

# International Trade 31E00500

## Lecture 10: Offshoring, Import Competition and Labor Markets

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- Trade in tasks
- Empirical evidence on effects of offshoring on labor markets

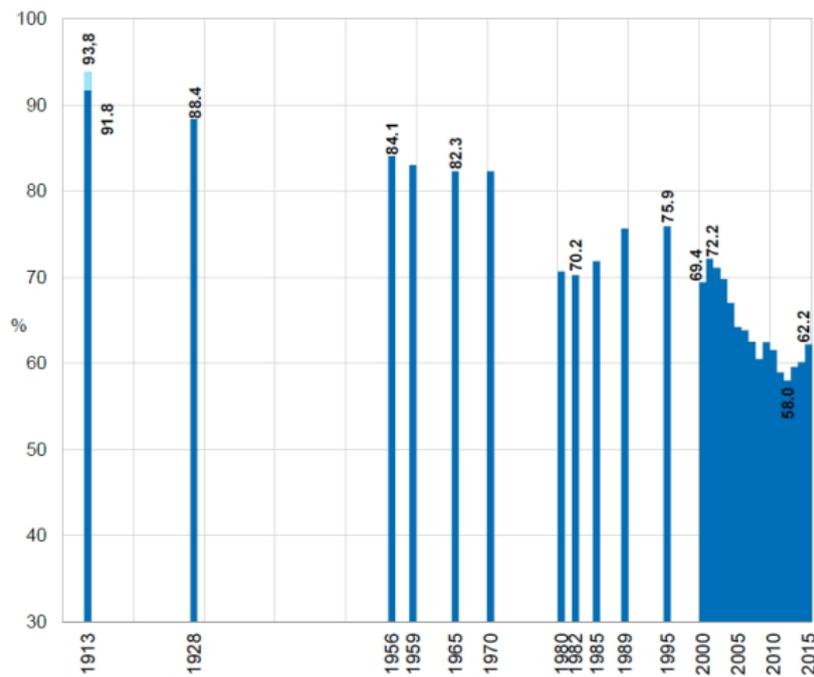
Adam Smith (1776) famously described the division of labor in a pin factory in late 18th-century England:

*One man draws out the wire, another straightens it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a peculiar business; to whiten the pins is another; it is even a trade by itself to put them into the paper; and the important business of making a pin is, in this manner, divided into about 18 distinct operations, which, in some manufactories, are all performed by distinct hands, though in some others the same man will sometimes perform two or three of them (p. 4).*

# Job Tasks, Division of Labor and Trade

- For nearly two centuries, there was specialisation with geographical concentration. Trade took place when the final good was shipped to the consumer.
- Revolution in transportation and communication technologies weakened the link between specialisation and agglomeration.
- Fragmentation, offshoring, global value-added-chains.
- Decreasing share of domestic value added in gross exports.

# Share of domestic value added in gross exports, Finland 1913-2015

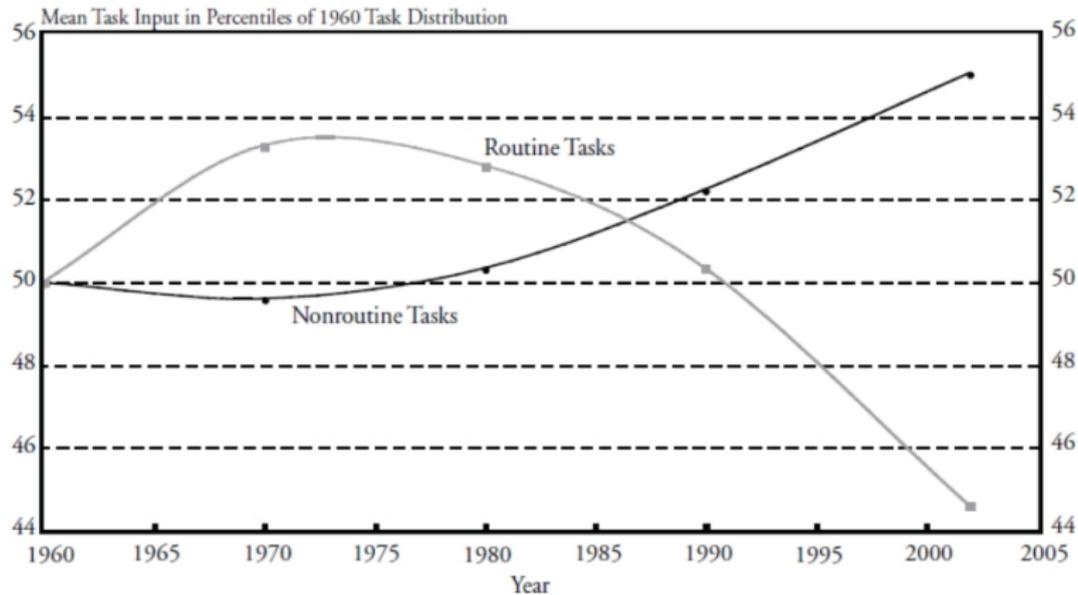


Source: Haaparanta et al. (2017) 100 vuotta pientä avotaloutta

# Offshoring and Trade in Tasks

- The old paradigm vs new paradigm of the trade theory
- Grossman and Rossi-Hansberg (2008) introduce offshoring of tasks into a Heckscher and Ohlin framework.
- A simple and tractable model of offshoring with trade in tasks to analyze the impact of offshoring on demand for labor.
- The effect on wages is decomposed into three effects:
  - productivity effect, terms-of-trade effect and labour supply effect

## Trends in Nonroutine and Routine Tasks



Source: Autor, Levy, and Murnane (2003)

# Trade in Tasks: Model

- Model allows trade in tasks, as well as trade in goods
- Production involves a continuum of  $L$  tasks and continuum of  $H$  tasks
- Industries differ in factor intensity, as usual
- Assign a number between 0 and 1 to each of the  $L$ -tasks,
- Order tasks so  $t'(i) \geq 0$ , so that tasks with lower indexes can more readily be performed offshore, and assume  $t(i)$  is continuously differentiable
- Cost of offshoring task  $i$  is given by  $\beta t(i) \geq 1$ ,  $\beta$  feasibility of offshoring
- For the moment only  $L$ -tasks can be offshored and same  $t(i)$  schedule in each industry

# Trade in Tasks: Model I

- Which tasks will the firm send offshore?
- Benefit: lower wages, Cost: instructing and monitoring workers at a distance or impersonal delivery of services
- Let  $w$  and  $w^*$  be the domestic and foreign wages
- A firm will offshore  $L$ -tasks (for low indexes  $i$ ) for which

$$\beta t(i) w^* < w \quad (1)$$

- Denote by  $I$  the index of the marginal task, which entails a similar cost in either location

$$w = \beta t(I) w^* \quad (2)$$

- Note  $I$  is also the fraction of  $L$ -tasks performed offshore because we have constructed the index of tasks to run from 0 to 1.

## Trade in Tasks: Model II

- Now, consider the cost  $c$  of producing one unit of some good.

$$c = wa_L(1 - I) + w^* a_L \beta T(I) + sa_H + \dots \quad (3)$$

- where  $a_L$  is the amount of domestic low-skilled labor used by the industry to perform a typical  $L$ -task,  $a_H$  is the amount of domestic high-skilled labor used by the industry to perform a typical  $H$ -task, and  $s$  is the domestic wage of high-skilled labor.
- Substituting (2) into (3) we find that

$$c = wa_L \Omega + sa_H + \dots \quad (4)$$

- where  $\Omega = 1 - I + \frac{T(I)}{t(I)} < 1$ .

# Trade in Tasks: Model III

- The wage bill for low skilled labor is a fraction of what it would be without possibility of offshoring (before changes in factor prices and any substitution between factors that might take place)
- Similar to the cost equation of a firm that but employes low-skilled workers whose productivity is (inversely) measured by  $\Omega$ .
- Reduction in offshoring costs (lower  $\beta$ ), (also  $\Omega$  falls), generates a cost savings for the firm that conducts some L-tasks abroad.
- Offshoring affects costs exactly as labor-augmenting technological change.

- Assume a fall in the cost of offshoring  $L$ -tasks affects the domestic market for unskilled labor via several channels:
  - the cost of performing the low-skill tasks?
  - the balance between labor demand and supply at the initial factor prices, output levels and techniques of production?
  - the incentives for the two sectors to expand? the composition of output at the initial prices?
  - the balance in world markets at the initial prices?

- Grossman and Rossi- Hansberg (2010) show that the change in the domestic wage of low-skilled labor resulting from a decline in  $\beta$  can be decomposed into three components:

$$\hat{w} = -\hat{\Omega} + \alpha_1 \hat{p} - \alpha_2 \frac{dI}{1-I} \quad (5)$$

- where  $p$  is the relative price of the offshoring country's export good in terms of its import good, or its T-O-T. "hat" percentage change.
- Note,  $\Omega < 1$  but a reduction in offshoring costs (lower  $\beta$ ) mean that also  $\Omega$  falls, that is  $\hat{\Omega} < 0$ .

# Trade in Tasks: Model VI

- Productivity effect (the first term on the right-hand side)
- Terms-of-trade effect (the second term on the right-hand side)
- Labour supply effect (the third term on the right-hand side)

- Effect of offshoring  $L$ -tasks on wages of skilled labor

$$\hat{s} = \alpha_3 \hat{p} + \alpha_4 \frac{dl}{1-l} \quad (6)$$

- No direct productivity effect, an effect on wages of skilled labor through T-O-T effect, labor supply effect can have beneficial implications for high-skilled labor.

- When do these effects operate and when do they not?
- A small Heckscher-Ohlin economy is one important case
  - Terms of trade effect?
  - Labour-supply effect ?
  - What labor captures all the benefits from the improvement of the offshoring technology?

- How would the effects be in a large economy?
  - The price effect ?
  - The labour-supply effect? The composition of output? Factor prices?
  - Suppose that only the high-skill intensive export sector is active in the Home country. How would the labour-supply effect impact wages of unskilled workers?

# Large Heckscher-Ohlin Economy II

- Both skilled and unskilled labour gain from offshoring in a large economy.
  - Depends on relative strength of the effects
  - Elastic demand (supply changes cause small rel-price changes) and sufficiently different factor-intensities of export and import sectors (rel-price changes cause small wage changes)
- Empirical evidence for a "win-win" situation
  - residual component of real wage movements for low-skilled blue-collar workers after accounting for the effects of TFP growth and T-O-T changes
  - the component represents the combined effects of the labor-supply expansion and productivity growth due to improved offshoring opportunities
  - uniformly positive 1998-2004

# Offshoring in Certain Industries

- If offshoring is concentrated to certain industries, the wage response tends to be similar to technological progress in these sectors.
  - Technological progress in an industry tends to benefit the factors which are intensively employed in this industry.
  - The increased ease of offshoring of L-tasks benefits low-skilled workers in labor-intensive manufacturing and high-skilled workers in skill-intensive sectors.

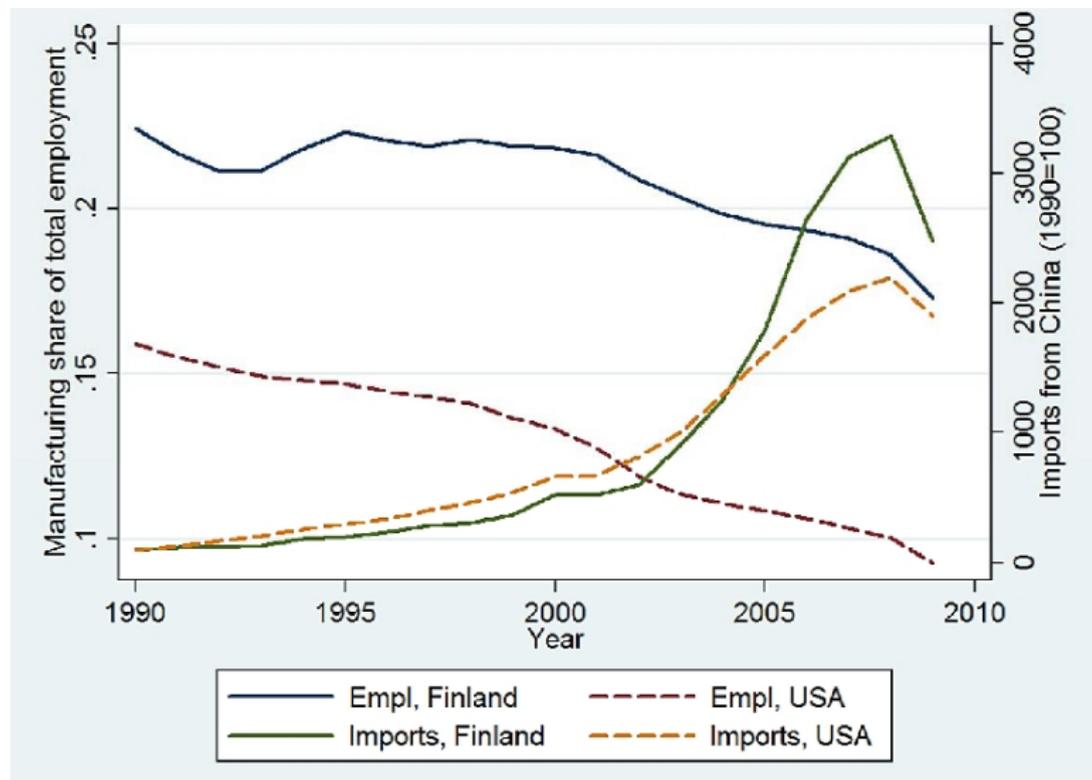
# Offshoring: Samuelson's Caveat

- When the North's superior technology is combined with cheap labor from South offshoring may be harmful to North's workers
- Technology transfer is harmful if it is in the nations' export sector
- Technology transfer in the import sector: workers import-competitive sector lose but consumers gain. Net effect positive.

- Concern that offshoring leads to job loss, declining middle class wages, and to rising inequality.
- A Washington Post article in July 2012 nicely summarized this concern:

“The debate over outsourcing has been morphing, and today there are growing numbers of people who think that what started as a sensible, globalized extension of sending some work outside a firm to specialized companies may in fact be creating long-term structural unemployment in the United States, hollowing out entire industries.”

# Import Competition, Offshoring and Employment



# Offshoring and labor demand: the first set of studies 1

Skill premium increased in the US and the UK and that income inequality seems to have increased in many industrialized countries

- Entry of large low-wage countries in world market, offshoring of manufacturing to China
  - Emergence of offshoring of services to countries such as India
- Hypothesis: Offshoring leads to a change in the relative demand for factors.
  - Until recently, it was expected to reduce the relative demand for jobs of low-skilled/unskilled.
  - Today, emphasis on how "offshorable" a job task is, meaning that both low-skill and high-skill jobs may be offshored

# Offshoring and labor demand: the first set of studies 2

- Basic references: Feenstra and Hanson (1996, 1999), Slaughter (2000) on FDI.
  - Note that Feenstra and Hanson use somewhat different methodology, probably better.
- See Crinò (2009), "Offshoring, Multinational and Labour Market: A Review of the Empirical Literature", and Hummels et al (2018) "Offshoring and Labor Markets" both in *Journal of Economic Literature*
- Results (first generation): offshoring tends to shift labor demand away from low-skilled, but the effects are mushroomed by other effects (including other z-type variables such as R&D, computerisation).
- Problems: endogeneity, heterogeneity, functional form (translog often rejected by data), Skilled-unskilled distinction not important

## Offshoring and labor demand: the second set of studies

- Acemoglu et al. (2016), Autor, Dorn, and Hanson (2013, 2015), Autor, Dorn, Hanson and Song. (2014), Balsvik, Jensen, and Salvanes (2015), Dauth, Findelsen, and Suedekum (2015), Ebenstein et al. (2014) , Baumgarten et al. 2013, Bloom, Draca, and Van Reenen (2016) analyze the effects of import competition measured as import penetration at the industry level.
- Hummels et al. (2014), Verhoogen (2008), and Amiti and Davis (2011) use information on firm-specific imports to study the effects of firm-level offshoring (see also Sethupathy 2013, and the survey by Hummels, Munch, and Xian 2016)

- Goldberg and Pavcnick (2003), Artuc, Chaudhuri, and McLaren (2010), McLaren and Hakobyan (2010), Ebenstein et al. (2011), and Menezes-Filho and Muendler (2011), study the effects of trade shocks at the industry and occupation levels;
- Studies that use occupation information and firm-level measures are more rare (Hummels et al. 2014, Nilsson Hakkala and Huttunen, 2016, Utar, (2018).

- Related literature has looked into offshoring effects by defining offshoring as changes in affiliate employment (Kovak, Oldenski, and Sly 2015; Ebenstein et al. 2014; Ottaviano, Peri, and Wright 2013; Becker, Ekholm, and Muendler 2013).
- Ashournia, Munch, and Nguyen (2017) study the effects of firm-specific import penetration on workers.
- Chiquiar (2008), Dix-Carneiro and Kovak (2015), Topalova (2010), and Autor, Dorn, and Hanson (2013) on trade shocks at the regional level.

*"Estimating the Impact of Trade and Offshoring on American Workers: Using the Current Population Surveys"*

- Employ cross-sectional data from the US Current Population Surveys to assess the wage and employment effects of imports, exports, and offshoring to low and high income countries
- Approximate offshoring by affiliate employment (sector  $j$ )
  - Both positive (high-income) and negative (low-income) wage effects of offshoring concentrated in most routine occupations
  - Argue that most routine tasks are most easily offshorable
- Identify large and significant wage declines among workers who leave manufacturing, and the wage decline is particularly pronounced for those who switch occupations
  - consistent with new trade models which introduce frictions into the labor reallocation process, such as Cosar (2011) and Artuc, Chaudhuri, and McLaren (2010).

## *"The Wage and Employment Effects of Outsourcing: Evidence from Danish Matched Worker-Firm Data"*

- Measure offshoring as imported intermediate inputs at the firm level (1995-2006)..
- Offshoring tends to increase the high-skilled wage and decrease the low-skilled wage
  - Exporting tends to increase the wages of all skill types

# Hummels, Jorgensen, Munch and Xiang (AER, 2014):

TABLE 5—WORKER-LEVEL WAGE REGRESSIONS

	log hourly wage				log labor income	
	FE		FE-IV		FE-IV	
	(1)	(2)	(3)	(4)	(5)	(6)
log offshoring	-0.0025** [-2.43]	-0.0014 [-1.41]	-0.0222** [-2.56]	-0.0228*** [-3.70]	-0.0148** [-2.06]	-0.0100* [-1.94]
log offshoring × high skilled	0.0060*** [5.59]	0.0061*** [5.57]	0.0510*** [7.71]	0.0523*** [7.78]	0.0220*** [3.59]	0.0239*** [3.84]

TABLE 8—WAGE EFFECTS BY TASK CHARACTERISTICS AND INDUSTRY EXPERIENCE

Interaction term (Z):	Routine	Non-routine	Non-routine (other than math)	Social sciences	Natural sciences	Communication	Industry- specific experience
log(offshoring)	0.0075 [0.83]	-0.0034 [-0.40]	-0.0055 [-0.66]	-0.0049 [-0.54]	-0.0155* [-1.70]	0.0030 [0.34]	-0.0248*** [-2.85]
log(offshoring) × high-skilled	-0.0081 [-1.20]	-0.0264*** [-3.89]	-0.0227*** [-3.37]	0.0151** [2.40]	0.0465*** [6.88]	-0.0081 [-1.28]	0.0512*** [8.53]
log(offshoring) × Z	-0.0422*** [-17.36]	0.0497*** [14.10]	-0.0443*** [-13.56]	0.0377*** [16.09]	-0.0008 [-0.44]	0.0446*** [17.23]	-0.0002 [-1.12]

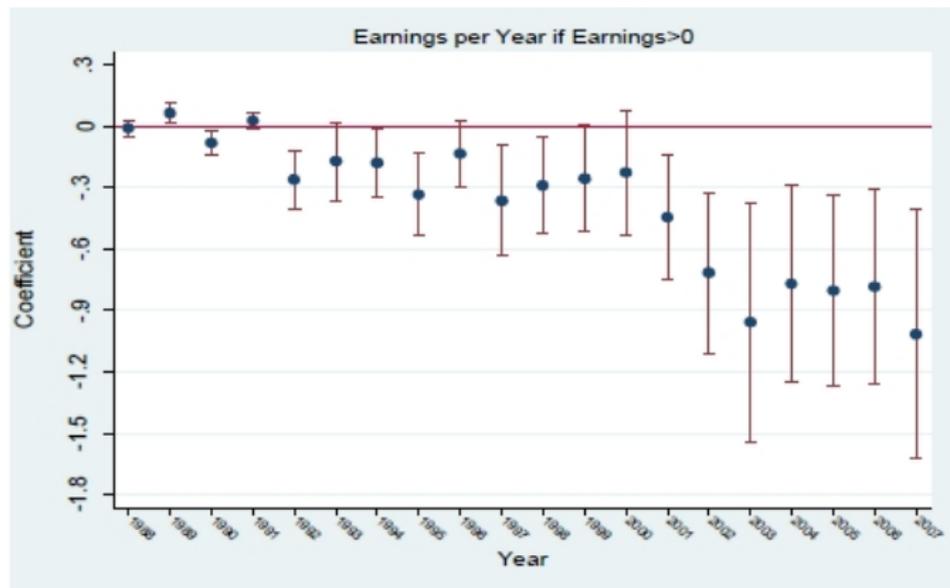
- The net wage effect of trade varies substantially across workers of the same skill type
  - Conditional on skill, the wage effect of offshoring exhibits additional variation depending on task characteristics.
  - Workers whose occupations involve routine tasks experience larger wage drops with offshoring.
- Long-term earnings losses
  - Displaced workers from offshoring firms suffer greater earnings losses than other displaced workers, and that low-skilled workers suffer greater and more persistent earnings losses than high-skilled workers.

## "The China Syndrome: Local Labor Market Effects of Import Competition in the United States"

- Analyze the effects of rising Chinese import competition (1990-2007) on U.S. local labor markets,
  - exploit cross-market variation in import exposure stemming from initial differences in industry specialization and instrument for U.S. imports using changes in Chinese imports by other high-income countries.
- Rising imports cause higher unemployment, lower labor force participation, and reduced wages in local labor markets that house import-competing manufacturing industries.
- Import competition explains one-quarter of the contemporaneous aggregate decline in U.S. manufacturing employment.
- Transfer benefit payments for unemployment, disability, retirement, and healthcare also rise sharply in more trade-exposed labor markets.

## "Trade Adjustment: Worker Level Evidence"

- Analyze the effect of exposure to import competition from China on earnings and employment of U.S. workers (1992-2007)



Year-by-year regression results by main outcomes

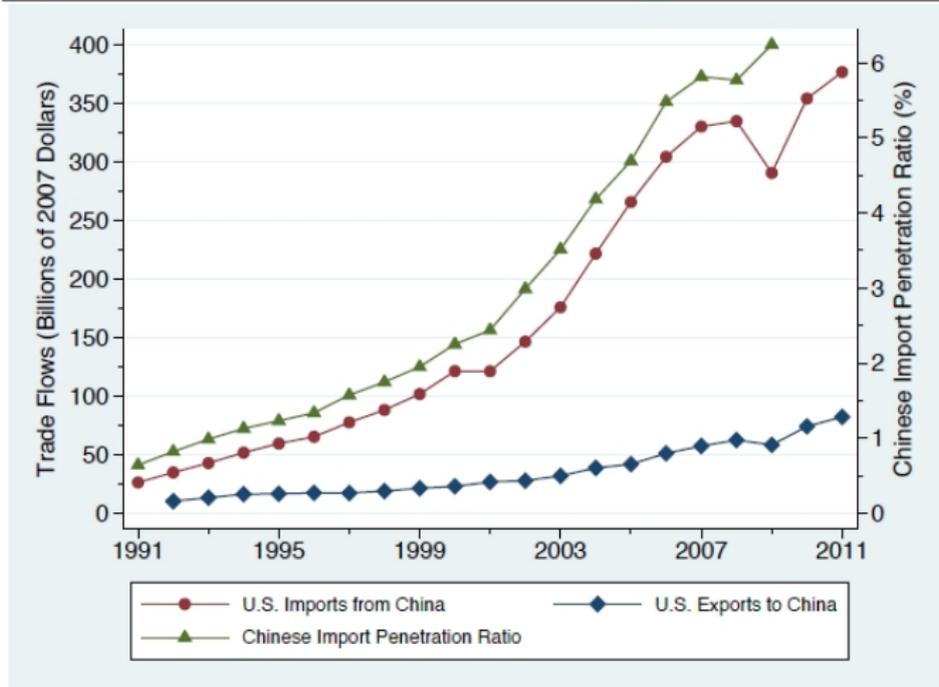
- Individuals who in 1991 worked in manufacturing industries exposed to high subsequent import growth
  - garner lower cumulative earnings and are at elevated risk of exiting the labor force and obtaining public disability benefits.
  - spend less time working for their initial employers, less time in their initial two-digit manufacturing industries, and more time working elsewhere in manufacturing and outside of manufacturing.
- Earnings losses are larger for individuals with low initial wages, low initial tenure, low attachment to the labor force, and those employed at large firms with low wage levels.
  - high-wage workers are better able than low-wage workers to move across employers with minimal earnings losses, and are less likely to leave their initial firm during a mass layoff.

## *"Import Competition and the Great U.S. Employment Sag of the 2000s"*

- Analyze the swift rise of Chinese import competition to sluggish U.S. employment growth
- Find it to be the major force behind recent reductions in US manufacturing employment, through output-input linkages and other GE effects.
  - net job losses of 2.0 to 2.4 million stemming from the raise in import competition from China 1999-2011.

# Acemoglu, Autor, Dorn, Hanson and Price (2014):

Figure 2. Bilateral U.S.-China Trade Flows and Chinese Import Penetration, 1991-2011.



### *"Made in China, Sold in Norway: Local Labor Market Effects of an Import Shock"*

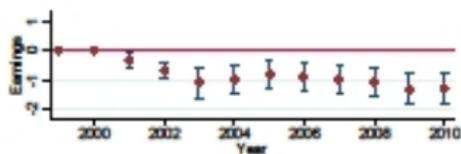
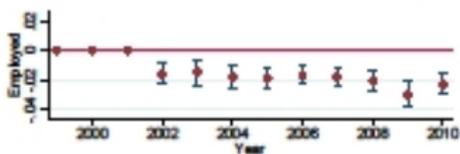
- Apply the approach of Autor, Dorn and Hanson on Norway.
- Find negative employment effects for low-skilled workers, and observe that low-skilled workers tend to be pushed into unemployment or leave the labor force altogether.
- Find no evidence of wage effects. An explanation: in Nordic welfare states firms are flexible at the employment margin, while centralized wage bargaining provides less flexibility at the wage margin.
  - Estimates suggest that import competition from China explains almost 10% of the reduction in the manufacturing employment share from 1996 to 2007 which is half of the effect found by Autor, Dorn and Hanson (2013) for the US.

## *"Worker-level Consequences of Firm-level Import Shocks: Evidence from Finland"*

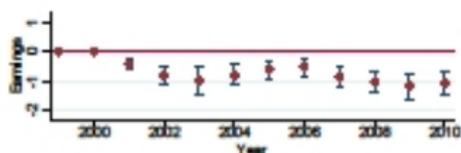
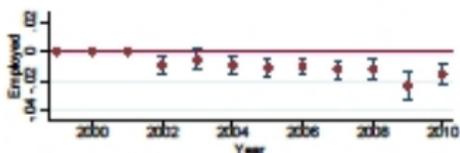
- Use the universe of Finnish manufacturing firms and the employees
- Analyse the effects of Chinese imports (2001-2007) on employment and earnings by distinguishing between import competition in final products and firms' use of imports in production
- Find that both types of Chinese import shocks increase the job loss risk for all workers and, in particular, for workers in production and professional occupations.
- Like Autor et al. (2014), find that workers initially employed in industries that face higher growth of Chinese import penetration suffer long-lasting reductions in employment and earnings.

# Nilsson Hakkala and Huttunen (2016):

## Industry Imports



## Import Competition



## Offshoring

