‘Mobile Underclass’: A Challenge for the Development of Digital Economy in Thailand

Implications and determinants of digital literacy, and policy implications

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Research and policy questions

What are the benefits of digital literacy?

What are the determinant of digital literacy?

How should we promote digital literacy?

Benefits of digital literacy on income

Classification: occupation, education and internet activities

Classification of occupation:

1. Cognitive non-routine: Manager, professional, and associate professional
2. Cognitive routine: Clerk, and sales
3. Manual non-routine: Agriculture
4. Manual routine: craft and plant operation
5. Elementary

Classification of education:

1. Primary school or lower
2. Lower secondary school
3. Upper secondary school
4. Tertiary

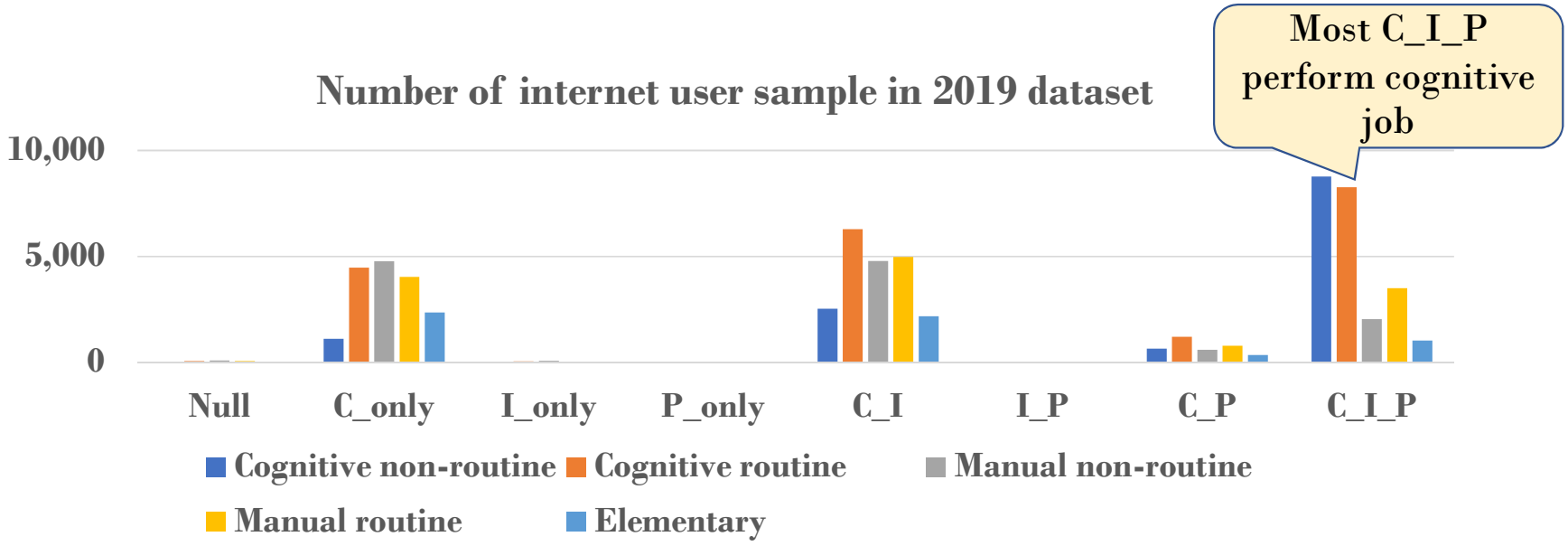
Classification of internet activities (proxy for digital literacy):

1. **Information seeking:**
   Search for goods & services, search for health information, search for state information, and read e-books
2. **Communication:**
   Email, discussion blog, social network and internet phone
3. **Problem solving:**
   Purchase of goods and services, sale of goods and services, state document submission, download software, online learning and mobile banking

Classification of internet users

- We divide internet users in Thailand in 2019 into 8 groups
  1. Those using no communication, information seeking and problem solving (**Null**)
  2. Those use communication only (**C_only**)
  3. Those use information seeking only (**I_only**)
  4. Those use problem solving only (**P_only**)
  5. Those use commucniation and information seeking (**C_I**)
  6. Those use communication and problem solving (**C_P**)
  7. Those use information seeking and problem solving (**I_P**)
  8. Those use everything ranging from communication, information seeking to problem solving (**C_I_P**)

Most samples are C_only, C_I, C_P and C_I_P



Most users use the internet for communication; therefore, we will focus on the combinations of internet activities which encompass communication only

Methodology

- Limit our analysis to **C_only**, **C_I**, **C_P** and **C_I_P**
- Look at their association with **income**

Control for occupation

Control for Education

- Apply **mid-range test** to test for differences in income between different groups associated with different internet activities
  - Mid-range test allows one to test whether mean of one group is significantly different from mean of another group.
  - Here, we set significant level at **5%.**
  - In next pages, */**/***/**** on next pages are used to annotate group of internet users into sub-set of internet users with **significantly different income levels**.

Result: Overall

Overall	
	Income
C_only*	10.2
C_I**	11.9
C_P***	13.8
C_I_P******	19.0

Note: Unit of income is in THB thousand per month

Users engage in more internet activities have significantly more income.

But can this be due to different concentration of occupation.

Next, we segment our sample by occupation and perform mid-range test again

Result: Segment by occupations

Cognitive non-routine	
	Income
C_only*	17.9
C_I**	21.4
C_P**	23.0
C_I_P***	26.6

Cognitive routine	
	Income
C_only*	11.2
C_I**	12.3
C_P***	13.4
C_I_P****	15.9

Manual non-routine	
	Income
C_only*	7.3
C_P*	7.8
C_I*	7.9
C_I_P**	10.7

Manual non-routine	
	Income
C_only*	11.1
C_I*	11.8
C_P**	13.3
C_I_P***	14.4

Elementary	
	Income
C_only*	9.1
C_I*	9.1
C_P*	9.2
C_I_P**	11.0

Note: Unit of income is in THB thousand per month

Even after segmenting our dataset by occupations, **those engaging in C_I_P have significantly higher income**. Again, but can this be because different concentration of education. Next, we further segment data by education, and run mid-range test again

Result: Cognitive non-routine / Cognitive routine

Cognitive non-routine use a lot of **'hard knowledge';** therefore, income is much more determined by education than internet behavior,

unlike cognitive routine which utilizes more **broad knowledge** rather than specific knowledge

Cognitive non-routine

Primary or below		Lower secondary		Upper secondary		Tertiary	
	Income		Income		Income		Income
C_only*	12.7	C_only*	13.3	C_I*	15.3	C_only*	21.4
C_I*	13.2	C_I*	14.3	C_only*	15.6	C_I**	24.5
C_P*	15.8	C_I_P**	17.6	C_P*	16.5	C_P**	24.7
C_I_P*	17.9	C_P**	19.9	C_I_P*	19.0	C_I_P**	27.8

Cognitive routine

Primary or below		Lower secondary		Upper secondary		Tertiary	
	Income		Income		Income		Income
C_only*	10.5	C_only*	10.4	C_only*	11.1	C_only*	13.4
C_I*	11.0	C_I*	10.9	C_I*	12.2	C_I*	14.6
C_P*	11.6	C_P*	11.4	C_P**	13.3	C_P*	15.6
C_I_P**	13.4	C_I_P**	13.0	C_I_P**	14.6	C_I_P**	17.9

Note: Unit of income is in THB thousand per month

Result: Manual non-routine / manual routine

For manual non-routine, if workers have additional skills, it can cast a lot of impact on income.

For manual routine, the scope of work is narrower; therefore, there is not much value added from knowing digital technologies.

Manual non-routine

Primary or below		Lower secondary		Upper secondary		Tertiary	
	Income		Income		Income		Income
C_only*	7.1	C_only*	6.8	C_only*	7.2	C_only*	10.0
C_I*	7.3	C_P*	6.9	C_P*	7.5	C_P*	11.1
C_P*	7.4	C_I*	7.1	C_I*	7.8	C_I*	11.9
C_I_P**	10.3	C_I_P**	8.8	C_I_P**	10.2	C_I_P*	14.6

Manual routine

Primary or below		Lower secondary		Upper secondary		Tertiary	
	Income		Income		Income		Income
C_only*	10.3	C_I*	11.2	C_only*	11.7	C_only*	12.6
C_I*	11.0	C_only*	11.2	C_I*	12.3	C_I*	14.1
C_P*	11.5	C_I_P*	12.9	C_P*	13.4	C_P*	16.1
C_I_P**	13.0	C_P*	13.0	C_I_P*	14.1	C_I_P*	17.3

Note: Unit of income is in THB thousand per month

Result: Elementary

Elementary							
Primary or below		**Lower secondary**		**Upper secondary**		**Tertiary**	
	Income		**Income**		**Income**		**Income**
C_P*	8.5	**C_P***	8.6	**C_I***	9.5	**C_only***	11.7
C_I*	8.8	**C_I***	8.7	**C_only***	9.6	**C_I***	12.0
C_only*	8.8	**C_only***	8.9	**C_P***	10.6	**C_P***	12.2
C_I_P*	9.9	**C_I_P***	10.5	**C_I_P***	11.3	**C_I_P***	13.7

Note: Unit of income is in THB thousand per month

Elementary jobs use very basic skills. **Although workers use more technology, it does not help much.**

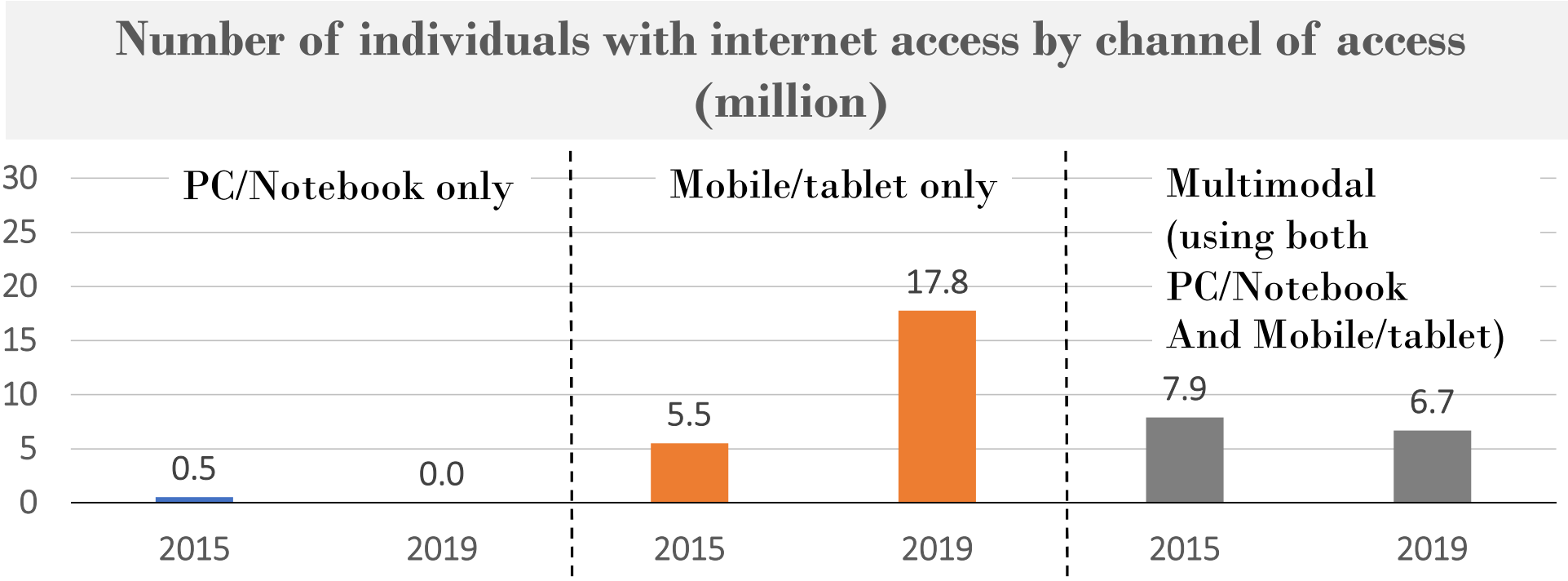
Wrap up mid-range test

- Engaging in more internet activities cast different implications to different types of jobs.
- **The benefit of having higher digital literacy may be as high as having high education.**

	Cognitive non-routine	Cognitive routine	Manual non-routine	Manual routine	Elementary
Primary or below, C_only	12.7	10.5	7.1	10.3	8.8
Primary or below, C_I_P	17.9	13.4	10.3	13.0	9.9
Tertiary, C_only	21.4	13.4	10.0	12.6	11.7
Note: Income (THB thousand per month)					

Determinants of Digital Literacy in Thailand

Thailand is entering a mobile era: Are we facing the problem of "mobile underclass"?



Note: ICT Household Survey 2015, 2019

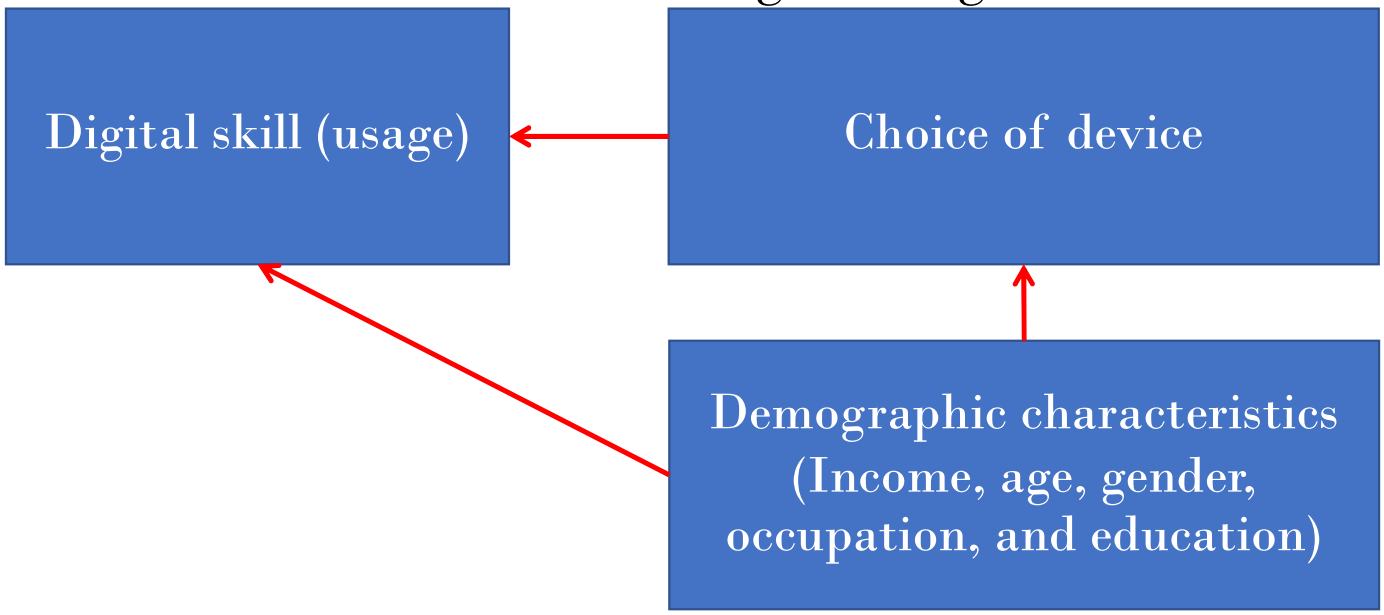
Model specifications (resource and appropriation theory)

Model 1:

Linear regression

Model 2:

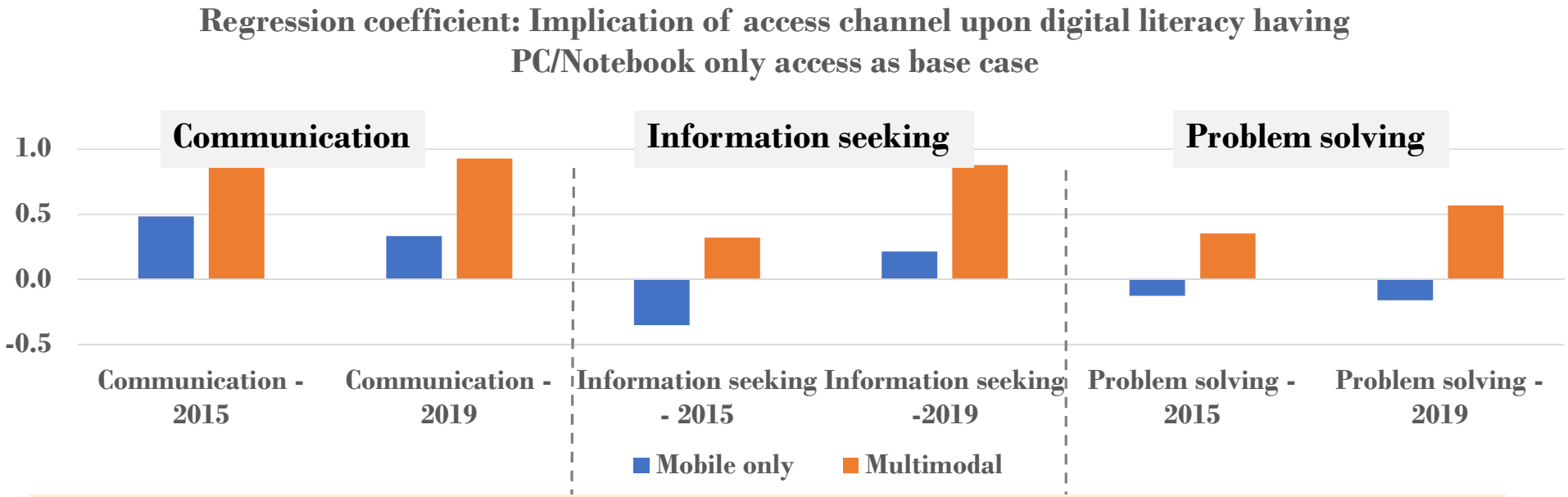
Logistic regression



Types of variables

- Three types of digital literacy – continuous variable
- Choice of devices – dummy variable
- Demographics:
  - **Income – continuous variable**
  - **Age – continuous variable**
  - **Gender – dummy variable**
  - **Occupation – dummy variable**
  - **Education – dummy variable**

Model 1 result: Implications of choices of devices

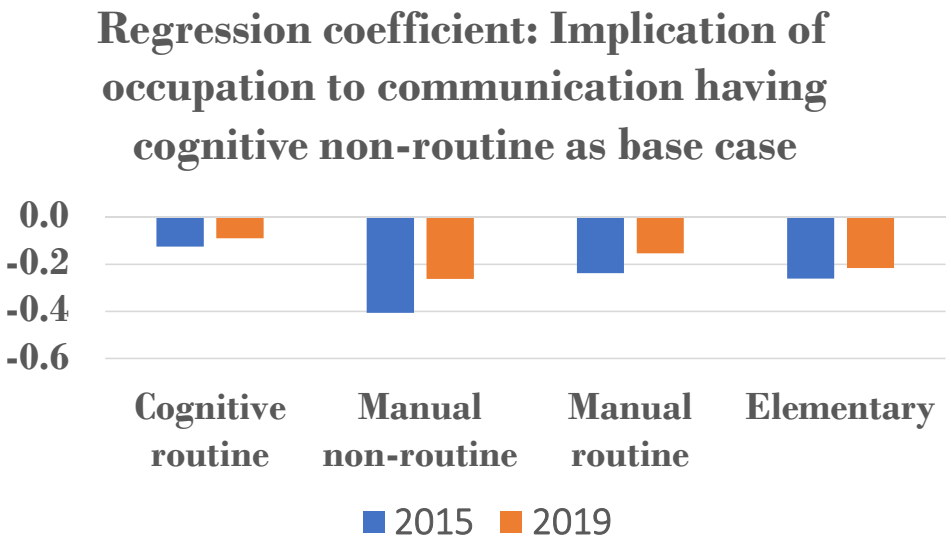


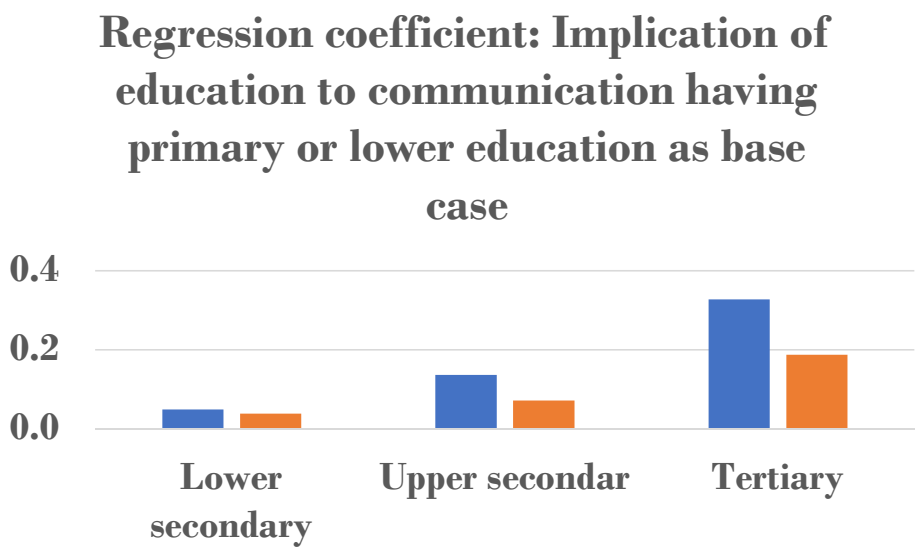
- Communication: Mobile has always been better than PC/Notebooks
- Information seeking: Mobile has just become better than PC/Notebooks and this is probably due to technological change
- Problem solving: PC/Notebook has always flare better than mobile only
- In all cases, being a multimodal users (having multiple access points) is the best

Model 1 result : Communication

Occupation: Cognitive non-routine workers are best at using the internet for communication

Education: Having higher education improve the ability to use the internet for communication



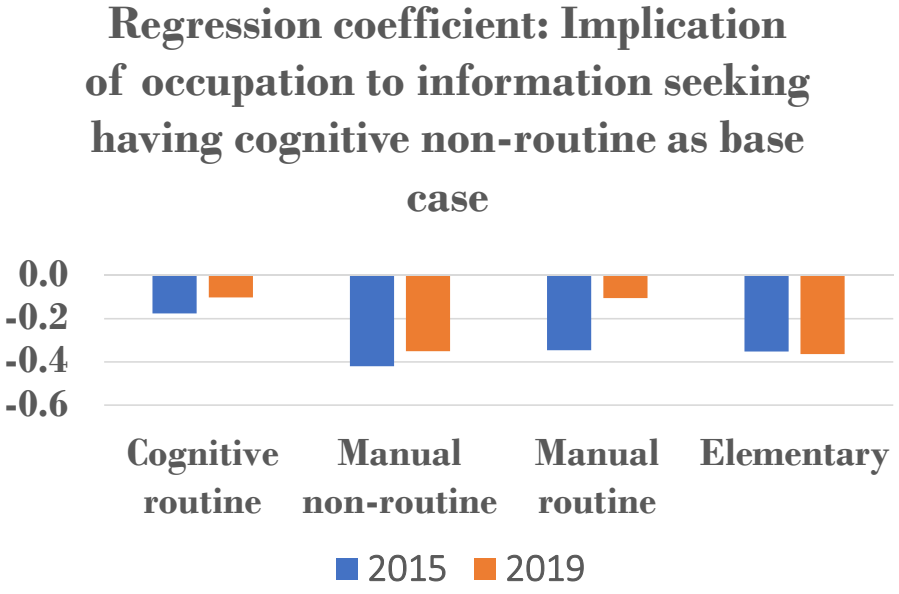


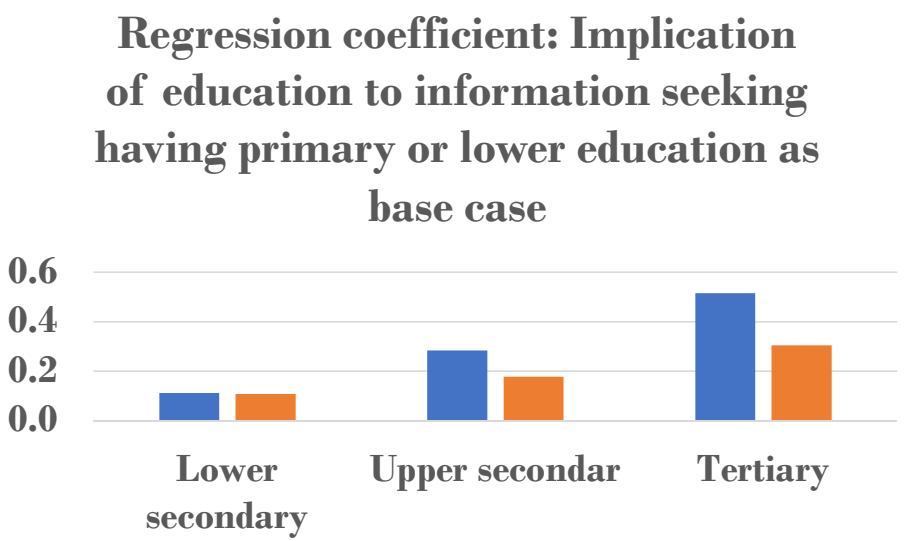
Gap between different social categories decline which may indicate technological improvement.

Model 1 result : Information seeking

Occupation: Cognitive non-routine workers are best at using the internet for information seeking

Education: Having higher education improve the ability to use the internet for information seeking



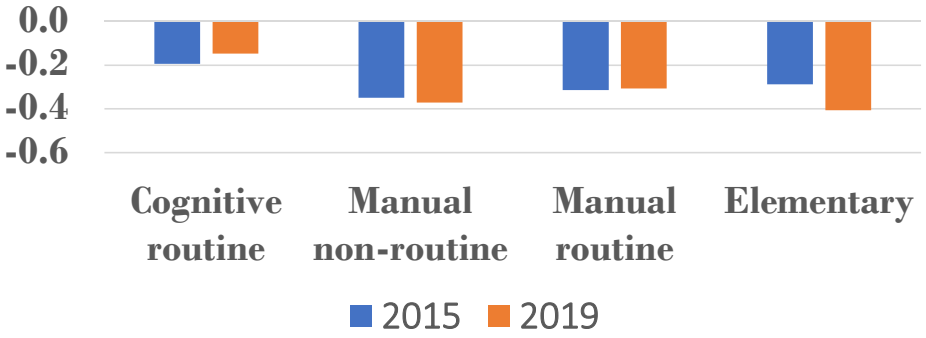


Gap between different social categories decline which may indicate technological improvement

Model 1 result : Problem solving

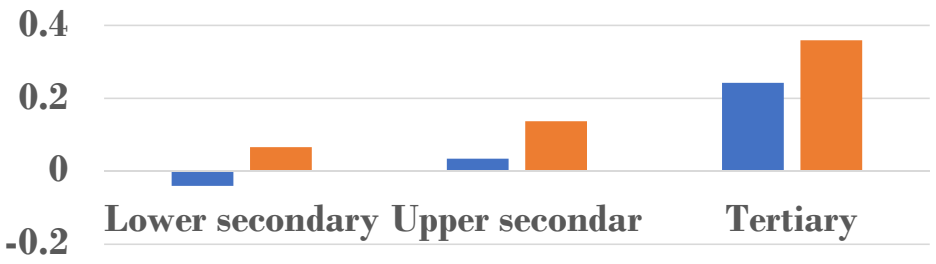
Occupation: Cognitive non-routine workers are best at using the internet for problem solving

Regression coefficient: Implication of occupation to problem solving having cognitive non-routine as base case



Education: Having higher education improve the ability to use the internet for problem solving

Regression coefficient: Implication of education to problem solving having primary or lower education as base case



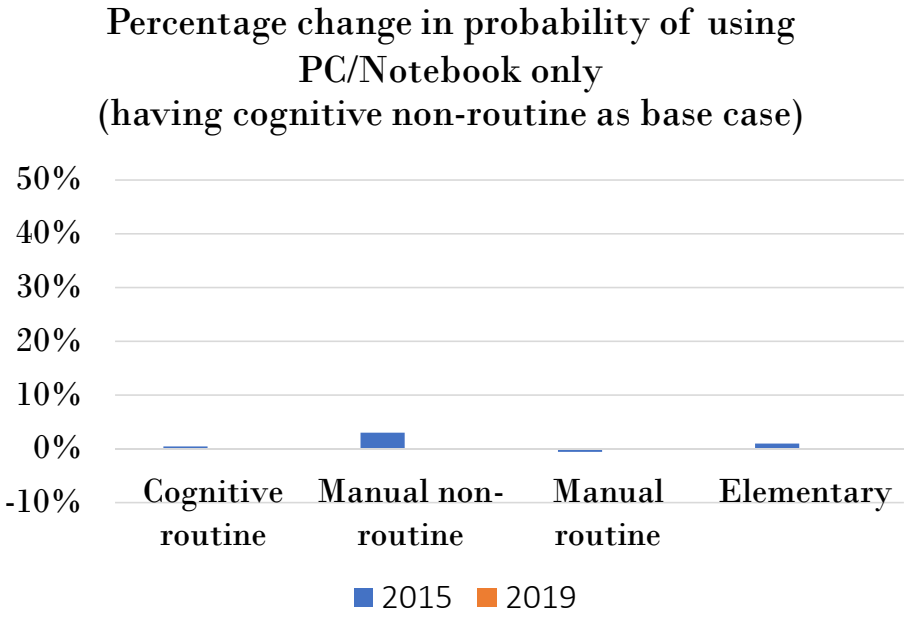
Gap between different social categories fails to decline and even increase and this may indicate failure of technological change to accommodate problem solving

Wrap up finding from model 1

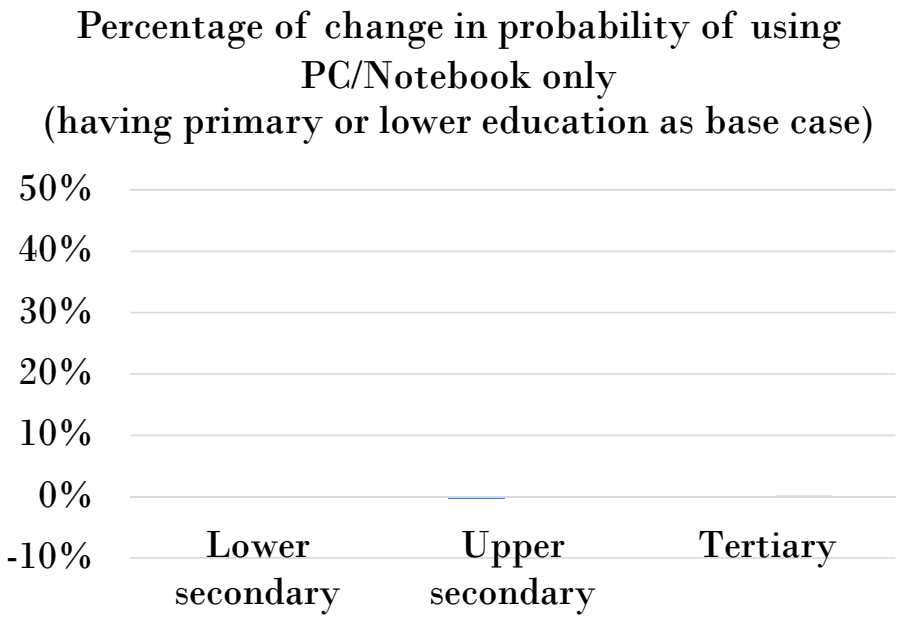
- Our finding lend support to "**mobile underclass**" hypothesis
  - Mobile only users still have problem when it comes to using the internet for problem solving
  - In all cases, having multiple access points to the internet is better than having one single device
- **Gaps between occupational/educational** categories tend to narrow down for communication and information seeking, but they persist or even **widen for problem solving**
  - Technological advancement maybe the driver of these changes as the tech companies increasingly adapt to mobile world
  - Alas, it seems to be easier to accommodate communication and information seeking, than problem solving

Model 2 result: PC/Notebook only

Occupation: All occupations have roughly equal chance of being PC/Notebook only user



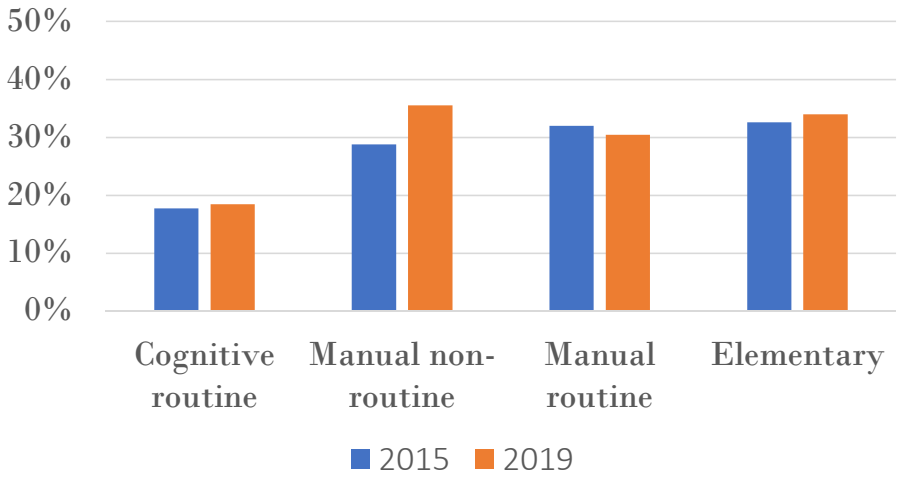
Education: All education level have roughly equal chance of being PC/Notebook only user



Model 2 result: Mobile/Tablet only

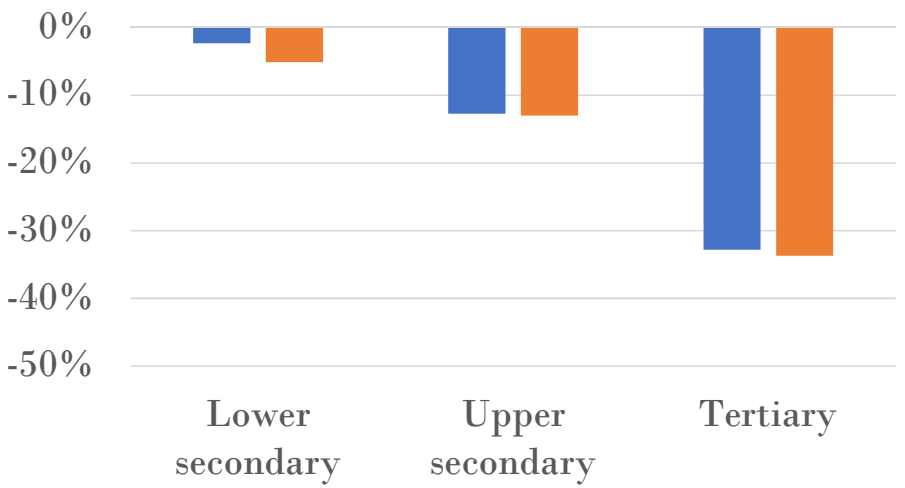
Occupation: Cognitive non-routine workers have the lowest chcance of being mobile/tablet only users

Percentage change in probability of using Mobile/Tablet only
(having cognitive non-routine as base case)



Education: Workers with higher education have relatively low chcane ot being mobile/tablet only users

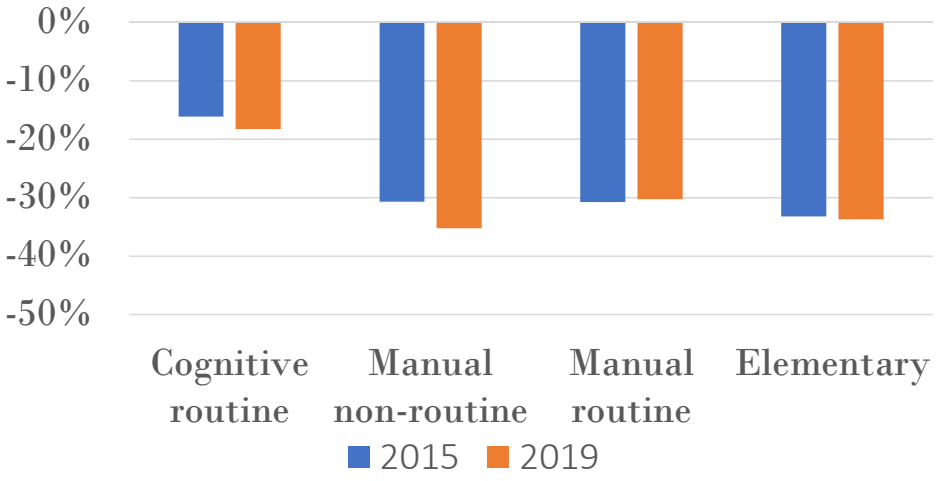
Percentage of change in probability of using Mobile/Tablet only
(having primary or lower education as base case)



Model 2 result: Multimodal

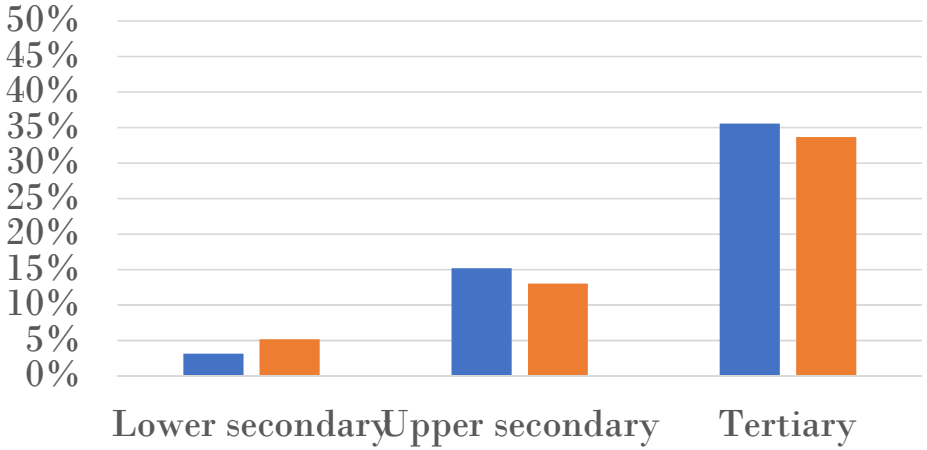
Occupation: Cognitive non-routine workers have the highest chcance of being multimodal users

Percentage change in probability of being multimodal users
(having cognitive non-routine as base case)



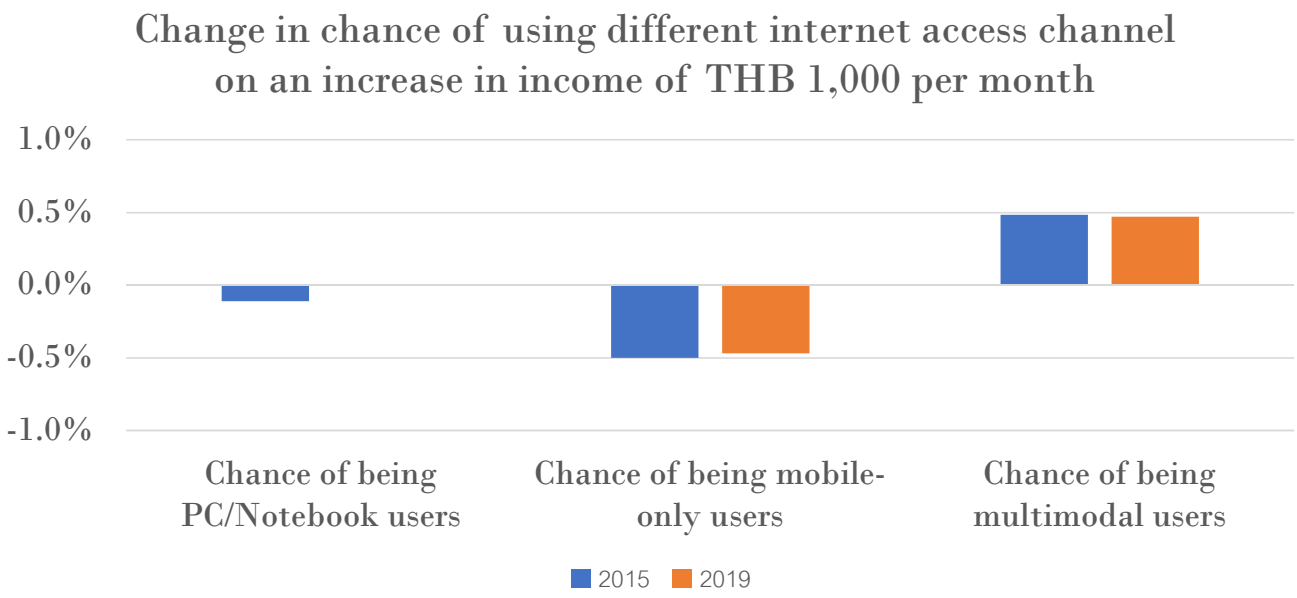
Education: Workers with higher education are more likely to be multimodal users

Percentage change in probability of being multimodal users
(having primary or lower education as base case)



Model 2 result: Affordability on device choices

Income effect: Change in income has very little effect on device choice

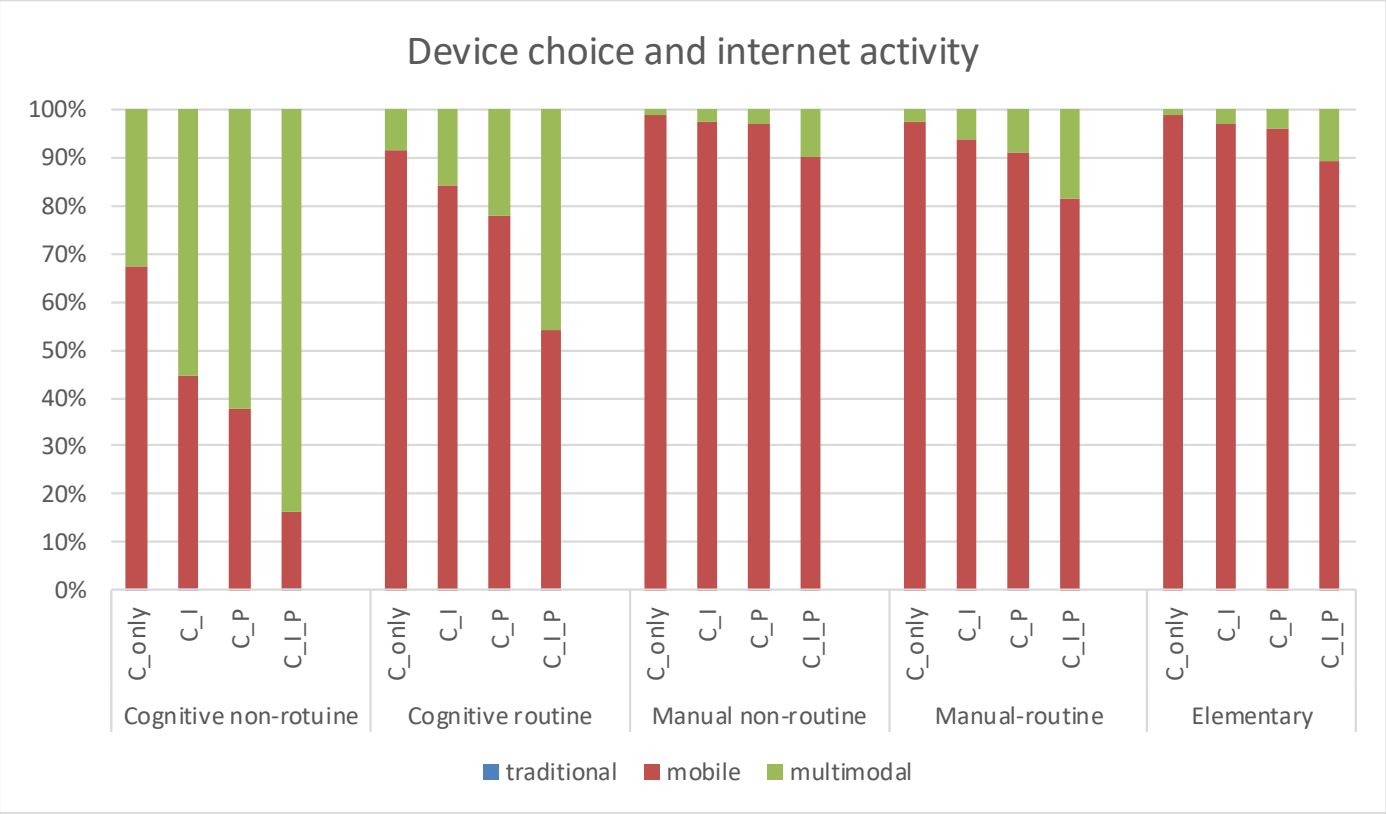


Wrap up finding from model 2

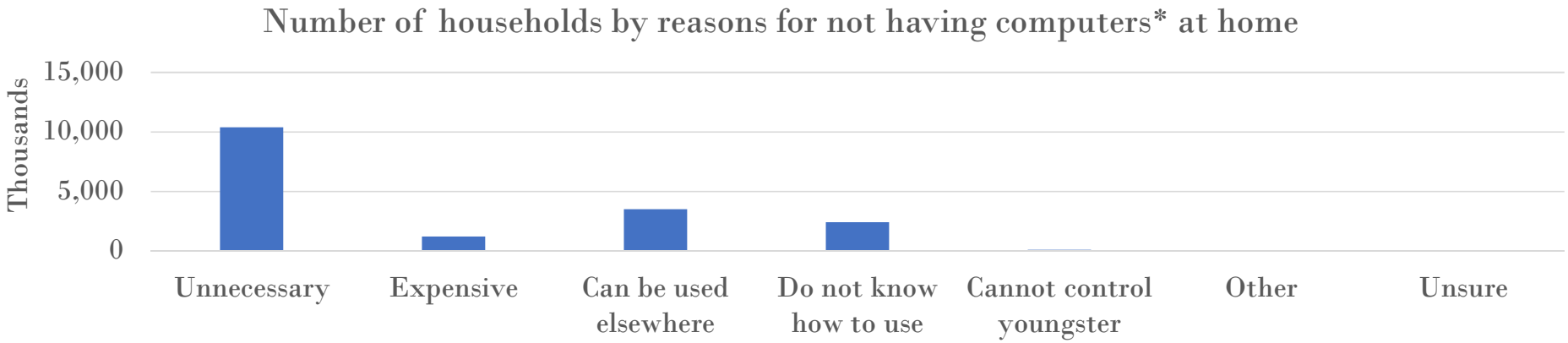
- Demographic characteristics have little effect of the chance of workers being PC/Notebook only users
- Job characteristics and education level cast a big effect upon the chance of workers being mobile/Tablet only users and multimodal users
  - Cognitive non-routine workers have the highest chance of being multimodal users and lowest chance of being mobile/tablet only users
  - Workers with higher education have her chance of being multimodal users and lower chance of being mobile/tablet only users
- Income casts little effect on choices of devices (affordability)

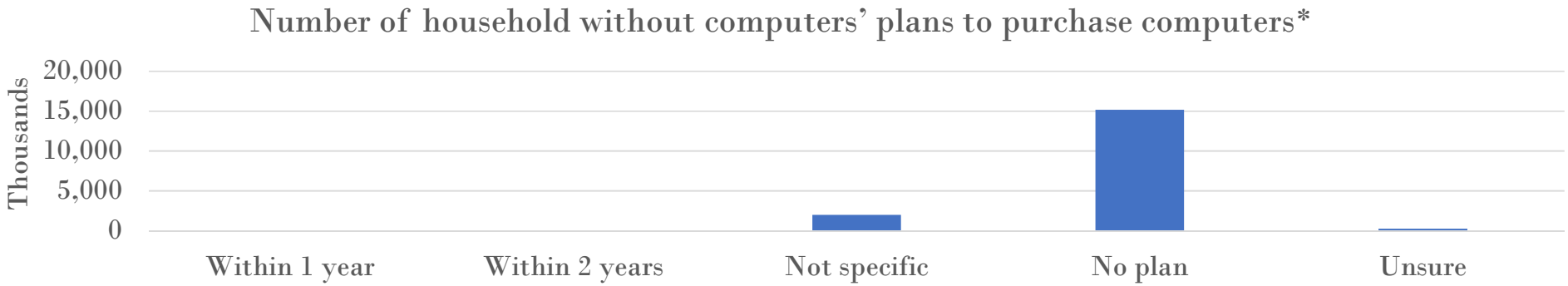
Policies Implications

To improve digital literacy in Thailand, multimodal users should be encouraged



Relevance seems to be the most pressing issue





*** Computers refer to personal computers, notebooks, and tablets**

Research implications on policies to encourage more multimodal users

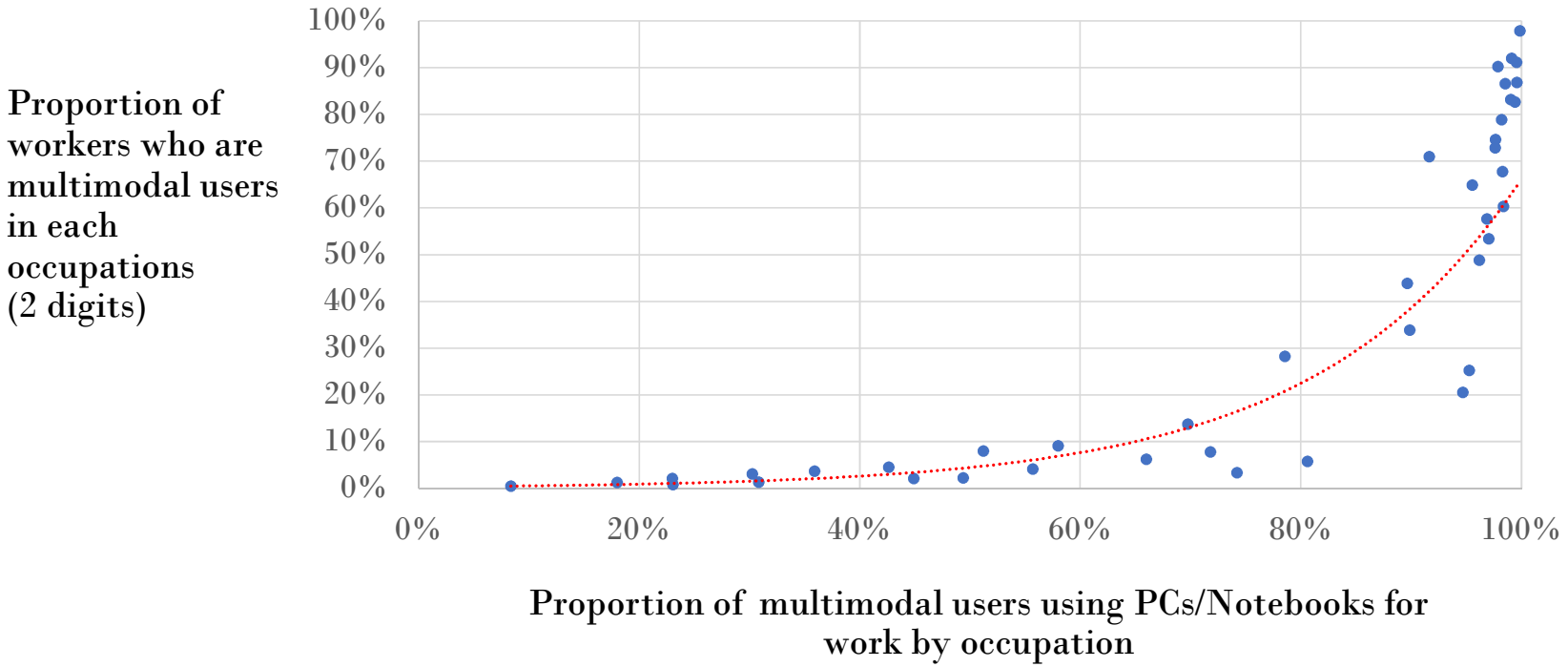
Creation of more cognitive tasks and readiness to perform such tasks

- It is clear that those who are multimodal users have superior cognitive skills
  - They perform cognitive jobs
  - They have higher level of education
- Encouragement of more cognitive skills should lead to natural emergence of more multimodal users with higher digital literacy
  - More cognitive tasks can be created with further digitalization which entails 'textualization' of the society (relevance)
  - Workers should readily be able to cease the opportunity with appropriate education (readiness)

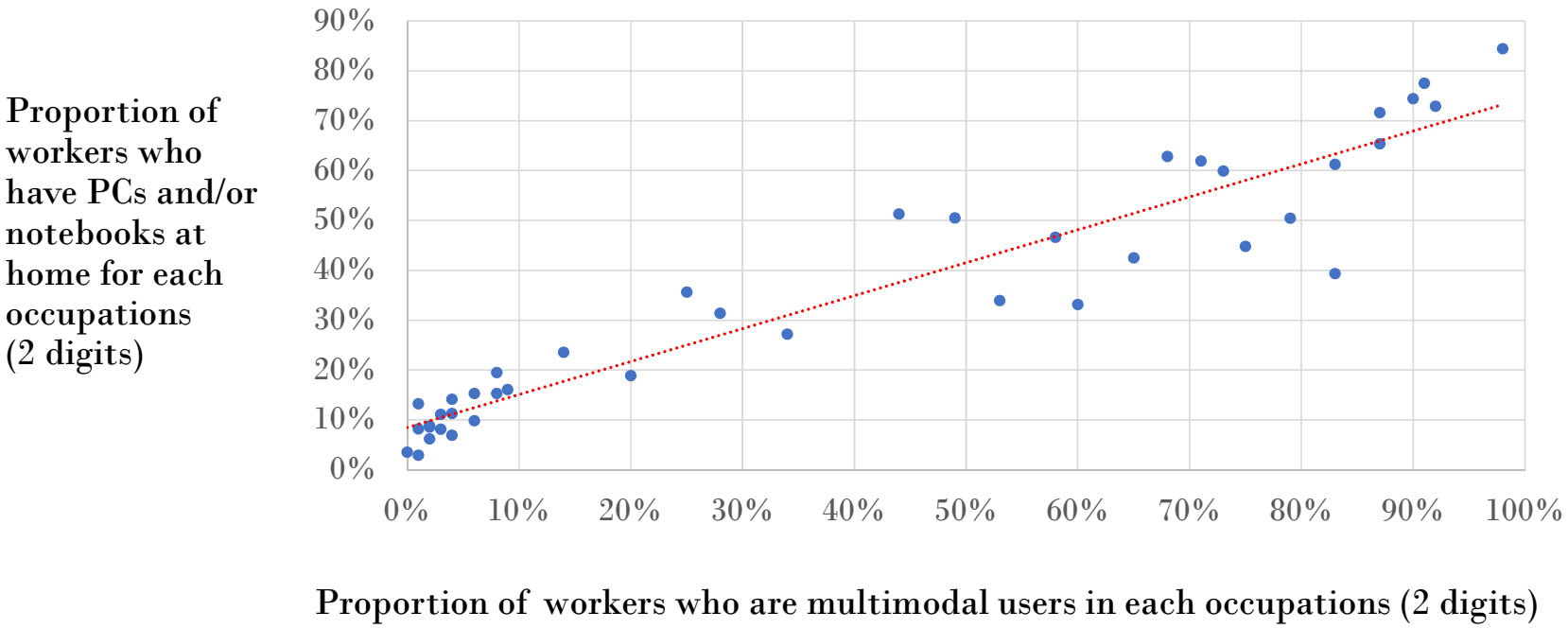
Affordability

- It is clear from regression analysis that affordability is unlikely to be an issue as changes in income lead to very little changes in choice of device

Digitalization of workplace as an important driver of multimodal user

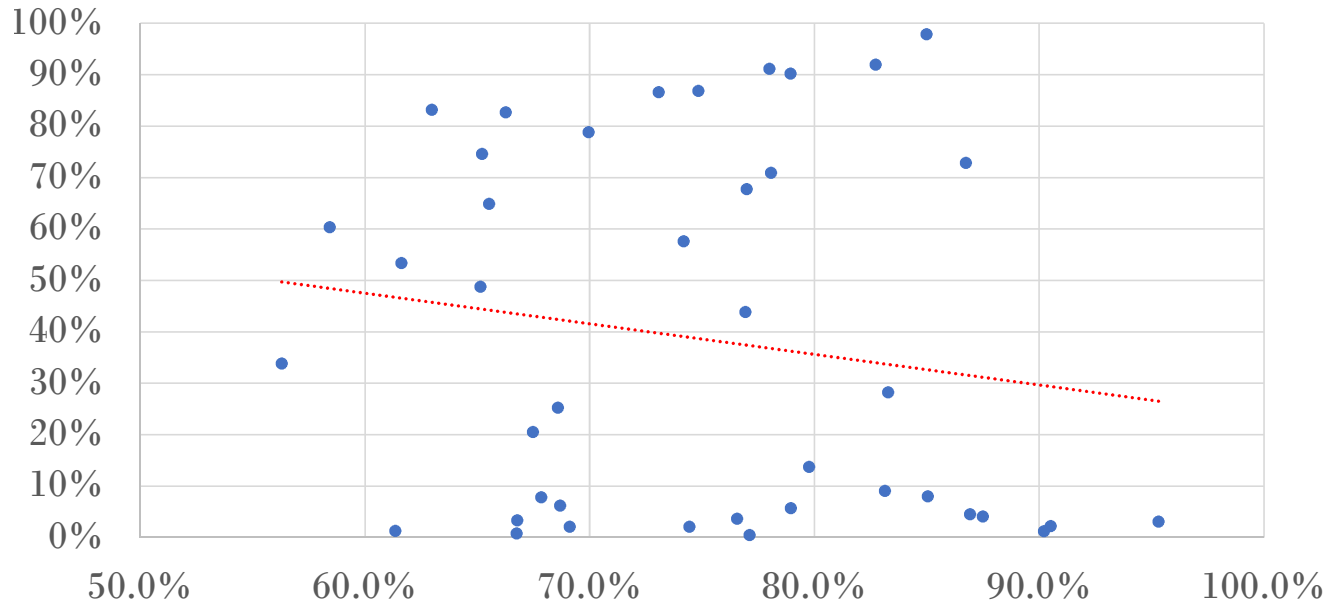


More multimodal users leading to workers having computers at home



Entertainment does not help

Proportion of workers who are multimodal users in each occupations (2 digits)

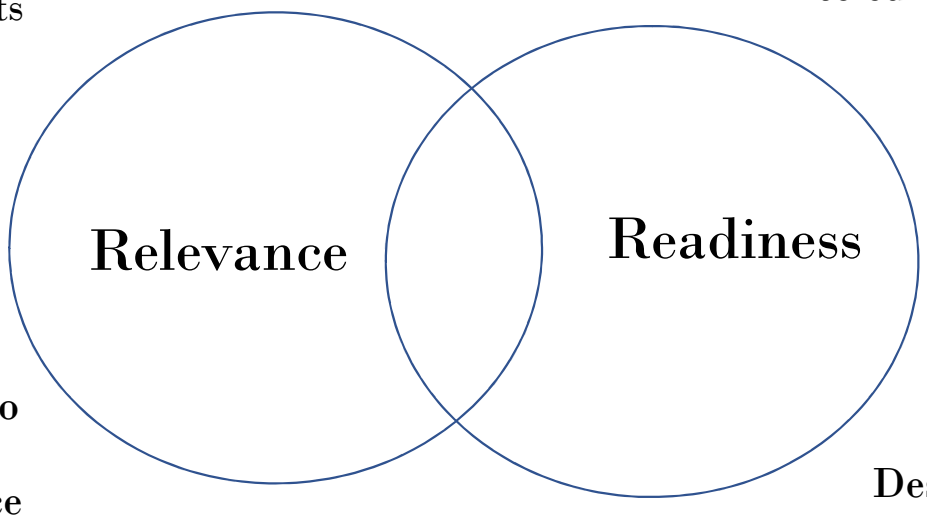


Proportion of multimodal users using PCs/Notebooks for entertainment by occupation

Policies to create better cognitive skills

Full integration of ICTs into user environments

Incorporate computing skills into curricula



Awareness program

Extend adult education on-the-job and public locations

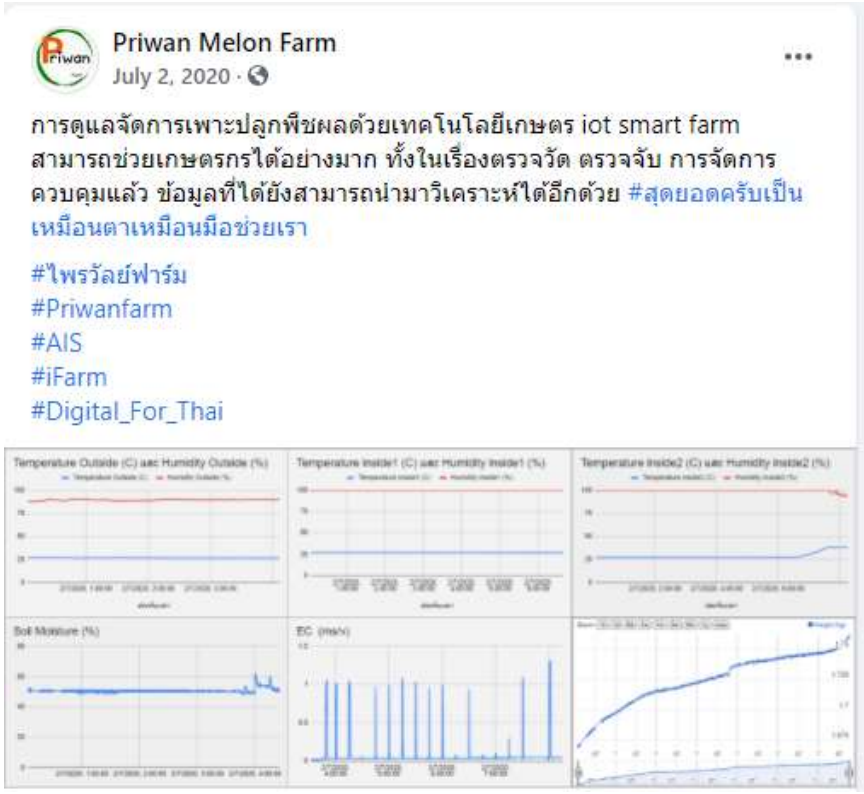
Make regulations to support positive outcome and reduce negative outcome

Design better applications (may target at specific demographic)

Opportunities to create cognitive tasks

Existing opportunities	New opportunities
E-commerce	Further digitalization of workplace
Sharing economy	Further automation
Freelancing	Big data analytics and AIs
Creation of new apps	Internet of things
Creation of new websites	Blockchain and its applications
Becoming influencers	Convergence between devices
Digital advertising	Quantum computing

“Textualization” of workplace: The case of agriculture



Wrap up policy implications

- Policies to improve digital literacy are to encourage more multimodal users who tend to have higher digital literacy
- Those with higher cognitive skills (performing cognitive jobs or having higher level of education) are more likely to be multimodal users
- Higher cognitive skills should be encouraged
  - Creation of more cognitive tasks with further digitalization of the society
  - Workers should be ready to cease the opportunity with appropriate education
- Affordability is unlikely to be an issue

Conclusion and key takeaways (1)

- Higher digital literacy leads to higher income. The effect can be as high as having high level of education
- Multimodal users are more effective at exploiting digital opportunities and have higher digital literacy
- Alas, mobile-only users are on the raise, not multimodal users
- More multimodal users should be encouraged, but relevance seems to be a major issue
- Multimodal users tend to have higher cognitive skills; therefore, more cognitive skills among members of the society should be encouraged
- This can be done by creation of more cognitive tasks by further digitalization of the society and create workers who are ready the cease the emerging opportunities

Conclusion and key takeaways (2)