastern provinces. Of course, living expense vary greatly to household size and the structure of household members (a number of members in school).

¹⁸ See footnote 7 for the living cost estimates

members who are still working in the automotive industry completely stop sending remittance payment. On the other hand, only 2 out of household member who has been retrenched from the industry cuts the remittances completely.

The observed moderate effect of the global recession on households needs to be interpreted with cautious as a number of household samples are rather small and the study might be subject to the sample selection bias problem. Pointed by local community persons and some household samples, there might be households that are vulnerable to poverty. These samples are likely to be reluctant to share their information. Particularly, interview with local community people e.g. social security office's staff, member of local authority, suggests that some former employees of the automotive industry are facing difficulty to pay financial debt (e.g. credit cards) so that their families (households in our study) are to a certain extent reluctant to share such information. These families are likely to be those severely affected by the impact of global recession.

While the current global crisis also directly affects household income, their jobs are not really related to the global economic performance to a large extent. All households earn their own income. There are 37 households receiving income from their own enterprises such as weaving, selling vegetables, operating their own farm. 24 households receive income from wage/salaried employment such as a policeman and a teacher. In a given household, there might be two members, one running its own business and the other being salaried employment.¹⁹ In addition, 50 percent of households are still getting remittances from other members, who are working outside the automotive sector. Hence the negative effect on households' income is about 12.1 percent. About 70 per cent of interviewed households mentioned the negative factors like price hike and energy price hike as a direct consequence of global recession. Moreover, 24 households have experienced a decrease in price of their own agricultural products. Besides, some households that have their own business are facing more competitors as other households who are affected somehow by the global recession re-enter informal sectors. This would make rural people more vulnerable to working poverty.

¹⁹ Mathematically, intersection between these two sets is not an empty set.

To cope with the impact of global recession, most of households (i.e. 88 per cent) prefer cutting their expense to increasing their income (more members start working and/or members increase their working hours) (Table 12). As mentioned earlier, these interviewed households are not at the border of poverty line, they cut their expense moderately. In addition, most households are in rural areas and usually catch fishes in a river and plant some vegetables in their backyard. Cutting expenditures on food would not affect their daily meal. When education issue is concerned, Information based on the household samples is not sufficient to conclude about the likelihood that households pull their children from school as a result of global recession. Note that this might be influenced by the sample selection bias discussed above.

6. Conclusion and Policy Inferences

Given the current developmental stage where Thailand's automotive sector (both car manufacturers and part suppliers) is highly integrated to the global economy, the current global recession inevitably have a significant adverse effect on the sector performance. The sector experienced significant output contraction. Vehicle production volume contracted by 54 per cent in the first half of 2009 comparing to 2008. This inevitably induces an adverse effect on auto parts industries through their interconnection within the production networks. All interviewed enterprises experienced sale decline by about 34 per cent.

This caused a negative impact of labor demand from the automotive industry. Based on our survey sample, total employment of all interviewed enterprises dropped by 23 per cent between June 2008 and June 2009. Interestingly, the magnitude of output contraction is far greater than that of employment contraction, reflecting the relatively high degree of skill-labor intensity, the relative importance of tacit knowledge, and to a certain extent the efforts of enterprises to avoid retrenchments.

It is unlikely for economic recovery to be V-shaped. According to our freshly built econometric model in this paper, vehicle production in 2010 is predicted to reach 977,257 units. It accounted only 70 per cent of the 2008 production volume. Given the bleak economic

recovery and the fact that the slow and lagged recovery of labor market, unemployment is one in ongoing policy challenges.

Based on our survey, temporary, young, low education level, less experience workers are the most vulnerable to be retrenched in presence of negative shock like the current global recession. Our study fails to find any evidence that female workers are more likely to be retrenched as opposed to males. They are likely to be working poverty and usually urban-rural migrants. Hence, the adverse effect of global recession can pass through to rural areas and causes reverse migration. This eventually has a negative impact on poverty.

While enterprises opt to terminating contract of temporary workers, reducing working hours and laid-off to mitigate the adverse impact of global recession, most of retrenchment is a consequence of reducing working hours as revealed in both enterprises and workers survey. Interestingly an option like sought new customers seems to be very difficult due to the nature of production networks where exchanged products are tailor-made.

There is evidence suggesting the effort to avoid retrenchment by the enterprises but different firm has different ability to hold their '*trained*' workers. Such ability largely depends on access to financial resources. As a result, employment contraction in part suppliers and indigenous suppliers in particular is higher as opposed to car manufacturers though the former tends to be more skill-specific than the latter. Particularly, employment contraction in indigenous and small-medium enterprises was 40 per cent or more.

The magnitude of global recession impact measured in terms of income contraction is more severe as opposed to the countrywide average. As expected, the magnitude of income decline for unemployed workers is tripled those still employed. Only 40 per cent of total retrenched worker samples, accept new job at the lower wage; 3 and 5 workers in formal and informal sectors, respectively. The others remain unemployed workers.

In the automotive sector, many workers and temporary ones in particular are urban-rural migrants. Migrant decision takes place if and only if these workers earn positive income, additional wage in the formal sector net of higher living expenses from staying in the Auto cities like Rayong, Chchoengsao, Chonburi, Aydhaya and Pathumthani. Between 2007 and 2008, most of enterprises in the automotive sector ran overtime operation so that workers can earn adequately to cover their more expensive living expenses. When the industry was hit by global recession and these factories run only normal operating hours, many workers are indirectly forced to leave their jobs.

Interestingly, even workers remain in the Auto cities and are looking for new jobs whereas the rest are likely to move either to other provinces or return their hometown in rural areas. The rationale for the former still in the Auto cities is simply because they have higher expectation about job opportunities there than somewhere else.

Most of interviewed workers sent remittances to their relatives in rural areas. When the effect of global recession takes place, three-fourth of them cut their remittances in responses to the global recession. The others remain unchanged their transferred amount simply because they leave their children in rural areas. Nonetheless, it does not cause any significant effect on households in rural areas as these households still earn their own income and their occupations are not really related to the global economic performance.

Noteworthy, the observed moderate effect of the global recession on households is likely to subject to self selection bias where we can observe only households that are far above the poverty line. Pointed by local community persons and some household samples, there might be households that are vulnerable to poverty. These samples are likely to be reluctant to share their information.

To cope with the impact of global recession, most of households (i.e. 88 per cent) prefer cutting their expense to increasing their income (more members start working and/or members increase their working hours). Cutting expenditures on food would not affect their nutrition intake simply because many households usually catch fishes in a river and plant some vegetables

in their backyard. Information based on the household samples is not sufficient to conclude about the likelihood that households pull their children from school as a result of global recession.

Experience observed in Thailand's automotive sector suggests that given the continued importance of global production network, retrenchment seems to be unavoidable option for enterprises in presence of negative shock like the current global recession. This issue is far more important for industries/enterprises whose competency is mainly driven by labor skill and tacit knowledge. Letting trained workers go incurs sizable costs to enterprises and could, to a certain extent, negatively affect their upgrading process countrywide. Hence, some policy measures are needed to mitigate any possible adverse impact of negative shocks on the industry and workers.

In this study, there are two policy inferences. Firstly, the government can play a role in enhancing enterprises' ability in holding their trained workers by establishing loans on standby for enterprises to delay worker retrenchment and cope to any negative shocks.²⁰ While it is definitely far beyond the scope of recent study to give all details what a newly established credit channel would be, a noteworthy feature of the proposed loans is that they should be able to quick respond to any shocks that might occur in the future. In other words, loans must be channeled wisely and timely simultaneously. 'Wisely' and 'Timely' seem to be a tradeoff in the traditional credit channel like commercial banks and state-owned banks like SME Bank which are country wide to prevent the default risk. By contrast, for loans on standby 'wisely' and 'timely' must go hand in hand so that a newly established credit channel is needed to serve both objectives simultaneously. In order to simultaneously achieve both purposes (wisely and timely), there would be a direct channel injecting funds to enterprises in presence of negative and country-wide shocks. One possible solution is to make use of the existing production network where car manufacturers are in the centre and have better information about part suppliers' performances.

²⁰ In March 2009, Thai government launched the career training and development program, namely "Career Plant" program to offers more job opportunities for the unemployed person, nearly unemployed, and new graduated persons totaled 500,000 persons. Such a program, however, cannot assist enterprises to hold trained workers. It simply helps freshly retrenched employees to find a job which is not really related to skills acquired so far. According to interview, President of Thailand Auto Part Manufacturers Association (TAPMA) urged that such measures are not very helpful and more importantly too late (Pracha Chat Turakit, April 2009). The same impressions are also revealed in our survey evidence.

Particularly, the former monitors the latter closely on a purpose of the vehicles' competitiveness and pressures them for technological improvement successively. With this advantage, a car manufacturer can be a potential candidate to be an intermediate. There is also a room for international organization like International Labor Organization (ILO), Asian Development Bank (ADB) and World Bank to participate in the loan in terms of finding financial resources.

Secondly, the impact of global recession on the automotive sector raises need for the country's economic shock absorber. As an economy is increasingly integrated to the global economy, it is unlikely to avoid adverse effect induced by shocks both positive and negative occurring elsewhere. The shock absorber includes unemployment insurance scheme and other social safety net schemes. While these measures are not new, what remains policy challenging is how we implement them effectively and efficiently. They would be in a top position in the policy agenda. One rather new kind of the absorber from this study is to promote local-community oriented economic activities. As found in the household survey, many of them have not been affected severely and few of them can help their relatives simply because they run their own business. This business is rather small and self-sufficient within a local community. This concept would be in line with the King's sufficiency theory.

Table 1
Production Capacity (Units) of Thai Car Assemblers, 1989-2006

	1989	1994	1999	2003	2005	2006
Toyota	24,000	100,000	200,000	240,000	350,800	450,000
Mitsubishi	40,000	126,600	160,000	190,200	170,200	208,000
Isuzu	27,400	83,200	140,600	189,600	200,000	200,000
General Motor	n.a.	n.a.	40,000	40,000	100,000	160,000
Auto Alliance & Mazda	7,200	8,400	135,000	135,000	135,000	155,000
Nissan	23,520	96,500	113,100	124,000	102,000	134,400
Honda	8,220	39,000	70,000	80,000	120,000	120,000
Hino	9,600	9,600	9,600	28,800	28,800	28,800
DaimlerChrysler	2,340	4,600	14,900	18,100	16,300	16,300
YMC Assembly	12,000	12,000	12,000	12,000	12,000	12,000
Volvo	6,000	6,000	6,000	6,000	10,000	10,000
BMW.	n.a.	n.a.	n.a.	n.a.	10,000	10,000
Total	160,280	485,900	901,200	1,063,700	1,255,100	1,576,500
Average Annual						
Growth *	-	24.8	13.2	5.7	5.7	19.9

Source : Thai Automotive Industry Association reported in Kohpaiboon (2009)

Table 2
Values of Thai Vehicle Export and Import, 1999-2007

	1999-2001	2002-04	2005	2006	2007
Export (\$million)	1609	2825	5198	6648	8227
<i>Percentage share</i>					
Passenger car 1000-1499 cc.	1	11	9	9	8
passenger car 1500-3000 cc.	13	13	19	23	23
one-ton pickups	67	57	44	47	43
Import (\$million)	488	548	795	772	1013
<i>Percentage share</i>					
passenger car 1500-3000 cc.	45	37	33	24	19
passenger car larger than 3000 cc.	8	11	6	6	4
Bus	13	16	29	29	33
Truck	11	10	5	5	7

Notes: passenger car 1000-1499 cc., 1500-3000cc. and greater than 3,000 cc are referred to HS870322, 870323 and 870324, respectively. One ton pick up truck is HS870421 whereas bus and truck are HS8702 and 8704, respectively.

Source: Compiled from UN Comtrade Database

Table 3
Percentage Share of Export Destination of Thai Vehicles, 1999-2007

	ASEAN-10	Indonesia	Philippines	Australia	Japan	Others	Total Value (\$million)
1999-2001							
Passenger cars	11.9	1.5	0.1	14.8	9.7	62.3	353.1
Trucks	4.5	0.2	0.7	23.8	0.1	71.6	1,266.7
Others	73.6	3.1	1.1	1.5	0.3	24.1	14.2
Total	6.7	0.5	0.6	21.7	2.2	69.2	1,634.1
2002-05							
Passenger cars	50.1	21.3	10.6	14.9	7.8	26.3	1,134.4
Trucks	6.8	2.7	0.9	23.0	0.2	70.1	2,223.2
Others	77.4	1.0	0.4	1.4	0.5	20.4	26.0
Total	21.8	8.9	4.1	20.1	2.7	55.0	3,383.5
2006-07							
Passenger cars	34.3	10.7	9.6	29.9	1.6	34.2	3,387.7
Trucks	5.8	2.5	1.0	18.6	0.2	75.4	3,990.3
Others	77.6	2.2	0.1	16.2	0.5	5.6	59.7
Total	19.4	6.2	4.9	23.7	0.9	56.0	7,437.6

Source: Compiled from UN Comtrade Database

Table 4
Basic Information of Interviewed Enterprises

	Number	Number of Pure Thai Enterprises	Export-output Ratio	% Sale Contraction between June08-June09	
				Domestic Market	Export
All Samples	41	12	19.8	-33.9	-14.2
Car-makers	5	0	41.9	-43.3	-30.3
Tier-1 Suppliers	24	4	20.8	-32.6	-11.8
Tier-2 Suppliers	12	8	8.8	-34.1	-13.8

Source: Compiled from the Enterprise Survey conducted by Authors.

Table 5
Number of Enterprises employing measures to cope with the impact of global recession, June 08-Aug 09

	All Samples	Carmakers	Tier-1 Suppliers	Tier-2 Suppliers
Cancelled/delayed upgrading of existing facilities	11	1	8	2
Cut-back production	40	5	23	12
Reduced non-labor costs	39	4	23	12
Sought new customers/markets	13	3	7	3
Reduced labor costs	35	3	21	11
Reduce workers	39	5	23	11
Stopped operation temporarily	39	5	23	11
Stopped recruiting workers	39	5	23	11
Reduced working time/shift	38	4	23	11

Source: Compiled from the Enterprise Survey conducted by Authors.

Table 6
Employment Structure of Interviewed Samples

	All Samples		Carmakers		Tier-1 Suppliers		Tier-2 Suppliers	
	June 08	June 09	June 08	June 09	June 08	June 09	June 08	June 09
Number of Workers	61,930	47,602 (-23%)	23,975	18,972 (-21%)	35,052	26,452 (-25%)	2,903	2,178 (-25%)
% of Total Workers								
Temporary workers	23.2	11.1	32.8	19.6	16.1	4.8	29.5	12.7
Female workers	8.3	9.2	5.6	6.7	10.3	10.9	7.6	9.9
Management and Professionals	7.6	8.7	8.2	10.1	7.1	7.4	9.2	11.7
Production Workers	74.8	73.6	73.8	71.3	75.3	75.5	77.2	71.3
Other Non-production Workers	15.4	17.7	12.6	18.6	17.5	17.0	13.8	17.3

Notes: * The number in parentheses indicates the percentage change from June 2008.

Source: Compiled from the Enterprise Survey conducted by Authors.

Table 7
Enterprises' Strategy in Adjusting their Existing Workforce in Response to the Global Recession

	All Samples		Carmakers		Tier-1 Suppliers		Tier-2 Suppliers	
	Total workers	Female workers	Total workers	Female workers	Total workers	Female workers	Total workers	Female workers
Developed flexible work arrangements	27.2	4.1	2.5	2.5	31.4	6.6	27.8	0.0
Provided Training	24.6	7.3	17.5	1.6	31.8	12.1	13.3	0.0
Reduced working time	78.5	16.8	84.1	55.3	70.3	14.3	91.7	8.3
Reduce earning (wages and bonus)	32.4	5.7	2.1	8.3	27.9	8.3	50.7	0.0
Reduced benefits	15.9	0.2	0.0	0.0	13.9	0.3	25.0	0.0
Offer unpaid leave	7.3	5.4	45.5	26.0	4.4	4.5	0.0	0.0
Laid off workers	17.3	3.1	45.2	7.9	10.0	1.6	21.5	4.5

Source: Compiled from the Enterprise Survey conducted by Authors.

Table 8
Request for Government Assistance
(Ratio of Enterprises which choose the following option as a percent of total sample)

	All Samples	Carmakers	Tier-1 Suppliers	Tier-2 Suppliers
Provide credit	26.8	40.0	20.8	33.3
Provide support for skill	29.3	0.0	33.3	33.3
Provide tax reduction	53.7	80.0	54.2	41.7
Provide subsidies on input costs	41.5	60.0	54.2	8.3
Provide subsidies on wages	4.9	40.0	0.0	0.0
Provide reductions in employers' contribution	43.9	60.0	41.7	41.7

Source: Compiled from the Enterprise Survey conducted by Authors.

Table 9
Summary of Worker Survey

	No. of Samples	Age (Years)	Working Experience in the auto industry (Months)	Working Experience at the current Enterprise (Months)	Receiving Training	Income Reduction (%)
Total	90	29.3	62.3	56.4	84	40.9
Male	67	30.0	66.6	60.7	63	42.4
Female	23	27.3	45.8	39.5	21	36.6
Employed	70	29.3	70.8	64.2	66	29.9
Unemployed	20	29.2	35.3	31.9	18	79.5
Automaker	21	31.2	79.3	76.0	21	39.0
Tier-1 Suppliers	56	28.8	56.8	50.9	51	32.5
Tier-2 Supplier	13	28.2	58.3	48.6	12	37.3
Management&Professional	9	33.6	75.2	62.2	9	25.7
Production workers	74	28.9	62.2	57.0	68	43.1
Non-production workers	7	28.0	47.0	43.3	7	37.7

Source: Compiled from the Worker Survey conducted by Authors.

Table 10
Average Income Reduction of Workers in the Automotive Industry (Percent)

	Automaker	Tier-1Supplier	Tier-2 Supplier	Total
Employed Workers	24.6	30.3	36.3	29.9
Unemployed Workers	100	76.0	50.0	79.5
Total	39	42.5	37.3	40.9

Note: CPI of the central region is used as a proxy of the deflator of Eastern region due to data unavailability.

Source: Compiled from the Worker Survey conducted by Authors.

Table 11
Worker Coping Mechanisms (Per cent of workers to total sample)

	Remittance Payment*	Food	Utilities/ Transport/ Communication	Entertain Expense	Assistance from Family	Assistance from Friends & Relatives
Total (90 Workers)	73.2	55.6	55.6	59	7.8	31.1
Male (67 Workers)	72.9	85.1	49.3	61.2	9.0	31.3
Female (23 Workers)	73.9	56.5	73.9	43.5	4.3	30.4
Employed (70 Workers)	71.4	51.4	51.4	58.6	5.7	20
Unemployed (20 Workers)	78.9	70.0	70.0	60	15	70
Car manufacturers (21 Workers)	60.4	61.9	52.4	80.9	9.5	19
Tier-1 Suppliers (56 Workers)	76.5	60.7	64.3	51.8	8.9	32.1
Tier-2 Suppliers (13 Workers)	66.7	23.1	23.1	53.8	0	46.2

Note: *This option is applicable for 82 workers (23 and 59 female and male workers, respectively; 63 and 19 employed and unemployed workers, respectively; 19, 51 and 12 workers in Car manufacturers, Tier-1 Suppliers and Tier-2 Suppliers, respectively.) who sent remittance payments to their households before the recession.

Source: Compiled from the Worker Survey conducted by Authors.

Table 12

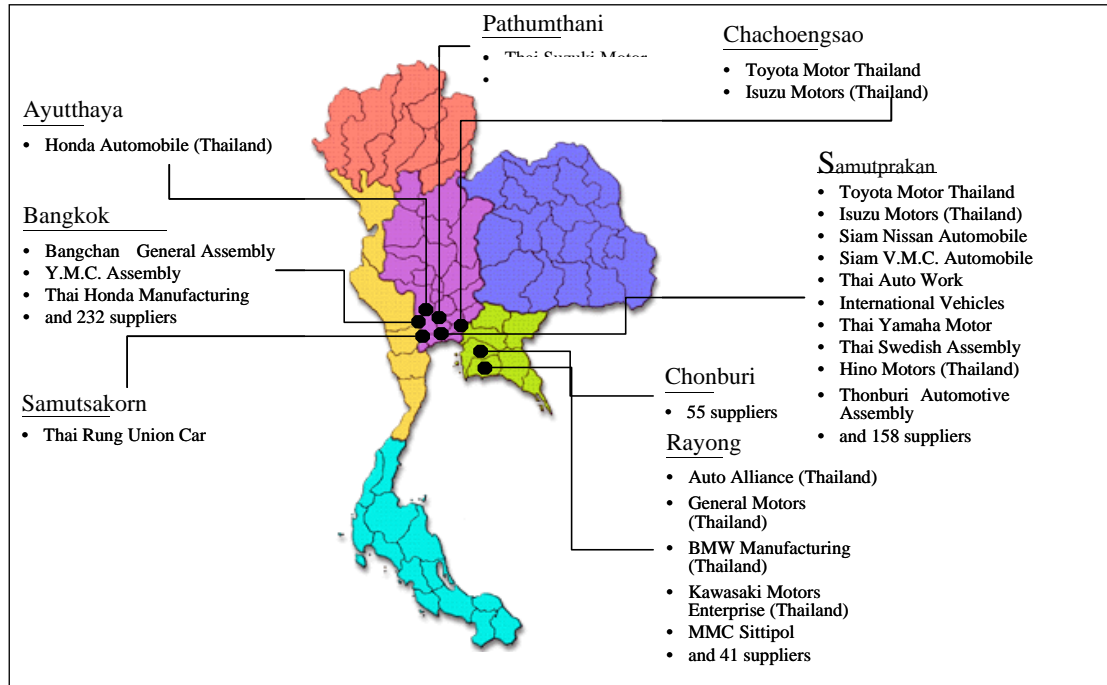
Household Coping Mechanisms (% of total samples)

	Household Reponses (% of total samples)			Reducing Expenditures				Financial Supports	
	Started Working	Increased Working Hours	Reducing Expenditures	Food	Utilities / Transport / Communication		Government	Friends and Social Networks	
					Moderately	Significantly			Moderately
Total (50 HHs)	16	8	88	62	6	42	14	46	16
Employed Households (30 HHs)	10	6.7	86.7	53.3	3.3	36.7	13.3	40	20
Unemployed Households (20 HHs)	25	10	90	75	10	50	15	55	10

Note: Employed households are referred to those having a close relative is working in the automotive sector whereas unemployed ones are those whose a close relative was retrenched from the automotive sector.

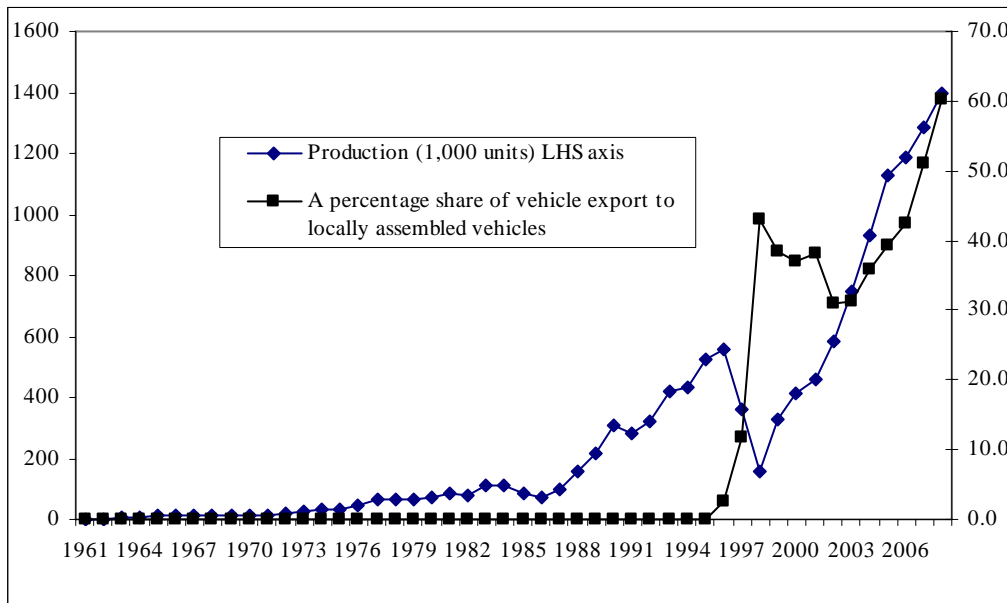
Source: Compiled from the Worker Survey conducted by Authors.

Figure 1
Locations of Car Manufacturers in Thailand



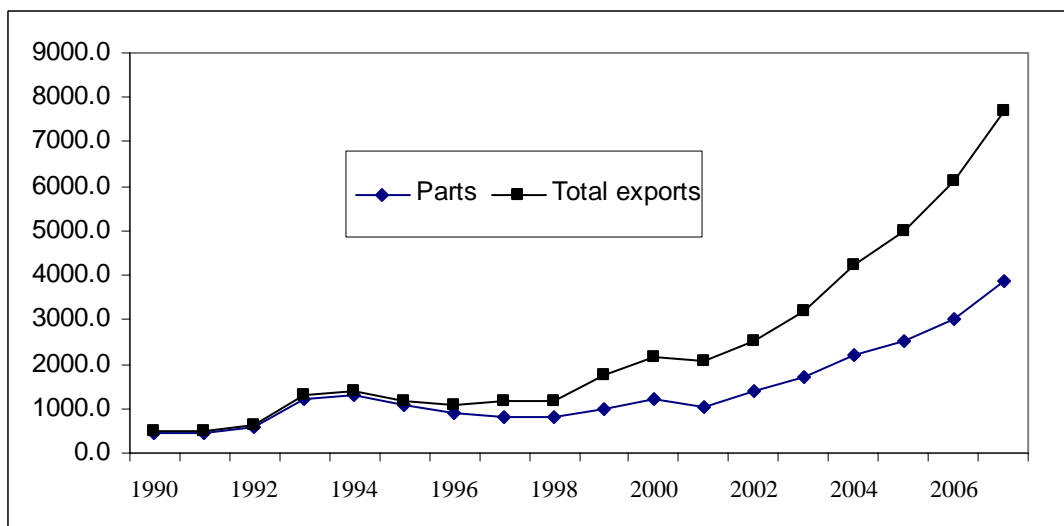
Source :Thai Automotive Industry Association

Figure 2
Volume of Vehicle Production and Share of Vehicle Exports, 1961-2008



Source: Thai Automotive Association

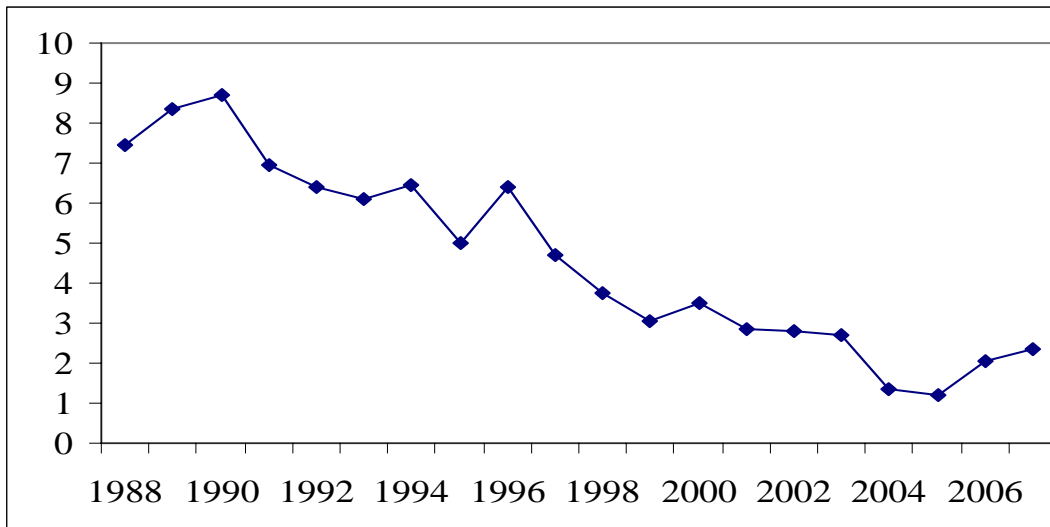
Figure 3
Export Value (\$million) of Thai Automotive Industry, 1990-2007



Note: Lists of auto parts are compiled from carefully choosing from 6 digit HS items. The final lists cover 91 items from HS39, HS40, HS85 and HS87. See the full list of auto parts in Appendix 1 of Kohpaiboon (2009).

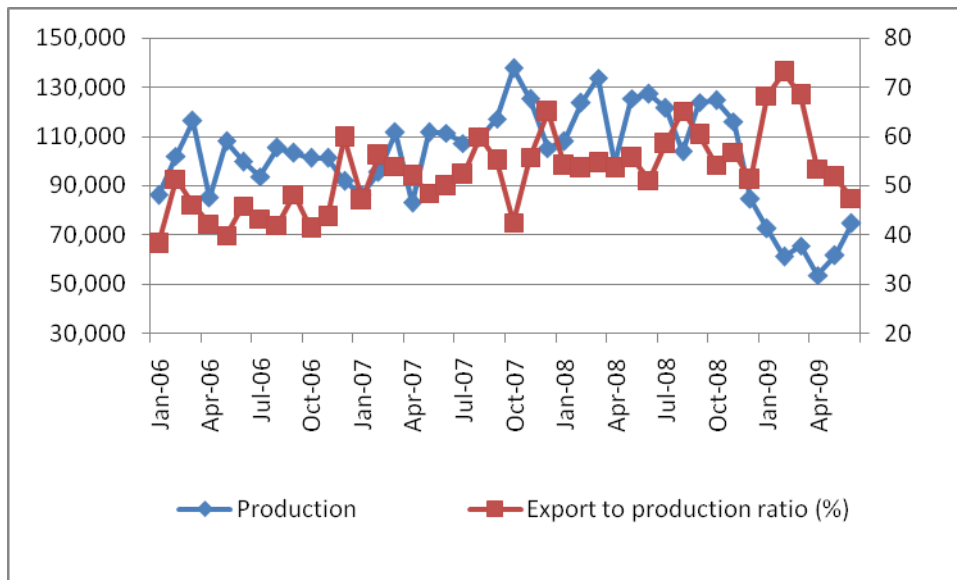
Source: Compiled from UN Comtrade Database

Figure 4
Ratio of (real) Import Value of Parts to Locally Assembled Cars
(\$million/1000 units), 1988-2007.



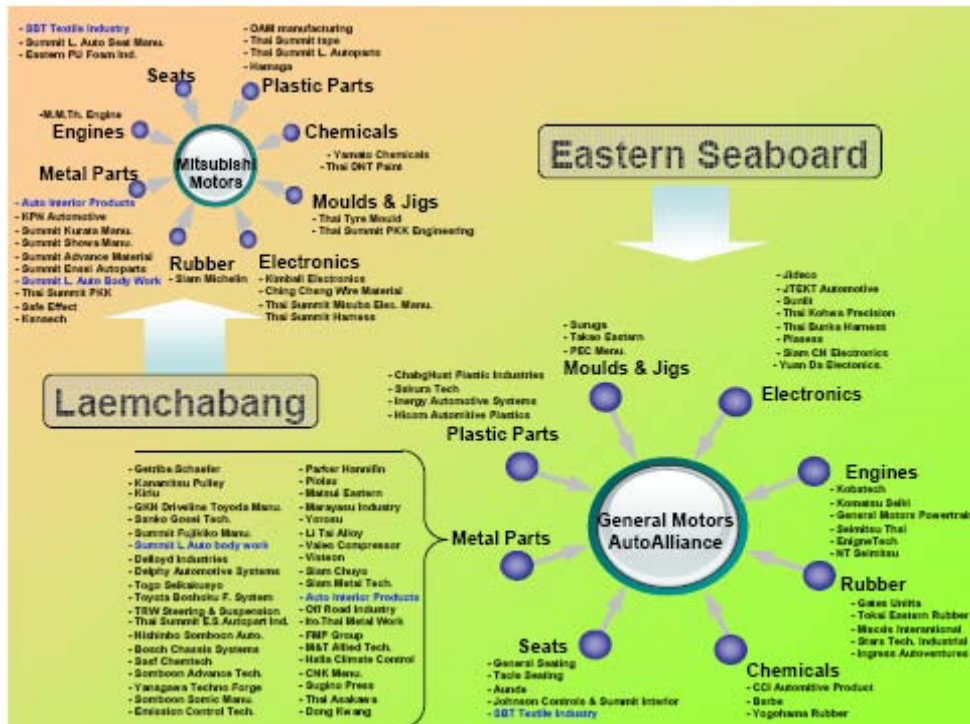
Source: Import value of parts is compiled from UN Comtrade Database according to the list in Appendix 1 of Kohpaiboon (2009) whereas vehicle units and their share are from Thai Automotive Industry Association.

Figure 5
Vehicle Production Jan 2007- Dec 2009



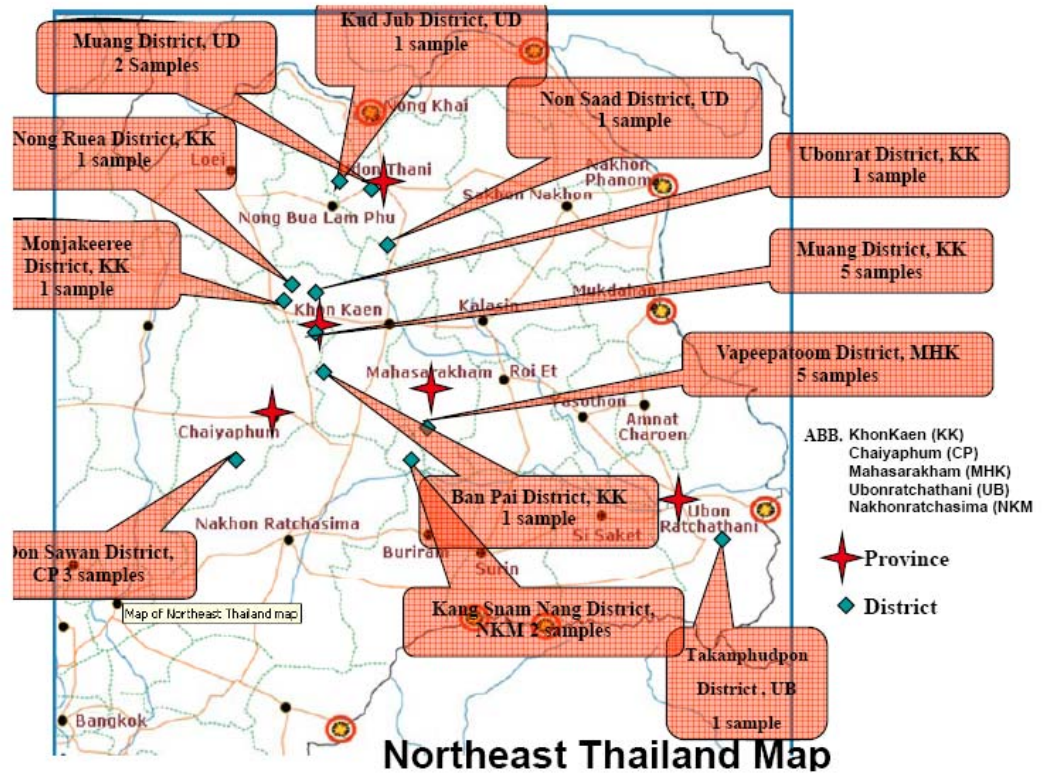
Source: Thai Automotive Institute

Figure 6
Automotive Clusters in Eastern Thailand



Source: data for Laemchabang Industrial Estate are a result of internet searching whereas those from Eastern Seaboard are compiled from the lists provided by the official source.

Figure 7
 Distribution of Selected Household Samples in Northeast Thailand



Source: Authors' Compilation from the Household Survey

Appendix 1

Reduced-form Vehicle Production in Thailand

In order to provide a broad picture how automotive production would be adversely affected by global recession, a reduced-form vehicle production equation is estimated. Basically, vehicle production is jointly determined by demand for and supply of vehicles. Demand is further disaggregated into that for domestic market and export. Domestic demand for vehicle (D) is a function of vehicle price (P), income ($GDPg$), wealth (W), credit availability (CRA) as expressed with their theoretically expected sign in Equation A.1

$$D = d(P, GDPg, W, CRA) \quad (A.1)$$

(-) (+) (+) (+)

In theory equation A.1 is also applied for export demand. Nonetheless, major export destination of Thailand's manufactured vehicles are Australia (28.6% in 2007), EU-15 (15.7%), Indonesia (6.4), the Philippines (5.2%) and developing economies in Middle East (14.2). It is statistically impossible to have these four explanatory variables for each country. To overcome this problem, the weighted average of GDP growth in the major export destination is used as a proxy of the income and wealth effect on demand for Thai manufactured vehicles (henceforth referred to as World demand for brevity). The weight used here is the export share. The major export destination included Australia, New Zealand, Indonesia, Malaysia, the Philippines, Singapore, EU-15 and the Middle East, all of which accounted for about 80 per cent of total vehicle export from Thailand between 2005 and 2007. All in all, world demand and export demand function are expressed in Equation A.2 as follows;

$$X = x(P_x, WD) \quad (A.2)$$

where P_x = export price

$$WD_{it} = \sum_{i \in N} GDPg_{it} * \alpha_{it}$$

$GDPg_{it}$ = annual (real) GDP growth of country i at time t

α_{it} = export value share of country i at time t

Vehicle supply is a function of its price and production capacity. Since the automotive industry as suggested in the previous studies (Kohpaiboon, 2006; 2009), is dominated by multinational enterprises (MNEs), production capacity is proxied by FDI inflows into the Machinery and Transport Equipment. The greater the FDI inflow, the greater the production capacity. In the automotive industry, trade and production patterns are largely determined by car MNEs. Decision to export and domestic sales are to a certain extent independent. Hence, export volume seems to be independent to how much vehicles are produced to serve domestic market. Hence export and domestic prices are incorporated in supply function (Equation A.3);

$$S = s(P, P_x, FDI) \quad (A.3)$$

(+)(+) (+)

A number of manufactured vehicles are jointly determined by supply and demand (both domestic market and export), i.e. $S = D + X = Q$. Note that Thailand started exporting vehicles substantially from 1998 onward. Hence, world demand effect is taken into consideration after 1998. To obtain the estimating model, Equations A.1 and A.2 are inversed so that we can replace P and P_x in Equation A.3. All in all, the estimating model is expressed in Equation A.4 below;

$$Q = g(GDPg, W, CRA, WD, CRA, FDI) \quad (A.4)$$

(+)(+) (+)(+) (+)(+)

Q = A number of manufactured vehicles

$GDPg$ (+) = (Real) GDP growth in Thailand

W (+) = Wealth of private sector measured by the sum of

(time and

saving) deposit and market capitalization

WD (+) = World demand measured by the weighted average of GDP growth of major exporting countries. Note that WD is equal to zero between 1971 and 1997 as Thailand did not export any vehicles.

CRA (+) = Credit Availability measured by claim on private sector .

FDI (+) = Foreign direct investment inflows into the machinery and transport equipment sector.

(The theoretically expected signs in the parentheses)

All variables except $GDPg$ and WD are in natural logarithm so the estimated coefficients can be interpreted as the elasticity. $GDPg$ and WD the growth rate which can be either positive or negative so that $\ln(1+x)$ is used to transform it and they can be interpreted as the percentage change of vehicle production with respect to a change in $GDPg$ and WD , respectively.

Equation A.4 is estimated, using data between 1971 and 2007. A number of manufactured vehicles are from Thailand Automotive Institute whereas FDI inflows are the series collected by Bank of Thailand. Claim on private sector, wealth and GDP growth are compiled from International Financial Statistics (CD-ROM) (December 2008) and World Economic Outlook Database, International Monetary Fund (IMF). Trade weight is from UNComtrade where vehicles are defined as HS8701-8704.

In line with the standard practice in time-series econometrics, the time series property of data was tested at the outset using the Augmented Dickey-Fuller (ADF) test. According to the test results, the variables under consideration are non-stationary, i.e. $I(1)$ (Table A.1). In this study, General-to-Specific (GSM) Model proposed by Hendry *et al.* (1984) is used to estimate equation of vehicle production. As argued in Wickens & Breusch (1988), Hargreaves (1994), Hendry (1995) and Pesaran *et al.* (2001), it tends to provide more precise estimate than the fashionable co-integration technique. The GSM model can be written in terms of short-run and long-run (cointegration) relationship as in equation (A.5).

$$\Delta Y_t = \alpha + \sum_{i=1}^{m-1} A_i^* \Delta Y_{t-i} + \sum_{j=1}^k \sum_{i=0}^{m-1} B_{ij}^* \Delta X_{j,t-i} + C_0 Y_{t-m} + \sum_{j=1}^k C_1 X_{j,t-m} + \mu_t \quad (\text{A.5})$$

where α is a constant, Y_t is the dependent variable, $X_{j,t}$ is the j^{th} explanatory

variable and A_i and B_{ij} are the parameters. $A_i^* = -\left[I - \sum_{i=1}^{m-1} A_i \right]$, $B_{ij}^* = \left[\sum_{i=0}^{m-1} B_{ij} \right]$,

$$C_0 = -\left[I - \sum_{i=1}^m A_i \right],$$

$$C_1 = \left[\sum_{i=0}^m B_{ij} \right], \text{ and the long-run multiplier of the system is given by } C_0^{-1}C_1.$$

Equation (A.5) is the particular formulation generally used as the ‘maintained hypothesis’ of the specification search. The estimation procedure involves first estimating the unrestricted equation (A.5), and then progressively simplifying it by restricting statistically insignificant coefficients to zero and reformulating the lag patterns where appropriate in terms of levels and differences to achieve orthogonality. As part of the specification search, it is necessary to check rigorously at every stage even the more general of models for possible misspecification. Such checks will involve both a visual examination of the residual from the fitted version of the model and the use of tests for serial correlation, heteroskedasticity and normality in the residual, and the appropriateness of the particular functional form used. In particular, any suggestion of autocorrelation in the residual should lead to a rethink about the form of the general model. Above all, theoretical consistency must be borne in mind throughout the testing down procedure.

Table A.2 reports estimates of Equation A.4 with a set of commonly used diagnostic statistics and long-run computed from the steady-state solutions. The standard diagnostic tests include Breusch-Godfrey Serial Correlation LM Test (LM test), Ramsey functional form specification test (RESET test), White Heteroskedasticity test (White test), Jarque-Bera Residual Normality test (JB test) and whiteness of regression residuals (Dickey-Fuller test).

The full model’s equation in Column A of Table A.2 is statistically significant at the 1 per cent level in terms of the standard *F-test* and performs well in all diagnostic tests except the whiteness of regression residuals. Nevertheless, coefficients corresponding to *CRA*, and *WD* in the short run are not statistically significant at the conventional level, i.e. 5 per cent. In addition, a negative coefficient associated to *W* seems to be counter intuitive. Hence, we dropped these three variables. The re-estimation of the full model without these three variables are reported in Column B in Table A.2

Estimated equation in Column B of Table A.2 is statistically significant at the 1 per cent level in terms of the standard *F-test* and performs well in all diagnostic tests. In the short run, coefficients associated with *FDI* and *GDPg* are statistically significant and positive. In the long run, *FDI*, *GDPg* and *WD* coefficients are positive

and statistically significant at 10 per cent or better. While the coefficient corresponding to W is positive as postulated by theory, it is not statistically significant at 10 per cent.

The following discussion focuses on coefficients corresponding to $GDPg$ and WD as they both are in the centre of our interest. When $GDPg$ is concerned, a per cent decrease in Thailand's GDP (e.g. economic growth declined from 6 to 5 per cent) would lead to 6.4 per cent drop in vehicle production in the short run. The long-run impact seems to be higher. One per cent decline in the country's economic growth leads to vehicle production by 20.6 per cent. The long-run impact of WD is smaller than that of $GDPg$. One per cent decline in world demand causes vehicle production contraction by 15.9 per cent.

The stochastic dynamic solution is employed in the vehicle production forecast simulation. In this simulation error correction, standard deviation is taken into consideration in generating the forecasted figure. The following assumptions are used for the forecast simulation.

1. Economic Growth of each country is as follows;

	2008	2009f	2010f
Euro area	0.9	-4.2	-0.4
Middle East	5.9	2.5	3.5
Australia	2.1	-1.4	0.6
New Zealand	0.3	-2.0	0.5
Singapore	1.1	-10.0	-0.1
Indonesia	6.1	2.5	3.5
Malaysia	4.6	-3.5	1.3
Philippines	4.6	0.0	1.0
Thailand	2.6	-3.0	4.0*

Sources: World Economic Outlook Database, *International Monetary Fund*, April 2009 and * the middle point of the forecast by Bank of Thailand.

2. In 2009 and 2010, FDI Inflows will decline by 13 and 5 per cent, respectively. The declining rate used for 2009 is based on the forecast by World Bank as reported in FDI Magazine, *Recession brings a shift in focus* (April 21, 2009).²¹ Nevertheless, in 2010, the forecasted figure is arbitrarily adjusted

²¹ Magazine is available online at http://www.fdimagazine.com/news/fullstory.php/aid/2842/Recession_brings_a_shift_in_focus.html

according to the enterprise interview finding. Particularly, most of firms expect the more intense competition in Thailand and the region (i.e. Southeast Asia and Oceania) as the region's sale prospect seems to be better than Triad region. Hence, investment would not be decreased at much as expected in the global economy.

3. We assume domestic wealth growth rate in 2009 and 2010 equals to the two years moving average, i.e. the growth rate in 2009 is the average rate between 2006 and 2008 and that of 2010 is the average between 2007 and 2009.

Figure A.1 illustrated actual vehicle production between 2000 and 2008 and the forecasts for 2009 and 2010. Based on a comparison between actual and forecasted figures for 2008, the model performs well. Particularly, the 2008 forecast is about 1,320,284 units, the actual one is 1,393,700 units, i.e. underestimation by 5 per cent. In 2009 and 2010, vehicle production is forecasted to reach 876,124 and 977,257 units, respectively. That is, in 2009, vehicle production would contract by 37.1 per cent from the previous year. In 2010, vehicle production would grow by 11 per cent from 2009.

Table A.1
ADF Unit Root Tests, 1971-2007

Variables	<i>t</i> -statistics for level with time trend	<i>t</i> -statistics for first difference
Q	-2.80	-5.24***
FDI	-2.99	-7.11***
GDP	-1.76	-3.27**
W	-0.80	-4.87***
WD	-2.37	-5.56***
CRA	-1.28	-3.10**

Notes: The figures reported are *t*-statistics on γ_1 in the following auxiliary regression.

$$\Delta X_t = \gamma_0 + \gamma_1 X_{t-1} + \gamma_3 T + \sum_i \beta_i \Delta X_{t-i} + \mu_t$$

where X is the variable under consideration, T is a time trend and μ_t is the disturbance term. In estimating the regression the lag length (p) on the lagged dependent variable is determined by the Akaike Information Criterion (AIC) to ensure the residual whiteness. *** and ** indicate the 1 and 5 per cent level of significance, respectively. Source: Authors estimates.

Table A.2
Vehicle Production Equation in Thailand, 1971-2007

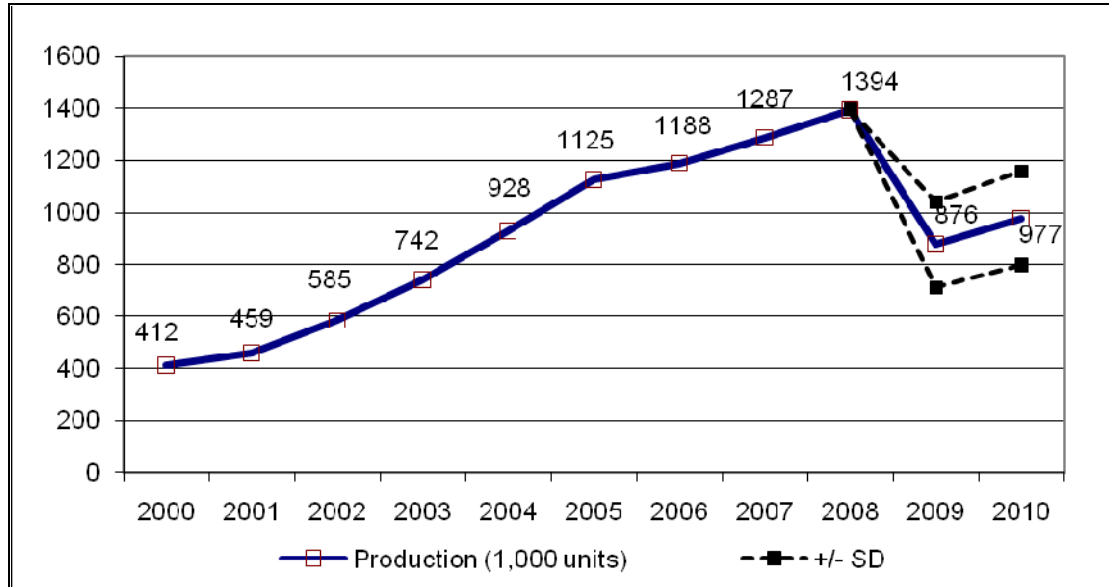
Variables	Full Model	Preferred Model
Constant	0.17 (1.15)	0.20 (1.51)
ΔFDI_t	0.10 (4.01)***	0.09 (3.55)***
ΔCRA_t	-0.11 (-0.30)	
ΔW_t	-0.03 (-1.79)*	
$\Delta GDPg_t$	6.91 (7.19)***	6.41 (10.3)***
ΔWD_t	-3.70 (-1.08)	
Q_{t-1}	-0.21 (-3.02)***	-0.21 (-3.14)***
FDI_{t-1}	0.10 (3.21)***	0.08 (2.63)***
$GDPg_{t-1}$	4.56 (4.55)***	4.33 (6.50)***
WD_{t-1}	0.27 (0.07)	3.35 (1.36)*
W_{t-1}	0.002 (0.11)	0.01 (1.03)
$Adj - R^2$	0.84	0.83
F-Statistics	18.2 (p=0.00)	23.09
LM test –F-test version	1.13 (p=0.34)	0.97 (p=0.39)
RESET test–F-test version	0.91(p=0.41)	1.88 (p=0.17)
JB test	0.75 (p=0.96)	0.50 (p=0.78)
White test–F-test version	0.89 (p=0.61)	0.94 (p =0.54)
Residual Whiteness	-3.21*	-3.62**

Notes: ***, ** and * indicates the 1 5 and 10 per cent level of significance, respectively.

See full discussion about tests used in the text above.

Sources: Authors' estimates.

Figure A.1
Actual Vehicle Production and Forecast in Thai Automotive Industry
Between 2000 and 2010



Note: Dashed line indicates the range of one-standard deviation.

Sources: Authors' Estimates.

Appendix II

Estimate of Cost of Living Equivalence

- 8 hours at normal wage (w) and 3-4 hours at 1.5 times of normal wages (OT). Assume the normal wage is 200 baht a day, the estimated living cost of 4,000-6,000 baht a month is equivalent to 20-30 working days.
- A worker would earn $12.5w$ - $14w$ a day. Hence within a month this worker would earn $275w$ ($12.5w \times 5.5 \text{ days} \times 4 \text{ week}$) to $336w$ ($14w \times 6 \text{ days} \times 4 \text{ weeks}$). The standard calculation of a working day wage is $8w$ so this would equal to 34.3 ($=275w/8w$) - 42 ($=336w/8w$) days.

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